

## 'Fatto di Fiemme': Stradivari's violins and the musical trees of the Paneveggio

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### Musical trees in the historical imagination

For centuries a particular microclimate in the Val di Fiemme has provided ideal conditions for the growth of resonance wood, the fundamental material for constructing the quality musical instruments central to the sound of Western music. Today part of the Parco Naturale Paneveggio/Pale di San Martino in the Italian province of Trentino, the Paneveggio is known as 'la foresta dei violini', the forest of violins.<sup>1</sup> From here, in the eighteenth century, the wood of the spruce<sup>2</sup> embarked on a long and arduous, yet delicate and fortune-dependent, journey: musical trees of the mountain-valley forests were brought to nearby cities, where luthiers transformed them into musical instruments for use in the concert hall, where the imaginations of countless audiences have been transfixed for centuries. Contrary to what happened to other musical woods, such as the pernambuco used to make violin bows, a combination of global values and local environmental and cultural conditions shielded the spruce from Venice's insatiable desire for timber and contributed to centuries of sustainable forestry in the Paneveggio.

Resonance wood from Fiemme has been used throughout the world, but its history is tied especially to the city of luthiers, Cremona, whose most famous son was Antonio Stradivari (1644/49-1737). Stradivari's instruments and their attendant myths, both products of the long eighteenth century, provide a case study to begin disentangling a web of cultural and ecological values and meanings. The life history of a violin

1. For introducing me to the Paneveggio, I am grateful to Valentino Bacchi, Roberta Ranon, Alfredo Vitolo and especially Anna Radice, who introduced me to Gian Piero Rivolta, *Storie di alberi, di legni e di uomini* (Desio, 2004). Established in 1901, Rivolta's business is one of the world's most respected purveyors of musical-instrument wood; see Patricia Kaden, 'Family affair', *Strings* 16:7 (2002), p.90-93; Carlo Chiesa, 'Mix and match', *The Strad* 112:1332 (2001), p.472. My thanks also to Albert Albano, Corey Bellis, Gavin Douglas, Benjamin Hebbert, Christina Linsenmeyer, Kailan Rubinoff and Leigh Rudner for stimulating conversations.
2. Also known as European spruce and Norway spruce, nomenclature is problematic for this tree, *Picea abies* or *P. excelsa* (or *abete* in Italian).

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involves a complex story emblematic of the ‘necessary union of culture and nature’, which, as Simon Schama mused, shows how ‘an understanding of landscape’s past traditions was a source of illumination for the present and future’.<sup>4</sup> While the history of these musical trees provides both respect for the present and hope for the future, such ecomusicological enquiry also raises questions about the concatenated cultural values that audiences have accorded to music, performers, instruments and luthiers, as well as to the musical instrument wood and the forests whence it came. In the case of the Paneveggio, social and natural vicissitudes have combined to accord shifting values to a resource that – despite the many human attempts to quantify it, and despite its literal rootedness – is both unquantifiable and mutable.

### Musical trees in the forest

This history of Paneveggian spruce is unlike the well-known modern story of another musical wood: pernambuco (*Caesalpinia echinata*). This wood, also known as *pau brasil* (Brazilwood) or in Portuguese as ‘flaming-red wood’,<sup>5</sup> is the best source for the performance-quality bows used to play violins, violas, violoncellos and double basses (all instruments that use spruce resonance wood).<sup>6</sup> The story of pernambuco is one of exploitation and near extinction.<sup>7</sup>

Pernambuco is a legume, one of the largest plant families on earth, but *C. echinata* is endemic to only specific microclimates within the coastal forest of Atlantic South America. Only about 8 per cent of the Mata Atlântica remains, and only 5 per cent of original pernambuco habitat is extant, although this loss is less well known than the similar fate of the nearby Amazonian forest.<sup>8</sup> These forests – along with the indigenous peoples and African slaves brought in to supplement them – have been plundered and exploited for over four centuries. European colonial

4. Simon Schama, *Landscape and memory* (New York, 1995), p.19, 17.

5. Nomenclature for *C. echinata* is also problematic because of confused references to ‘Brazilwood’ and ‘pernambuco’. Brazilwood may be *C. sappan* or even a species of *Tabebuia*; it is a less expensive red-coloured wood from Asia known in Europe before the discovery of South America. Aboriginal peoples called pernambuco ‘ibirapitanga’. *La botanica della musica*, ed. Gabriele Rinaldi (Bergamo, 2009), p.28-29; and James Beament, *The Violin explained* (Oxford, 1996), p.159.

6. Although of a different historical lineage, double-bass construction is similar to that of the violin family. I use ‘violin’ to represent this family complex.

