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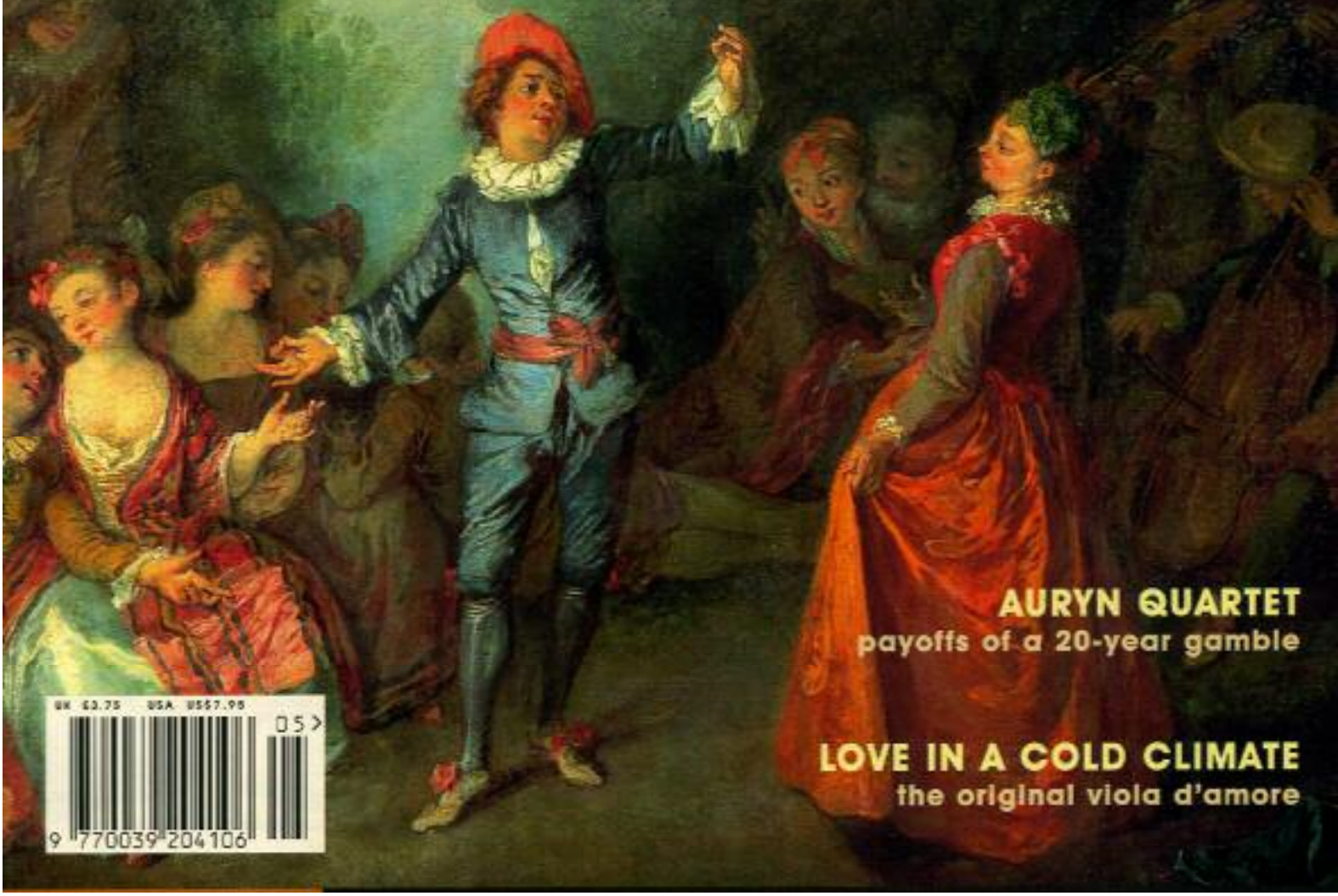

