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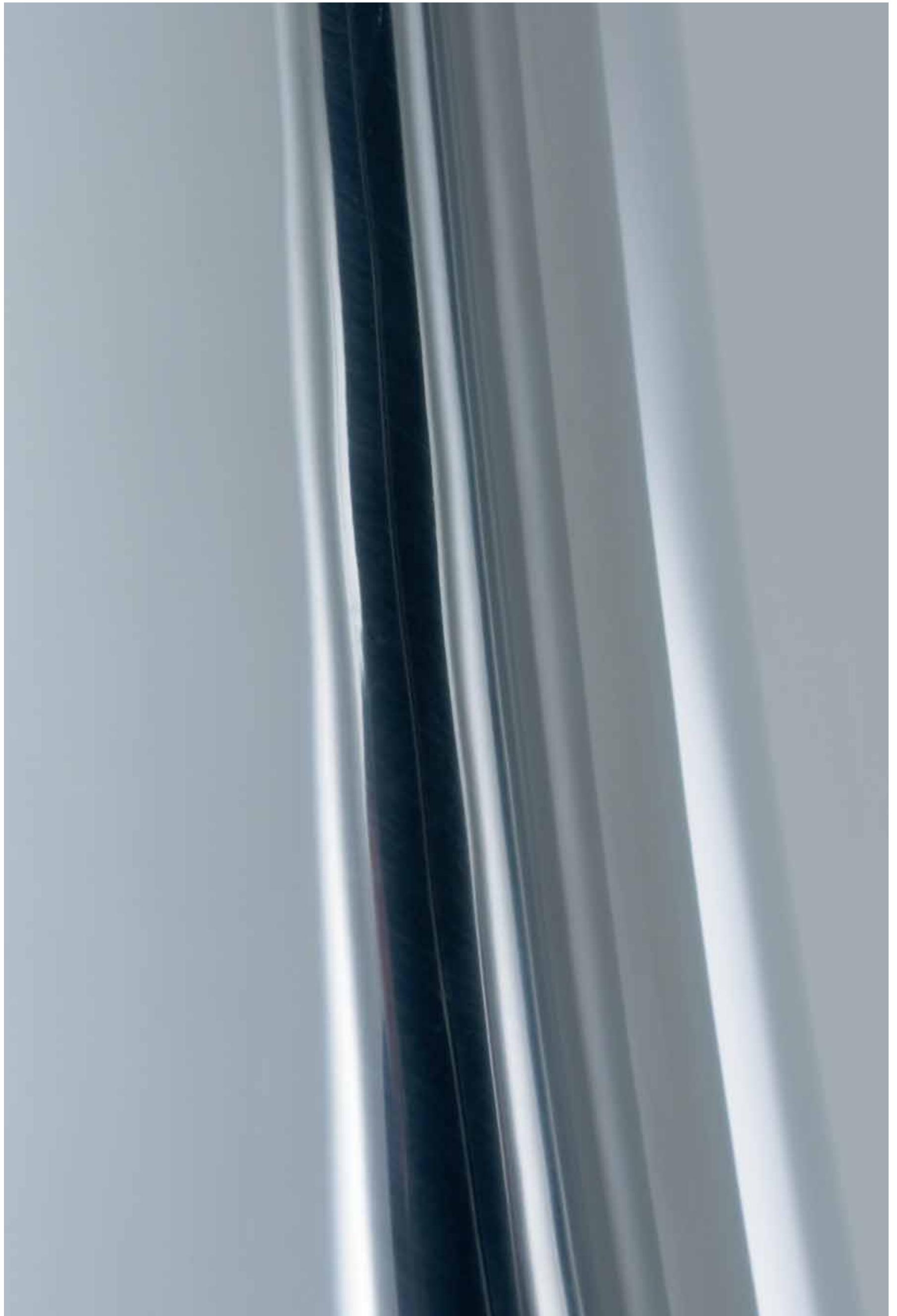
Muon  
a KEF Concept  
designed by  
Ross Lovegrove

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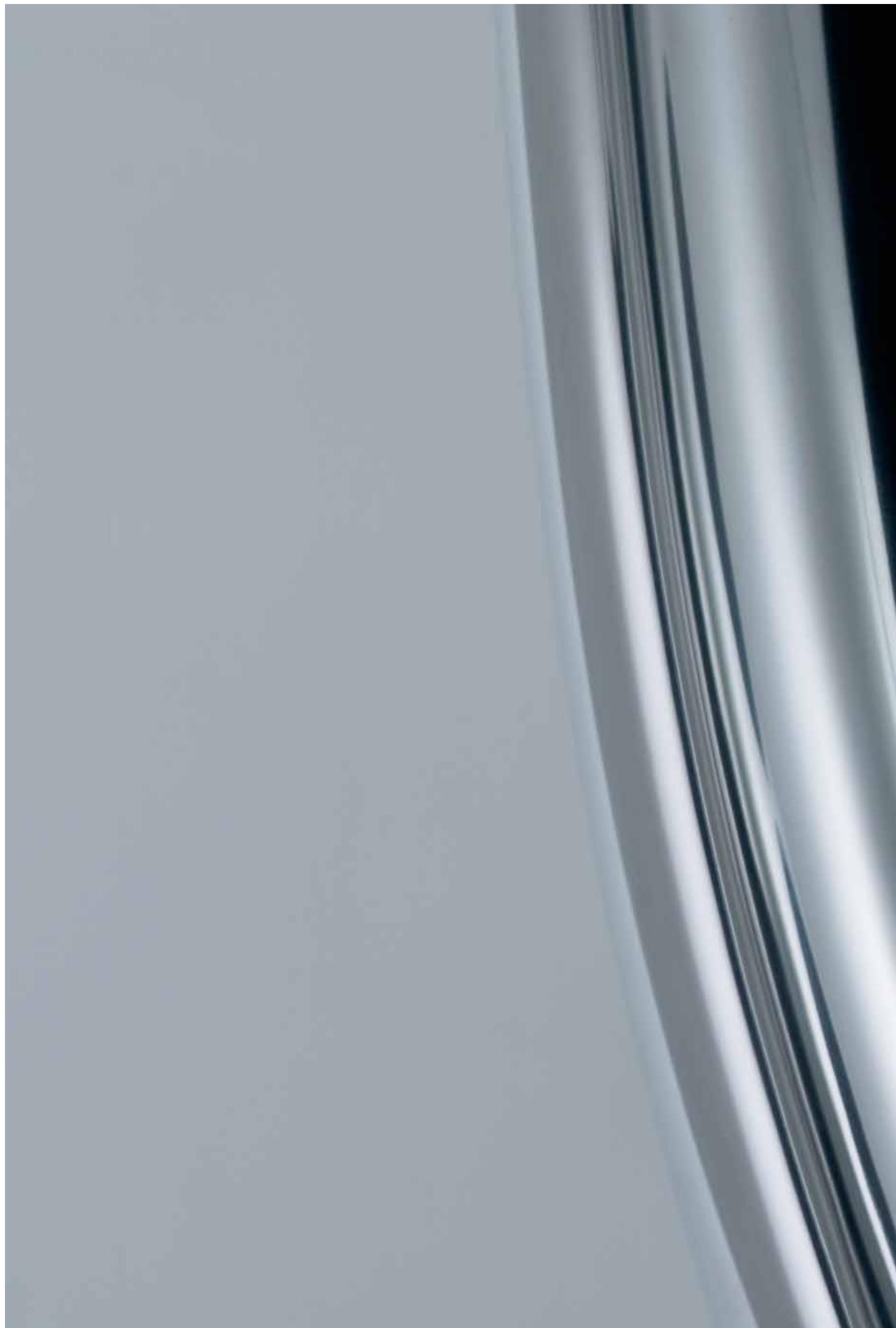
 KEF®