7. Most of the following is based on Russ Rymer, *Out of pernambuco* (forthcoming); I heard Rymer’s passionate presentation in October 2009 at the Radcliffe Institute for Advanced Study; see also his ‘Saving the music tree’, *Smithsonian magazine* 35:1 (2004), p.52-63.

8. These figures are provided by the International Pernambuco Conservation Initiative, who kindly shared with me some pre-publication material from *The Conservation, restoration, and repair of stringed instruments and their bows*, ed. Tom Wilder, 3 vols (Montreal, 2010).

powers fought wars against each other and against indigenous peoples over pernambuco due to its capacity to provide the dye for the regal red garments of kings and cardinals (manufactured chemicals replaced it as a dye by the late nineteenth century). *Pau brasil* gave its name to the country we now know as Brazil.

Archetiers (bow makers) began using pernambuco in the eighteenth century after François Xavier Tourte realised its remarkable properties. His experimentation with the subtle, strong, stable and beautiful wood contributed to a new concave bow design that allowed for greater control in playing violins when compared to the then traditional snakewood or ironwood bows that were either straight or convex. Only wild-grown pernambuco, which have competed for light and space in the forest, have these properties; plantation- and urban-grown trees are insufficient for quality bows. Tourte's design is still used today, and further innovations have resulted in a flourishing bow-making industry.

At the same time, however, bow makers have recognised the precarious place of this unique resource. Although they alone have not put pernambuco on Brazil's endangered species list – the explosive urban growth of cities such as Rio de Janeiro and São Paulo, slash and burn agriculture, large-scale cattle operations, soybean farming, eucalyptus plantations and tourism development have contributed to decreasing pernambuco habitat – archetiers constitute one of the most visible public faces of pernambuco use. Bow makers have tried to become more responsible, but, lacking a quality replacement (no synthetics or other woods have the same properties), they have continued to rely on this increasingly rare resource, the price of and demand for which results in poaching. In response to the threat facing pernambuco and its forests, in 2007 the United Nations Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) developed restrictions on the pernambuco trade that included requiring musicians to register their bows with the state – a law that, if enacted, would result in control tighter than that for handguns in the United States. But with programmes such as the International Pernambuco Conservation Initiative and other industry cooperation and management programmes dedicated to preserving Brazil's coastal forests, CITES may not need to resort to such drastic measures. Although the tree and its habitat are endangered due to a long history of exploitation, pernambuco's use as a musical wood has contributed both to its demise and to preservation efforts.

Pernambuco is not the only musical wood that is endangered. Many woods of the *Dalbergia* genus used for instruments are also exploited. Quality clarinets, oboes and wooden flutes are made from the endangered African blackwood (also known as mpingo or grenadilla,

*Dalbergia melanoxylon*). Guitars frequently use rosewood (*Dalbergia* spp.) and ebony (*Diospyros* spp.), which are also threatened. Jakwood is the traditional material for the classical Indian veena, which was crafted traditionally from a single piece of a tree that grew on the grounds of a religious institution and had a bell hung from its branches, such that the resonance of the bell would permeate the wood – but such carefully tended trees can no longer grow large enough to meet increasing demand. In unwitting ways, musical cultures have contributed to the destruction of the ecosystems on which they depend.

But there are exceptions, as with the millennium of spruce forestry in the Val di Fiemme. The spruce is a widely distributed species found throughout the world in temperate and boreal forests, and it is by no means endangered; but high-quality wood for instruments requires particular growth conditions found in only a few places, such as Alaska, the Adirondacks and this small region in the Alps. Furthermore, even in the right microclimate – one in which light, soil, altitude and moisture combine to produce long-lived, slow-growing trees in a properly timed growing season that results in balanced growth rings – only a minuscule percentage of harvested trees yields a trunk with true resonance wood. Then, a luthier can use only a small section of that trunk, which must first be cleaved (or quarter-sawn) carefully and air-dried for years.

The Paneveggio has the optimal microclimate for resonance-wood development. More importantly, it has had cultural institutions to manage this resource carefully. Furthermore, it was in close proximity to supply Brescia and Cremona, home to Western music's most renowned luthiers, including Nicolò Amati (1596-1684) and Giuseppe Guarneri del Gesù (1698-1744), as well as Stradivari. Their use of Paneveggian spruce and their famed craftsmanship – idealised by luthiers, performers and listeners alike, and studied and copied for centuries – provided the moniker 'the forest of the violins'. But these famed men may not have made such remarkable instruments were it not for the communities of the Val di Fiemme and the rulers of the Tyrolean-controlled Paneveggio who, for centuries, practised what would be called today sustainable forestry. Such responsible practices continued even as luthiers required select wood to serve their increasing market, and even as another Fiemmese neighbour, Venice, demanded significant quantities of wood to build its massive navy.