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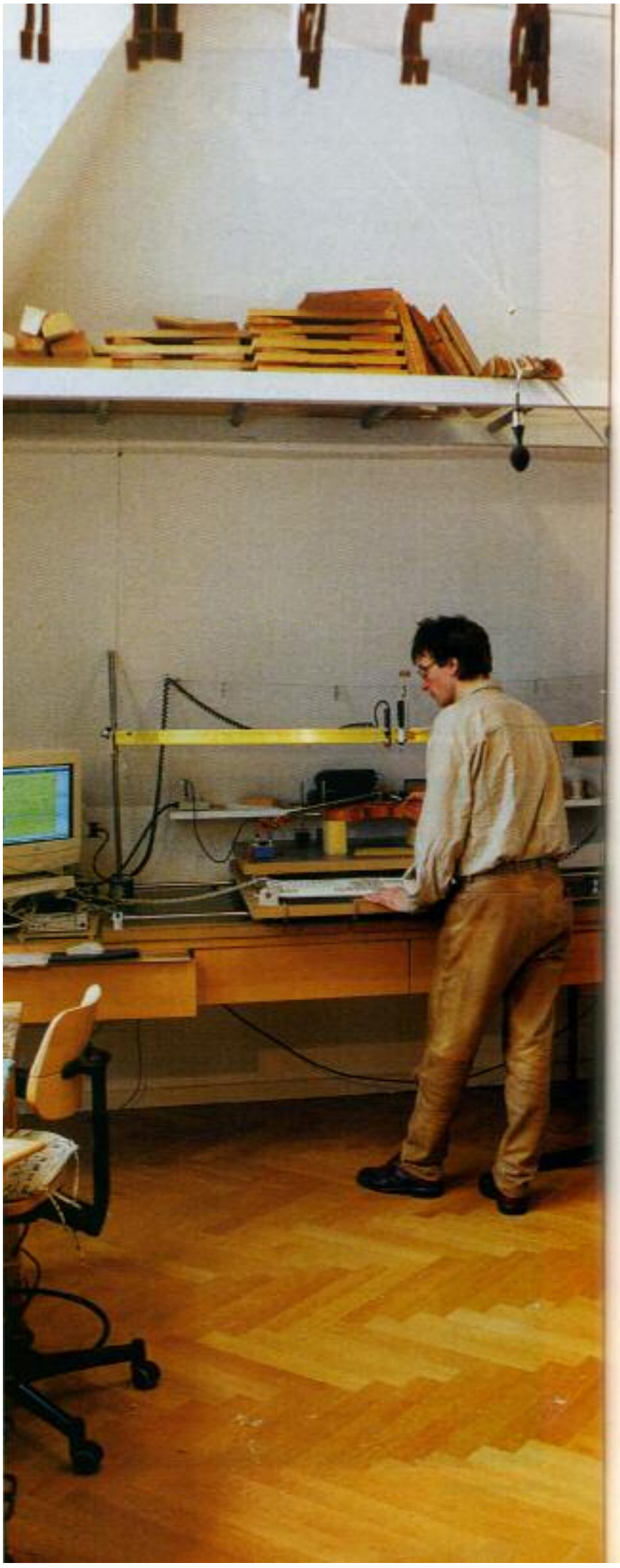
When Munich-based luthier and acoustician Martin Schleske began making tonal copies of Italian masters it wasn't just musicians who were impressed. **Joseph Curtin** meets a man he regards as one of the most important living violinmakers

**Early in the winter of 1999** I climb the four flights of stairs to violin maker Martin Schleske's workshop, atop an elegant building near Munich's historic centre. Schleske is a tall, handsome man with green eyes, brown hair and a broad smile. His assistant Georg Gerl laughs after hearing him speak English with me: 'So it's not just in German he talks so quickly!'

Indeed, Schleske's ideas on everything from violins to theology are delivered at Autobahn speeds. When he was 14 he built himself an electric violin to play in a rock group, then at 16 quit high school and left his hometown of Stuttgart for the violin making school in Mittenwald. Helmut Müller, who taught physics and acoustics there, remembers him as an 'excellent but embarrassing student' for his habit of asking questions the teachers could not really answer. Upon graduation Müller offered Schleske a job with his firm, Müller-BBM, an acoustical consulting business distinguished for, among other things, its work on many concert halls in Europe. For two years Schleske did violin research there, investigating varnish, wood and vibrating plates. He vividly recalls his workroom as a kind of island smelling of wood shavings and varnish set in the high-tech environment of Müller-BBM. He now speaks with obvious affection and admiration of Müller, who remains his mentor. And his workshop still maintains the happy juxtaposition of a traditional craft with the tools of scientific research.

The room has high, sloping ceilings and a huge north window



**Main Picture** Schleske uses modal analysis to make ‚tonal copies' of great italian instruments

**Opposite** one of Schleske's „Schreiber" Strad copies

Photos: this page: Jan Fischer, opposite: Peter Hofstetter

# Sounding out the establishment

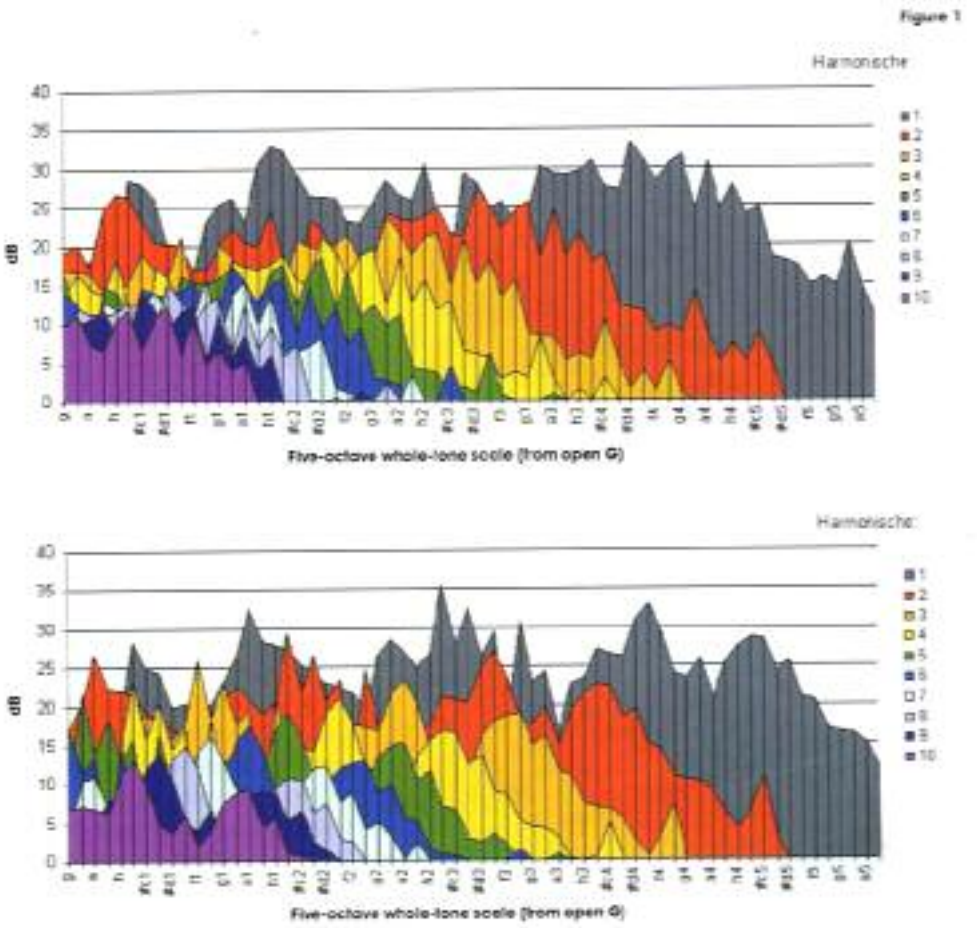
that bathes it in light. Beneath the window a workbench is scattered with gouges, planes, scrapers and knives. Rack-mounted electronic equipment flanks a large table spanned by precision linear bearings. These carry the measuring equipment used for Modal Analysis, a technique long beloved by engineers for studying structural vibration in everything from bridges to aeroplanes. It was first used for studying violins by Müller-BBM in 1983. With his own equipment Schleske can now in a matter of hours form a relatively complete picture of how each part of an instrument vibrates at any frequency. 'I borrowed 150,000 Marks to build it,' he says. His set-up for drying varnish feels more improvised – a few black light bulbs hung on the bathroom wall.
Schleske lives with his wife Claudia and their two sons in a house on the outskirts of Munich. 'I am not one of those fathers who tries to decide his children's future,' he says. 'They will one day be free to choose whether they want to make violins…' He grins, 'or cellos instead.' In 1990 Schleske went back to school to better understand the tools he had learnt to use at Müller-BBM. Four years later he gained a Masters diploma in physics. 'Martin is always apologising for his physics,' says physicist Gabriel Weinreich, a pre-eminent figure in violin research. 'He learnt it at college rather than university, and so may not have studied Quantum Mechanics as a university student would. But he is so intelligent that this makes no difference. He's not the sort of researcher who takes the theoretically expected answer and sails off into the sunset. He tests his ideas – and he does this with great ingenuity.'
I first encountered Schleske's work in the Catgut Acoustical Society Journal. An article published in 1996 examined the relationship between the tap-tones of violin plates and the resonances of the finished instrument. Another article that year outlined his method for making 'tonal copies' of old violins. Trying to copy an old violin, tonally or otherwise, is hardly an original project, yet Schleske's work struck me as unprecedented. Proposing the violin as a 'tonal sculpture' – a sort of bouquet of resonances which uniquely determine its sound – he showed it was possible to reproduce, resonance by resonance, a great many of the acoustical features of a Montagnana violin. I was impressed by the cleanliness of the science, the grounding in workshop practice and the almost unbelievable patience involved. In the tap-tone study an instrument was graduated, assembled, analysed, opened, re-graduated, reassembled and re-analysed 14 times. The articles effectively challenged many existing notions of plate tuning – not to mention the conventional job description of a violin maker.
Schleske set up his own workshop in 1996, and the tonal copies he began making of old Italian violins soon got the attention of some superb musicians. A 1733 Guarneri 'del Gesù' copy finished in 2000 was purchased by violinist Yamamura Fumika, who says she found it hard to imagine replacing her Joseph Rocca with a modern violin until she tried the Schleske. The principal cellist of the Bayerische Staatsoper, Franz Amann, awaits a cello on Schleske's bench. He has to date built thirty-eight violins, four violas and three cellos. Though to some extent still in his formative years, I think of him as one of the most important living makers.