### Musical trees out to sea?

From at least the fourteenth century the Republic of Venice genuflected to its Alpine neighbour and timber supplier. The Venetians referred to the Val di Fiemme as their *magnifica sorella* ('magnificent sister'), hence the

traditional name of Magnifica Comunità di Fiemme (MCF). Today, the MCF is praised for quality wood and successful management of common-property forests, but such respect might never have been were it not for the region's particular topography – and had Venice's economic desires prevailed.

The Venetians had a voracious appetite for raw materials to build and maintain their navy; their Arsenale could produce one ship per day.<sup>9</sup> As Karl Appuhn put it, Venice itself has a 'hidden heart of wood': trees are the literal foundation for this floating city.<sup>10</sup> For example, the foundation for the Basilica of Santa Maria della Salute (built c.1630) required 12,000 oak piles; extrapolated to the urban core, that would result in approximately 20,000,000 piles. In the Arsenale, the hull of an average round ship required eighty oak trees, and a small galley ship needed about 180 oars – yet one formidable beech tree would yield but six.<sup>11</sup> During the Turkish wars, the Venetians felled and stockpiled massive amounts of timber for their shipbuilding. Paolo Veronese's 1571 painting *Allegoria della battaglia di Lepanto*, which depicts a sea battle between Christian and Ottoman forces, provides a visual representation of ships that, in the context of such material use, represents a forest at sea.

For firewood, construction and canal maintenance, the Republic had a vast network of timber suppliers that stretched from the Alpine border of Austria to the Dalmatian and Greek coasts. Venice took a market approach and mostly respected the varied customs and practices of these local suppliers. But in the fifteenth century the Republic began acquiring land and passing laws regarding its forest properties and partners. Although Venice learnt that local over-forestry had a negative environmental impact (flooding and silted canals on the mainland and in their lagoon), and despite laws and practices reflecting an understanding of responsible management, the actual practice of sustainability eluded them. The Republic's lands were less productive than those of their partner communities, due in part to unenforceable Venetian legislation, clandestine cutting and overuse.<sup>12</sup>

9. Rivolta, *Storie di alberi*, p.42. That figure may represent construction with prefabricated materials. More representative numbers (ranging from dozens to over a hundred ships per year, depending on type and economic/war situation), along with some unique documents regarding numbers and sizes of boards, are provided in Frederic Lane, *Venetian ships and shipbuilders of the Renaissance* (Baltimore, MD, 1934), especially p.218. See also Grove, *Green imperialism*, p.27.

10. K. Appuhn, 'Inventing nature: forests, forestry, and state power in Renaissance Venice', *Journal of modern history* 72 (December 2000), p.861-89 (866).

11. Williams reports that a large warship of 1000 tons needed between 1400 and 2000 oak trees each about 100 years old, thus requiring approximately 16-20 hectares of forest. M. Williams, *Deforesting the earth* (Chicago, 2003), p.193.

12. Appuhn, 'Inventing nature', p.861-89; Appuhn, *A Forest on the sea* (Baltimore, 2009),

Tall, straight, strong and resistant spruce timbers were ideal masts for Venice's war and merchant ships. The Republic convinced the communities of Cadore (just east of Fiemme and in a watershed connecting to Venice) to surrender their spruce forests in exchange for political favours and money, disrupting centuries of local traditions without ever gaining satisfaction for the amount of timber received.<sup>13</sup> But the MCF was just out of easy reach due to the topography of the Dolomites; hence, Venice was content to continue a market approach with its 'magnificent sister'. If the MCF had had less of a history of independent management and had been just a little closer, it might have surrendered like Cadore. Its unique location and practices, however, allowed it to avoid exploitation and to manage its forests sustainably.