Like most makers Schleske is eager to study classical instruments. To encourage a steady flow through his shop, he offers tonal adjustments. 'When someone brings in an instrument, I always ask them to play three things,' he says. 'The first to demonstrate the problem, the second to show what they love about the instrument, and finally scales or arpeggios, something that can't be so easily hidden behind.' These are frequently recorded for future reference, and Schleske puts on a CD he made of Daniel Müller-Schott, a 24-year-old cellist who has toured with Anne-Sophie Mutter. A three-octave scale rolls through

the room like a tidal wave. 'I told him to just warm up,' says Schleske. 'He didn't know I was already recording.' He touches a button and a passage from Elgar's Concerto fills the studio. The cellist and his Gofriller produce an altogether ravishing sound, finishing with a rising scale that lifts me a few inches off the floor. Schleske grins. 'The most erotic sound I have ever heard!'

Later we walk though Munich's historic centre. It is a lovely November dusk, the streetlights just coming on, and we talk about the roots of musical sound. I mention reading that birds have a genetically programmed range of songs, but unless a young bird hears adults singing during a critical developmental period, it will never learn to sing. Schleske tells me about the research of Dr Friedrich Blutner, an East German scientist who found that mothers instinctively answer their newborn infant's cry with a response an octave lower. The first cries of hundreds of infants were recorded, and ten years later most of the children could recognise their own cry among those of strangers. The military were trying to find a way to get the attention of fighter pilots who at supersonic speeds were under such severe stress that the usual red lights and audio alarms were not even noticed. They found that a recording of the whispered voice of the pilot's child could get him to react with a rapidity previously thought impossible. 'Daddy, the wing is on fire!' or perhaps, 'Daddy, drop the bomb...' Blutner became so concerned with possible misuse of this research that he shut down the programme. Until recently most acoustical research in America was funded by a government interested in tracking Soviet submarines by the sounds they make. Are there any innocent pastimes? Schleske himself sometimes worries that his research might inadvertently enable large manufacturers to put individual makers out of business.

He divides his 60-hour working week between research and making, though the division is often vague. 'You can finish an instrument and then see how it sounds, but it should be the other way around: a violin is finished only when it sounds. So they sometimes take a long time to finish, and this time is nothing other than research. My latest violin was a tonal copy of a "del Gesù". When I first played it, it didn't have this sound – or is it a sensation? – that is so addictive for the player, and I didn't get the same feeling of being sucked into the string. Analysis showed a weakness of the first body resonance, very strong in the original. So I did another modal analysis, removed the top, changed some graduations and made another bass-bar. Then another analysis, another radiation measurement and finally the resonance was almost identical to the original. Is this research or making? Then comes the exciting day: taking the new violin to the orchestra where the original is played, playing them back and forth, and the reaction from the musicians.




**Above** comparison of the sound radiated by two violins—the ‚Schreiber'-Stradivari (top) and an anonymous Saxon instrument of low quality. The levels of the first ten harmonics are plotted for each note, beginning with the open G string to the left of the graph. The higher the harmonics, tending to be lower in amplitude, appears as 'foothills' in the foreground, while the strong lower harmonics show as broad 'mountain ranges' in the background. Does the more chaotic landscape presented by the Saxon violin reflect the difference in perceived quality?

**Below** Schleske measures the sound radiation of an instrument

What I do is not much different from any maker with distinct tonal aims, though I am happy to have some good acoustical tools at hand.'
Violinist Gabriel Bussi Ruben, who owns a 2000 tonal copy of the 'Schreiber' Strad, describes meeting Martin Schleske. 'We talked a whole afternoon about his violins on one hand and my expectations and needs on the other. He has a very sensitive personality and I didn't want to tell him exactly how I wanted my violin to be. I wanted him to feel my personality, spirit and musicianship and apply his art to create a good violin for me. When half a year later I picked up opus 37 [Schleske assigns each instrument an opus number], I was amazed.' Violin making thrives on such interaction between player and maker, and I like to imagine the violin was invented after some impossibly demanding 16th-century musician visited the workshop of Andrea Amati.
Schleske did a study of the language professional violinists use to describe sound. He found a surprising consistency – still, one wonders whether some sort of computer analysis might provide an objective basis for conversations about sound. After all, satellite photographs show us things about the weather that we can't see while standing in the rain.
Nowadays anyone with a computer and soundboard can start spooling out graphs and charts. Getting useful information is a rather more difficult project. Just as any single photograph of an instrument highlights some details while obscuring others, so every method for measuring its sound has strengths and weaknesses depending on what questions you are trying to answer.
Schleske mounts the violin on a tripod and taps the bridge with a tiny, precisely calibrated hammer. The small blow sets the instrument into vibration. A microphone picks up the resulting sound and a computer analyses it and plots a spectrum – a graph showing how amplitude changes with frequency. There are complications. The instrument's resonances tend to become confused with those of the room. (Players instinctively understand this; some rooms are better than others when it comes to trying out a violin.) Schleske sidesteps the problem by averaging measurements from six different positions with respect to the room. This helps smooth out the room's acoustical irregularities, rather like the way that rotating the platter

Figure 2

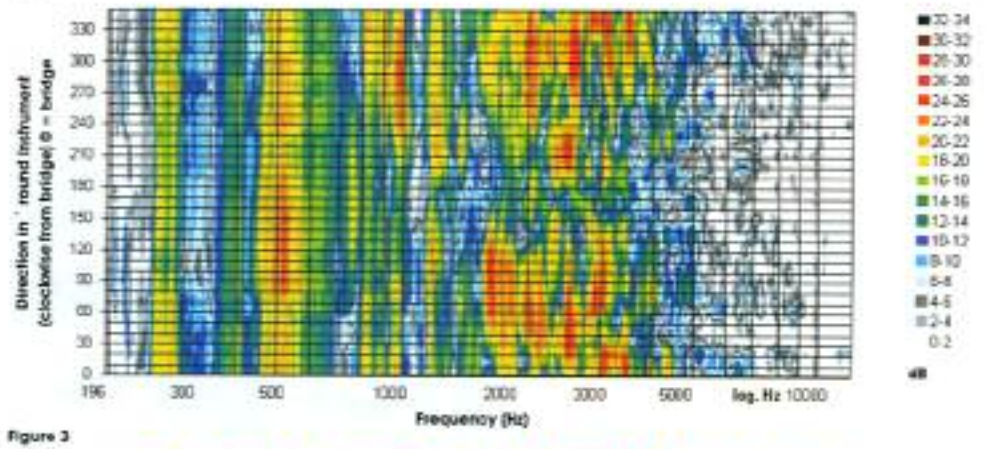
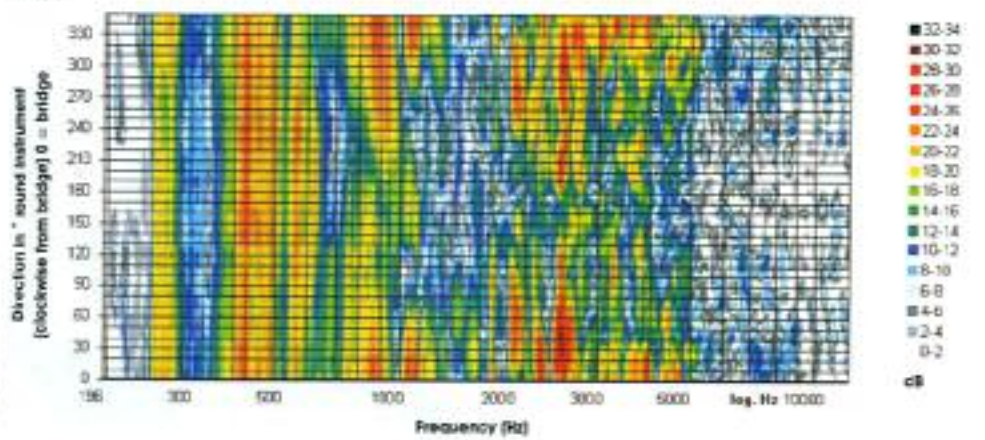