Through intensive and dangerous work, the MCF nevertheless benefited from Venetian partnerships. The watershed of the Paneveggio and Val di Fiemme drains to the west via the Avisio River, which joins the Adige River just north of the Tyrolean capital of Trento. The Adige enters the Po valley and empties into the Adriatic south of Venice. Most Fiemmeser lumber went to market via this route, which for Venice was a circuitous 300 kilometres. But a route half as long, and heading more directly to Venice, involved crossing the Dolomites just south of the Paneveggio; near Canal San Bovo lumber could enter the Vanoi River and then move into the Brenta or Piave waterways for Venice. Although this route offered a more direct link, it unfortunately included smaller mountain rivers and steep, sometimes uphill, grades; the Fiemmeser solved the problem by skidding the logs on paths they built and allowed to become frozen with ice in the winter, eventually bringing them to larger water bodies where they could be floated down in the spring. The sliding logs and rushing waters often took the lives of the loggers, and the paths are still strewn with memorial markers.<sup>14</sup> The responsible management and dedicated labour of the Fiemmeser made trade possible (particularly in the seventeenth century when widespread deforestation resulted in higher prices or when passage via the Avisio was blocked),<sup>15</sup> but the effort and cost of bringing large quantities of high-quality logs to Venice were just enough to make exploitation difficult.

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p.306-307; Grove, *Green imperialism*, p.27. For a general context, see also M. Williams, *Deforesting the earth* (2003), p.168-209, esp. 193-96.

13. Raffaello Vergani, 'Le materie prime', in *Storia di Venezia: temi: il mare* (Rome, 1991), p.285-312. See also Appuhn, *A Forest on the sea*, p.98 ff.

14. Rivolta, *Storie di alberi*, p.121-25, and Gianfranco Bettega and Ugo Pistoia, *Un fiume di legno* (Primiero, 1994). In the context of scarce lumber resources in the Mediterranean, the ice-sliding methods resembled the more efficient production of the Dutch, who exploited Baltic forests (see Lane, *Venetian ships*, p.232).

15. Candido Degiampietro, *Storia di Fiemme* (Cavalese, 1972), p.74, 78.

## Musical trees in the mountain valley

The logs from the high mountain valleys of the Paneveggio that skidded and floated down the Vanoi on their way to Venice were not uniquely destined for luthiers, but they grew among the musical trees that produced resonance wood.<sup>16</sup> The segregation of these resources required careful control, and the MCF has a long history of sustainably managing its forest resources.<sup>17</sup> Thanks to this work, and despite Venice's desires, eighteenth-century luthiers were able to procure Paneveggian resonance wood.

Traces of settlement in the Val di Fiemme date to pre-Roman times, when difficult access kept the valley isolated from the trans-Alpine traffic of the Adige valley. In 1111, the bishop-prince of Trento and the Fiemmesi codified that independence in the *Patti Ghebardini*, which along with later similar documents provided the eleven villages of the Val di Fiemme with direct common ownership of their forestry, pasturage, fishing, hunting, water and other resource rights on approximately 45,000 hectares of land, over half of which are forested. (In the 1990s, the MCF owned some 20,000 hectares of land, which is also more than half forests; private interests held less than 2000 hectares.) In 1270, the Fiemmesi underscored the importance of these forests by declaring them to be used for the Church and the general needs of the valley (mostly for building and fuel, with some lumber sales permitted). Such an arrangement provided the important resource base for a robust local economy and survival in the Alpine environment.

The democratic institutions for communal planning and decision-making that were set up in the twelfth and thirteenth centuries continued until Bavarian and Austrian rule began early in the nineteenth century, when those states no longer recognised the previous agreements; the modern Italian state, however, has reaffirmed the earlier laws. Fiemmesi with ownership rights are known as *vicini* (neighbors), today defined as someone born to a resident family of *vicini* or having lived permanently in the valley for twenty years. (In the 1990s, of some 20,000 residents, approximately 18,800 were *vicini*; in the past, only male heads of households were considered *vicini*.) The *vicini* of each village

16. My overview of the Val di Fiemme relies on Riccardo Morandini, 'A modern forest-dependent community: the Magnifica Comunità di Fiemme in Italy', *Unasylva* 47:3 (1996), p.47-52.

17. See also C. Ford Runge and Edi Defrancesco, 'Exclusion, inclusion, and enclosure: historical commons and modern intellectual property', *World development* 34:10 (2006), p.1713-27; Maurizio Merlo, 'Common property forest management in northern Italy: a historical and socio-economic profile', *Unasylva* 46:1 (1995), p.58-63; Antonio Zieger, *La Magnifica Comunità di Fiemme* (Trento, 1973); Degiampietro, *Storia di Fiemme*; Rinaldi, *La botanica della musica*; and Rivolta, *Storie di alberi*, p.117-21.

elect as their representative a *regolano* to sit on the valley governing council, led by a *scario* (president) who is charged to make most decisions and, with the help of the *saltari* (forest guards), to protect the forests. For the most important decisions, *vicini* come together in general assemblies (*comuni generali*). At least since the early sixteenth century, the MCF has preserved the *vicini*'s oral rights and obligations in written documents; provisions of the 1592 *Ordini dei boschi*, for example, include protections against fire, preservation and/or limited use of certain forest tracts, dates for harvesting, and the number of trees each *vicino* can harvest and sell each year. All sold lumber had to bear the Comunità brand, a practice continued to this day.

While the general trend of management in the MCF has been sustainable, various incidents have taken the forests in other directions. For example, in the eighteenth century, some forests were leased to commercial enterprises,<sup>18</sup> but the mismanagement that resulted caused the MCF to resume direct communal control. The nearby battlefronts of World War I resulted in extensive clear-cutting, road-building and munition damage to trees. In the 1930s, some clear-cutting practices continued along with road development into previously inaccessible areas; at the same time, some management practices were extremely cautious, resulting in over-mature areas that decreased yields. By the 1980s, management flexibility and technology allowed for more integrated sustainable management (i.e. selective logging, replanting, natural regeneration) of a finely divided mosaic of forest lands. These efforts are combined with management of pastures and meadows for agriculture, as well as with a small tourist industry. Since organised management plans under a professional forester began in the late nineteenth century, the MCF has also been able to use its financial resources to build roads and hospitals, to fund educational and cultural organisations (e.g. music and sport), and to support local tourist industries.

The land in the Fiemme is stratified: the highest elevations are rocky mountain tops, the hill and mountain sides are covered in forests and dotted with the occasional alpine meadow, while the small valleys provide more accessible land for pasture, dwelling and the dominant wood-products industry. The climate and terrain combine with human management to create ideal conditions for forest growth. Spruce is the dominant species, mixed with larch at higher altitudes; the higher altitudes also provide ideal conditions for the growth of resonance wood. Mature spruce are *c.*150-200 years old and 45 to 50 metres tall. In the 1990s, the density of standing timber was as much as 320-420 cubic

18. See Zieger, *La Magnifica*, p.79 ff., and Degiampietro, *Storia di Fiemme*, p.74 ff.



metres per hectare (by contrast, the mean for the rest of Italy was 160 cubic metres per hectare); annually, the forests add 55,000 cubic metres, while annual extraction amounts only to 45,000-50,000 cubic metres. The MCF sold 50 per cent of that harvest for further processing and processed another 36 per cent in Fiemmesse sawmills; of the remaining 14 per cent of high-quality wood for carpentry, only less than 1 per cent is free of defects and suitable for lutherie. When an Italian craftsman or luthier says her work is 'fatto di Fiemme' ('made of Fiemme'), she is praising the rare material fundamental to the quality of her creation.

### Musical trees in the city

The Lombard city of Brescia, which lies at the southern edge of the Alps in the Po valley about 50 kilometres west of the Adige, was a centre for Italian lutherie by the fifteenth century. But Cremona, its neighbor 50 kilometers south, became the hub of instrument-building between the sixteenth and eighteenth centuries. These cities were well situated geographically to take advantage of wealthy clientele, trade routes and supplies of quality wood from the Adriatic basin and the Alps, including the Paneveggio.

Lutherie originally referred to the craft of manufacturing lutes, medieval plucked chordophone (stringed) instruments similar to the Mediterranean guitar, Indian sitar and Middle Eastern oud. The etymology of the word 'lute' tells of its material creation and regional entry into Europe: the Middle French 'lut', derived from the Occitan 'laut', came from the Arabic 'al-kd', or literally 'the wood'. Craftsmen applied the same skills to bowed chordophones of the violin family. The Cremonese Andrea Amati established the basic form of the violin, and by the late seventeenth century his successors developed its form into one that has changed little since then. Countless studies have been written on the techniques and methods of violin construction, from the scientific to the aesthetic to the personal; considering that none has yet answered fundamental questions (e.g. why does the violin sound the way it does, and why do so many people like it so much?), countless further studies will be written.<sup>19</sup>

The basic construction of the violin appears simple – a stick, some strings, a box – but it is a complex object made of about seventy parts. The stick and many other parts are made of maple, and the fingerboard (on the stick) is of ebony; historically, the strings were of gut, but modern violins use gut or other core materials wound with steel. The sides of the box are made of a hardwood, and for aesthetic purposes the back is often

19. See, for instance, Beament, *The Violin explained*; Voichita Bucur, *Acoustics of wood*, 2nd edn (Berlin, 2006), p.173 ff; John Marchese, *The Violin maker* (New York, 2008).

quilted, or curly maple (such use resulted in the Americanism ‘fiddle back maple’). The front of the box, closest to the strings, is the primary soundboard, typically of spruce resonance wood.