Figure 3




**Above left** a graphic representation of sound radiated by the 'Schreiber' Stradivari of 1712. Frequency increases from left to right along the horizontal axis, while the vertical axis shows the position of the microphone, zero being a point directly above the bridge. Amplitude of sound is shown by colour. Vertical stripes indicate resonances which radiate equally in all directions, while scattered patterns typical at higher frequencies indicate directional radiation

**Left sound** radiated by a 1733 Guarneri 'del Gesu'. The pronounced yellow stripes with orange highlights to the left indicate the strong low-frequency radiation that gives the instrument its characteristic dark sound. By contrast the Stradivari is somewhat stronger in the 2000Hz to 4000Hz range associated with brilliance. The Stradivari displays especially well the rapid fall-off in energy above 4000Hz that is typical of fine instruments. Too much energy at these higher frequencies lends harshness to the sound.

in a microwave helps avoid cold stripes in your hot dog.
Another complication is that violins radiate different frequencies unequally in different directions. To capture this Schleske takes readings with the microphone in 120 different positions around the instrument. The two-dimensional spectrum now becomes a three-dimensional map. One sees greater energy at low frequencies in the Guarneri, accounting for its darker sound. The change from broad bands of colour at low frequencies to scattered patterns higher up nicely illustrates what Gabriel Weinreich has termed Directional Tone Colour (see The Strad, April 2000). To better co-ordinate violin spectrums with what listeners actually hear, Schleske has recently begun mapping violin sound at its final destination – the basilar membrane of the human ear. Here, 3,000 tiny hair cells transform vibration into an excitement of the nerves that the brain reassembles into music.

Figure 1 compares the note-by-note overtones of the 'Schreiber' Strad with a rather poor Saxon instrument. Where the Strad shows a fairly orderly landscape of foothills and mountains, the Saxon takes us into altogether more chaotic country.
Is the Strad's apparent orderliness related to our perception of its tonal beauty? Schleske remembers seeing an exhibition of architectural drawings by the great architect of the German Baroque, Balthasar Neumann. He was struck by the recurrence of circles in the designs – perceptible enough to tease the eye with a sense of their presence but never so obvious as to become banal.
'With tonal beauty there is perhaps this balance of the predictable and the surprising,' he says. 'Violin sound changes from note to note, but the ear needs to be able to recognise an underlying tonal unity.'
He broadens the concept: 'It is the same in our relationships with friends, or spouses – and even with God.

I don't want a friend who is too predictable – I will become bored – or one who is completely unpredictable – it is too uncomfortable. And I don't believe in a God who is simple and easy to understand, nor in a God who is incomprehensible.'
Schleske believes that 'aesthetics is not a subsidiary branch of physics, and great instruments will never be made by analysis alone. There comes a point when we have to jump in and become violin makers. As soon as we do this we are too close for understanding. When we listen to great music we don't understand the music, just as when we pray we don't understand God. Instead we feel understood.'
When I ask him about the future of violin making, he mentions new materials and new designs to explore, 'but my only guiding vision is the human voice. Unlike the voice, the violin has a fixed set of resonances, and only the bow to modify the way in which they are excited. Imagine a violin where the player can also control the instrument's resonant structure the way a singer can. This would be a musical revolution!'

**Above** tonal copy of the 'Schreiber' Strad. 'What I do is not much different from any maker with distinct tonal aims-' says Schleske, 'though I am happy to have some good acoustical tools at hand'