Ideal resonance wood has particular natural characteristics, but careful selection and craftsmanship also play a role in making a good sound. Rubbing a horse-hair bow across taut strings creates sound waves (vibrating air), which the soundboard amplifies and enriches. In addition to the need for large-diameter, old-growth logs free of defects, the properties of elasticity and internal friction contribute to the acoustic properties of the wood. Longitudinal and transverse wood grain affects these properties; in turn, growth conditions (light, soil, altitude, moisture and season length) affect wood grain. Resonance wood needs balanced growth rings, which entail ideal proportions of densities of and distances between early and late wood (also called spring and summer wood); resonance wood needs a preponderance of the former. Moreover, an unusual transverse property known as indentation, which Paneveggian spruce often has, contributes to acoustic and aesthetic properties. Craftsmen trained in the art and science of finding resonance wood must select standing trees; they must carefully fell, test and choose the logs; meticulously hand split or carefully cut them; and then air-dry them for years (the length of time is dependent on the particular log and the local climate). Despite the volumes of science dedicated to resonance wood, the selection and production of it still relies on experience and art. Upon successful selection and preparation of this rare musical wood, the artistry of the luthier is needed to make it sing.

In the history of the violin – from Amati’s original designs of the 1560s to mass production in Chinese factories today – one luthier has achieved mythic fame above all others. Antonio Stradivari had the aid of two sons, Francesco and Omobono, but both died soon after their father, ending the dynasty in the mid-eighteenth century; most of the instruments attributed to the Stradivari workshop (known as ‘Strads’) came from the hands of Antonio during his nearly seventy-year-long working career. The majority of these approximately 650 Strads (primarily violins and cellos) post-date the 1680s, the time of Stradivari’s rise to prominence beyond Cremona. The first two decades of the eighteenth century have been called Stradivari’s ‘golden period’, with instruments such as the ‘Betts’ (1704), ‘Alard’ (1715) and ‘Messiah’ (1716) cited as the pinnacle of his achievement. Today, Strads are held by museums, foundations, collectors and the world’s most respected performers.

Stradivari developed what many consider to be an ideal violin sound, which comes from the use of resonance wood. Throughout his career, Stradivari fine-tuned the measurements and proportions of the violin; the primary change was one of increased length, but he also adjusted the

curvature and relative dimensions of the basic figure-of-eight shape – all of which affected the size of the soundboard. In addition, the size and placement of the sound holes (the f-shaped cuts) and the placement of the internal bass bar and sound post (both also of spruce and used for support and acoustic purposes) affected the amount and structure of resonance wood. Stradivari's varnish has also been idealised because, rather than being a mere aesthetic finish, varnish affects the resonating properties of wood.

Most of Stradivari's spruce was of local Alpine or Adriatic origin, although he may have used different wood qualities depending on the particular commission. Many luthiers and musicians from (and much tourist literature from, and popular literature about) the Val di Fiemme and Paneveggio emphasise the importance of the 'forest of the violins' for Stradivari. They also perpetuate romanticised stories of Stradivari strolling through the Paneveggio choosing the most musical trees to be soundboards for his creations.<sup>20</sup> We should remain sceptical, but lacking significant data to the contrary and considering some certain correlations between Stradivari and Alpine spruce,<sup>21</sup> it is likely that he obtained many soundboards from the relatively nearby MCF.

Two recent studies convey the scientific curiosity of Strads. A team analysed five instruments from between 1692 and 1720, and found that the varnish compositions were similar. A first layer of drying oil penetrated the surface of the wood; a second superficial layer contained oil, resin and pigment. All the ingredients were in common use at the time; thus, despite other studies that have found various purported special ingredients (from proteins to volcanic ash to fungi), Stradivari's varnish was not the unique component of his craft but was just one part of it.<sup>22</sup> A second study remains a hypothesis but, like the varnish issue, attracted widespread attention. During the period between 1645 and 1715, a unique climatic situation known as the Maunder Minimum resulted in reduced solar activity, lower temperatures and, as a result

20. In addition to tourist brochures from the region and many luthiers' websites and promotional materials, see Paolo Lazzarin, *One hundred & one beautiful small towns of Italy* (New York, 2004); and *Il parco naturale di Paneveggio-Pale di San Martino* (Florence, 1997), p.36.

21. One dendrochronological study (discussed below) correlated Stradivari's instruments with Paneveggian spruce, as did various studies in Provincia Autonoma di Trento, *Il legno di risonanza della foresta di Paneveggio* (Trento, 2002); further, Damiano Magugliani, *L'albero della vita, l'albero della Val di Fiemme* (Cavalese, 1989), p.158, cited research similarly correlating two Stradivari (and three Guarneri) instruments. Remarkably, however, even the most recent scholarship on Stradivari ignores his wood sources beyond the most basic of assertions; see Stewart Pollens, *Stradivari* (Cambridge, 2010), p.6-7, 269-70.

22. Jean-Philippe Echard *et al.*, 'The nature of the extraordinary finish of Stradivari's instruments', *Angewandte Chemie: international edition* 49:1 (2010), p.197-201.

of the longer winters and cooler summers, reduced tree-growth rates. Trees that grew during this period – particularly in ideal environmental settings such as the Paneveggio – had even ring development and could make excellent soundboards. During the latter part of his career, Stradivari used wood grown during the Maunder Minimum, thus likely enhancing the quality of his instruments.<sup>23</sup>

On the one hand, Stradivari's varnish has been refuted as his 'secret' technique, and, on the other hand, Stradivari's wood has been proposed as his (new) 'secret' material. Yet other luthiers – some famous, others not so – used Stradivari's varnish and wood. Why are their instruments not as mythical? A combination of craftsmanship and cultural values has enthroned Stradivari as the king of luthiers. This mythologising process has been driven by taste-makers, dealers and performers.

### Musical trees in concert and auction halls

Performers of European classical music, along with market actors, have propagated the myth of Stradivari's singing wood. Luthiers and performers respected Stradivari's technical and artistic achievements in the eighteenth century, but it was at the start of the nineteenth century that the mythologising process began, notably with abbé Sébastien-André Sibire, who wrote: 'Antoine Stradivarius! A ce nom auguste et vénérable je m'incline profondément devant le patriarche des luthiers'.<sup>24</sup> In France, the worship continued in the violin-making of Jean-Baptiste Vuillaume (1789-1875), who studied and sold Strad copies, and the writing of François Joseph Fétis, who historicised and praised both luthiers.<sup>25</sup>

Performers and composers who used Strads are too numerous to list (although much ink has been spilled tracing their lineages), but consider a sampling: the influential Italian composer-violinists Archangelo Corelli (1653-1713) and Giuseppe Torelli (1658-1709) and the dedicatee of Ludwig van Beethoven's (1770-1827) opus 47 violin sonata (1802), Rodolphe Kreutzer (1766-1831), all owned Strads. Kreutzer's Strad of 1727 now carries his name and is played by the Russian-Israeli violinist Maxim Vengerov. Well-known contemporary performers who play Strads include Yo-Yo Ma, Itzhak Perlman and Joshua Bell.<sup>26</sup>

23. L. Burckle and H. D. Grissino-Mayer, 'Stradivari, violins, tree rings, and the Maunder Minimum: a hypothesis', *Dendrochronologia* 21:1 (2003), p.41-45.

24. Sibire, Sébastien-André, abbé *La Chélonomie, ou le Parfait luthier* (Paris, 1806), quoted in W. Henry Hill, Arthur F. Hill and Alfred E. Hill, *Antonio Stradivari: his life and work (1644-1737)* (London, 1902), p.274, which also lists performers who used Strads and luthiers who adopted his forms.

25. François Joseph Fétis, *Antoine Stradivari, luthier célèbre* (Paris, 1856).

26. Provenance information is widely available; see Ernest Doring, *How many Strads?* (Chicago, IL, 1945/1999); Hill et al., *Antonio Stradivari*; and [www.cozio.com](http://www.cozio.com), accessed on 27 April 2010.

Yet performers also use other eighteenth-century and modern instruments by respected but less famous luthiers, such as Vuillaume and Samuel Zygmuntowicz (b.1956). Since at least 1817, interested parties have conducted blind sound trials, in which experts (violin players, makers and dealers) attempt to determine which of a number of instruments (e.g. a Strad, another Cremonese instrument, a Vuillaume, and a Zygmuntowicz) is the Strad. Most have produced results no better than chance – much to the chagrin and amazement of the judges and performers (and expectant audiences), many of whom still swear allegiance to the handling and tone of the Strad.<sup>27</sup>

Despite the alterations of most Strads – repaired or changed to withstand the demands of nineteenth-century repertory and larger concert halls – and despite the many other excellent instruments available, the arbiters of taste have created a highly profitable marketplace for Strads. Copies were mass-produced in nineteenth-century France as part of efforts to democratise luxury, and writers and musicians praised originals, which museums and investors began collecting and loaning to performers. The result is that antiquarians, dealers and auction houses have managed steadily to increase demand – and prices.<sup>28</sup> Twentieth- and twenty-first century auctions of Stradivari violins and cellos have resulted in enormous prices: in 2010, the ‘Molitor’ Strad (1697) sold for a record \$3.6 million. Its proud new owner, violinist Anne Akkiko Meyers, plays it with a \$200,000 pernambuco bow made by Tourte.

### Musical trees in the future

But how do we really value that piece of wooden craftsmanship that is a Strad? And how do those values connect to its roots in the ‘forest of the violins’? These instruments – made from the prized resonance wood of the Paneveggio, crafted by the consummate skill of luthiers such as Stradivari, played by talented musicians who perform the carefully wrought musical works of famed composers – are cultural commodities that have histories ranging from their originating forest to their ultimate performance stage.<sup>29</sup> The object itself, the Strad, does not contain all that

27. See Beament, *The Violin explained*, p.89 ff.; Marchese, *The Violin maker*, p.130 ff; and John Whitfield, ‘Rot offers fresh sound for violin makers’, *Nature news* (16 June 2008), accessed from <http://www.nature.com/news/2008/080616/full/news.2008.894.html> on 7 February 2012.

28. My understanding of the Stradivari mythology has been enriched by Christina Linsenmeyer, ‘Competing with Cremona: violin-making innovation and tradition in Paris (1802-1851)’ (doctoral dissertation, Washington University, St. Louis, in progress), which she kindly discussed with me.

29. This section is informed by *The Social life of things*, ed. Arjun Appadurai (Cambridge, 1986), particularly Appadurai’s ‘Introduction: commodities and the politics of value’ (p.3-63).

is special, even as musicians, craftsmen and scientists try to uncover its secrets. Rather, the value lies in its process of becoming, its life history. Cultural values are mapped onto a wooden box with a stick and some strings. It is not just the talented player or the magnificent music or the genius composer; nor is it just the master luthier or his secret varnish or his perfect proportions; nor is it just the rare resonance wood or the unique forest whence it came, or the careful craftsmanship to supply it or the sustainable practices that harvested it. Rather, it is a combination of all these elements, a coming together of ecological and cultural factors that create value – and by creating demand and generating respect for the wooden object, we send a ripple through the chain and can create value for other steps along the way, from instrument to music to craft to forest.

Recognising this historical web of valuation and the attendant elements of possible exploitation or sustainability can shape our understanding and inform our management of both nature and musical cultures. This history shows that values accorded a Strad contributed to sustainable practices in the Paneveggio while, at the same time, similar values accorded a pernambuco bow contribute to exploitation in the Mata Atlântica. Just as a variety of factors contribute to deforestation in Brazil (material greed, urban sprawl, monocultures, violin bows, etc.), so too do a variety of factors contribute to the preservation of the Paneveggio (cultural institutions, geographical location, climate, soundboards, etc.). Building on Schama: understanding past forests contributes to realising the peril and possibilities of present and future forests. The story of the Paneveggio offers lessons for other forests, such as the Mata Atlântica: although difficult to create ex nihilo, practices of communal forestry, local common-property institutions and socio-economic development can go hand in hand with providing goods to the global marketplace,<sup>30</sup> particularly when resulting cultural commodities such as violins have widespread – if practically unquantifiable and culturally mutable – values.

The sharing of local knowledge and histories (as opposed to top-down international conservation initiatives), can both prevent and encourage the proverbial repetition of history. After the late-eighteenth-century enthronement of Stradivari and the copying and mass production of Strads in the mid-nineteenth century when originals were highly prized,

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For a more sustainability-oriented approach to material culture, see Annie Leonard, *The Story of stuff* (New York, 2010).

30. Merlo, 'Common property forest management in northern Italy'. The sizes of the two forests are vastly different, but lessons from the smaller Paneveggio could be extrapolated for the larger Mata Atlântica.

thousands of Italians migrated from the Italian Trentino to Brazil. In 2009, the community of Primiero, on the southern side of the Paneveggio just outside the Fiemme, became a sister city of Piraquara, a Brazilian town just east of Curitiba in the Mata Atlântica (though far south of the pernambuco growing area). One goal of the association is to share ideas and resources that contribute to sustainable development.<sup>31</sup>

In the end, both ecological and cultural values have contributed to sustaining musical trees in the Italian 'forest of the violins' and to felling similarly valuable trees half a world away in Brazil. The mythological figures of Stradivari and his instruments specifically, but also the violin family in general, have contributed to threatening as well as to preserving the unique resources on which Western music depends. Understanding this union of nature and culture stands to inform, affect and (de)value future endeavours as well.

31. Daniele Gubert, 'Il Parco in Brasile', accessed from <http://www.parcopan.org/it/news/il-parco-in-brasile-n102.html> on 10 September 2011.