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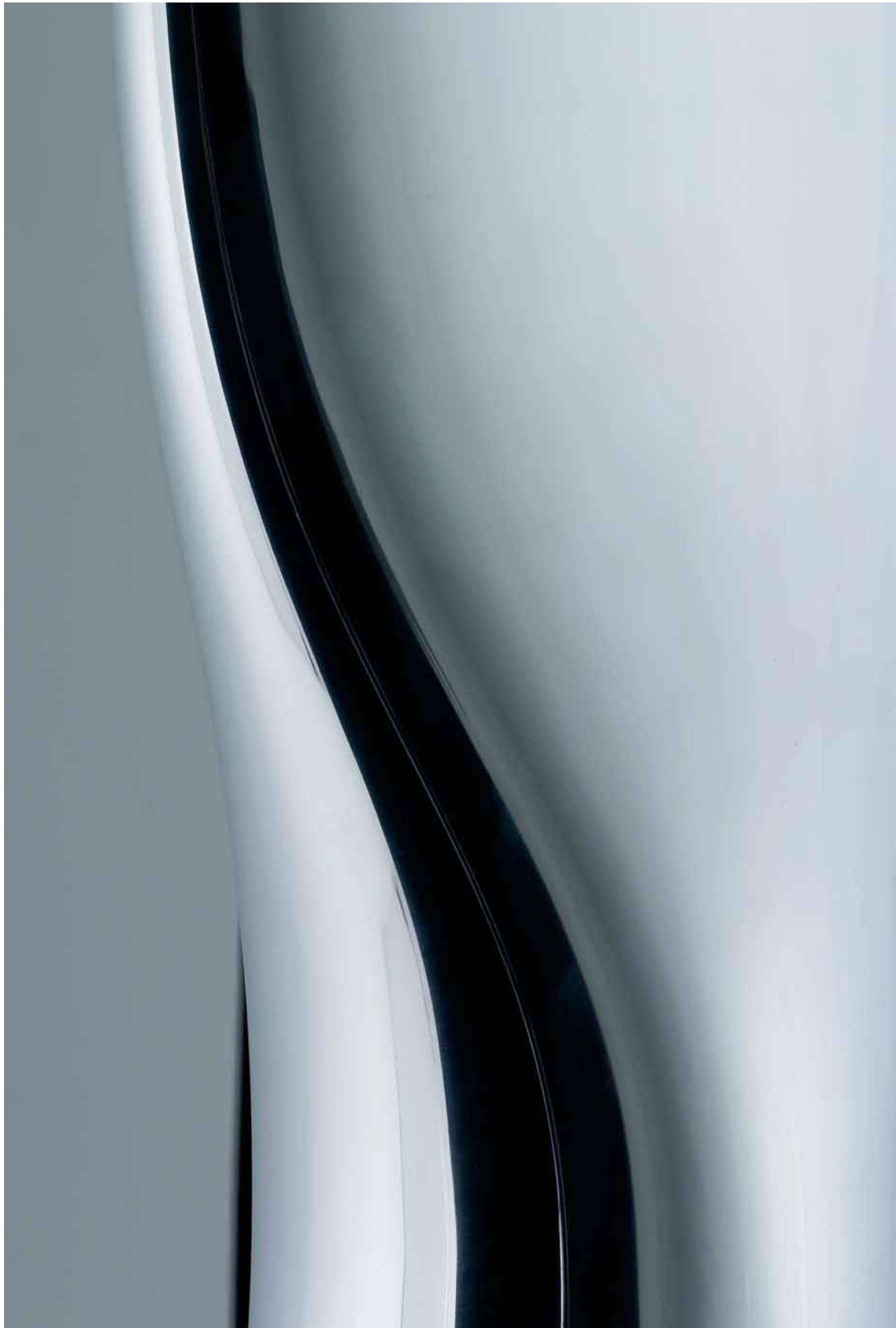






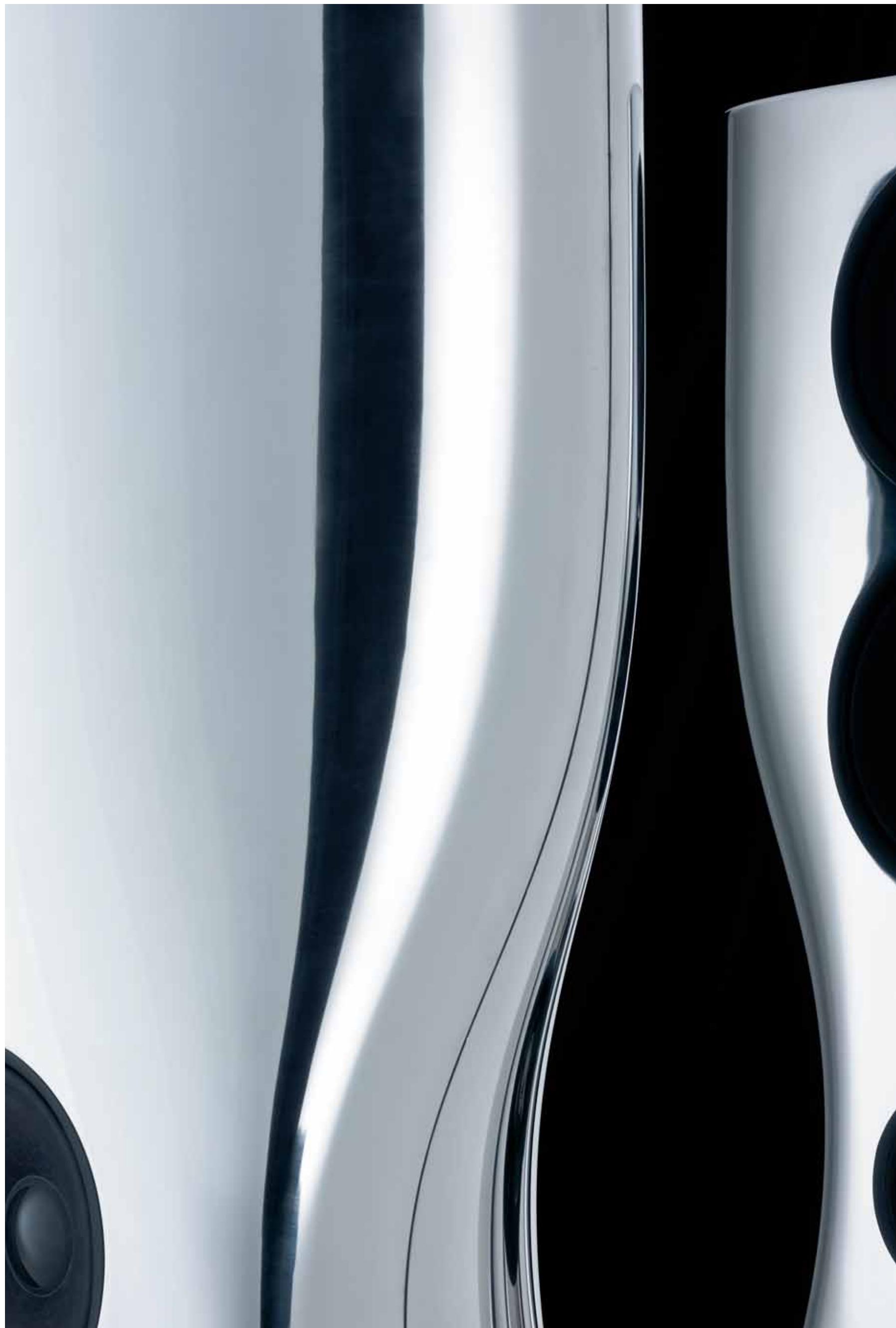




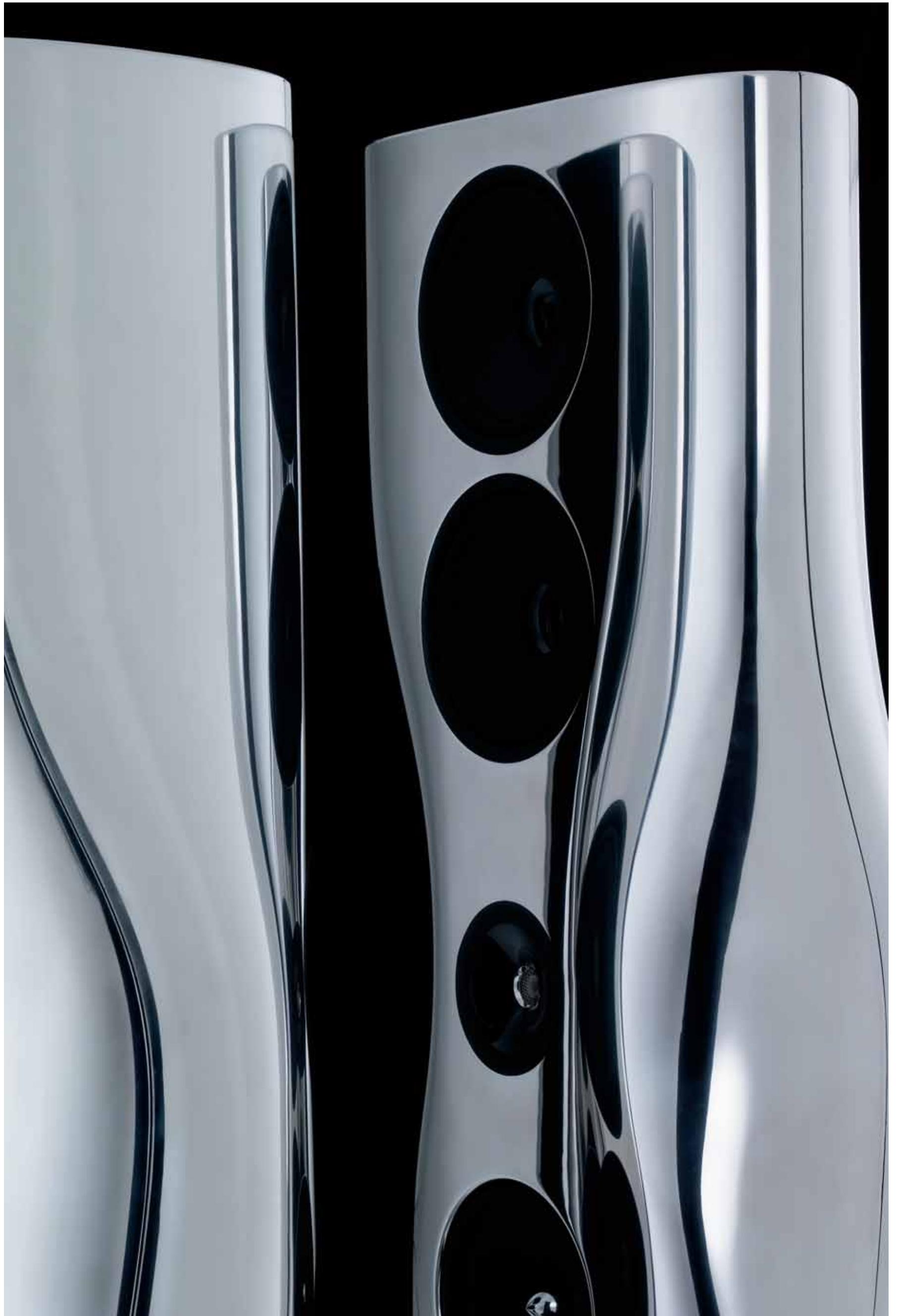






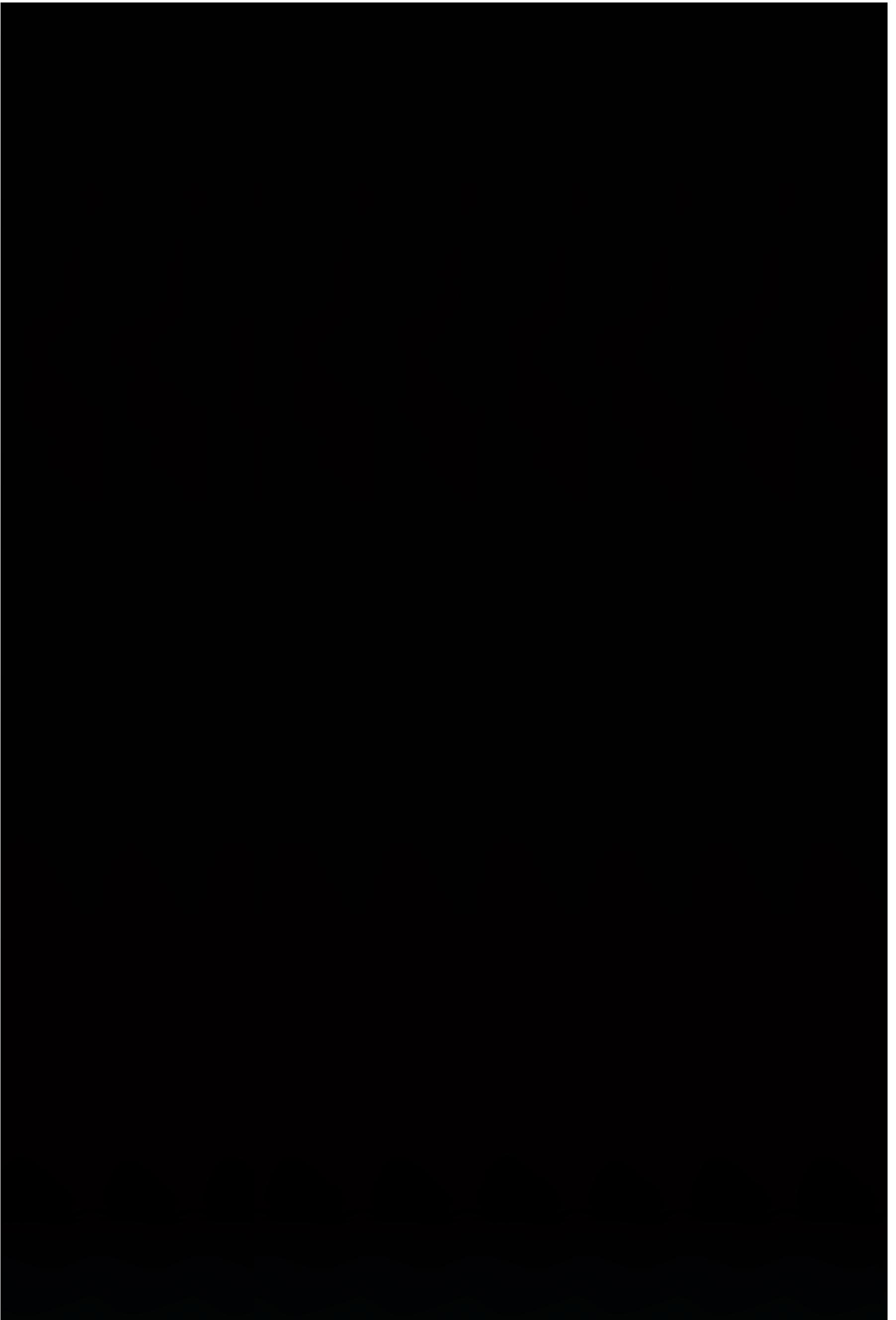
















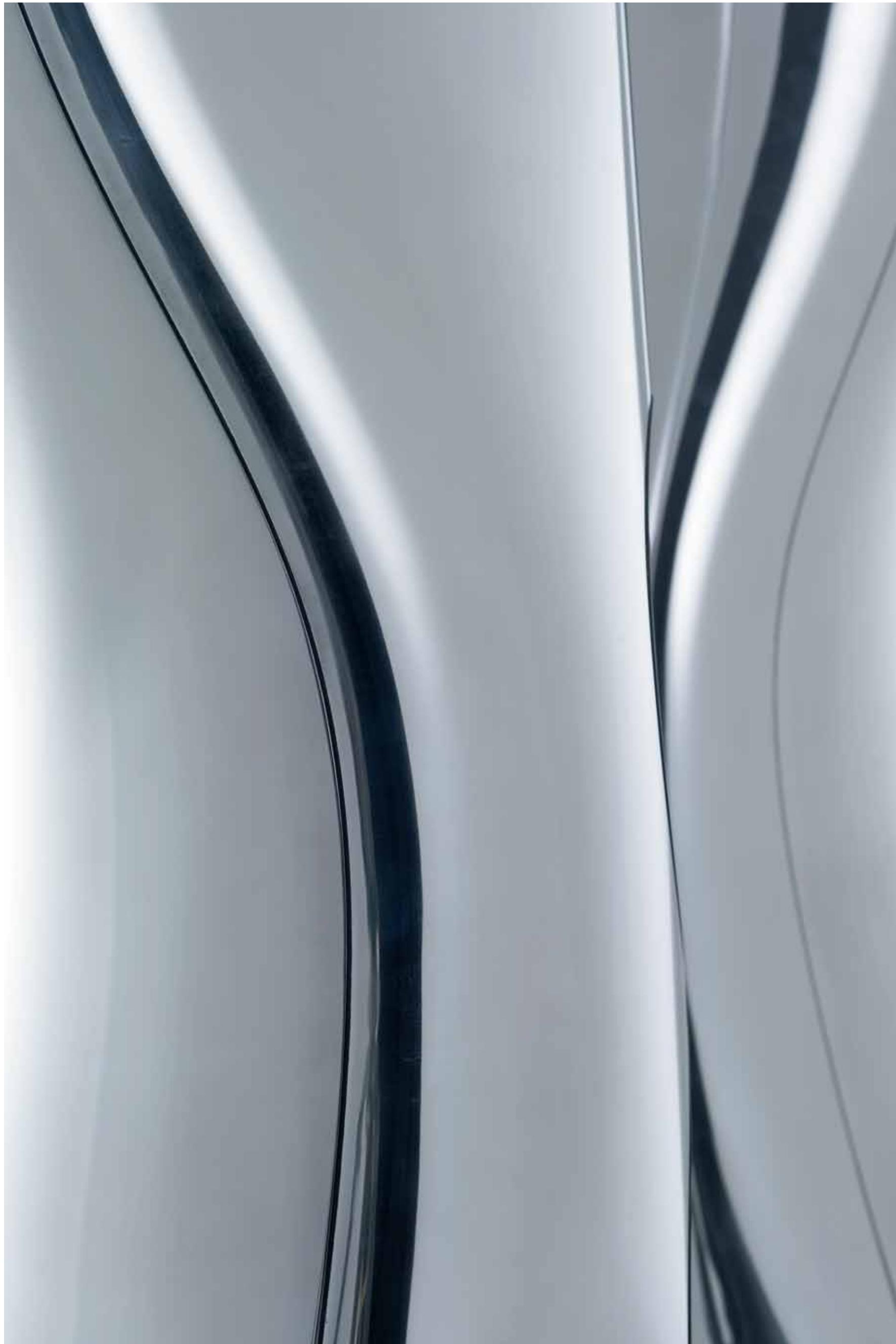












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Muon  
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There can be few design-led manufacturing projects in this world where the central aim is to create an 'ultimate'. But this was precisely the goal at KEF® when the company commissioned the visionary industrial designer, Ross Lovegrove, to develop with them the *Muon*® – perhaps the most extraordinary audio speaker ever conceived.

Creating an ultimate is never easy, and here the key was to marry a sensual yet logical organic form to state-of-the-art audio technology. The result, which was arrived at remarkably smoothly, is nothing short of spectacular – an elegant synthesis of art and science. The *Muon* is a 21st century totem of incredible power and beauty, producing unrivalled clarity of sound. Listening to it is a jaw-dropping experience. Whether classical, jazz, rock or hip-hop, the music envelops you in pure sensorial delight. Shut your eyes and it is hard to believe that you're not hearing a live performance.

The powerful audio magic of the *Muon* results from the Uni-Q® technology specially developed by KEF's engineers, enhanced by Lovegrove's highly-considered design of the super-formed aluminium speaker housing. The seductive, curvaceous form of *Muon* allows the sound to flow without distortion across its polished, mirror-like surfaces. Although impressive in scale, the *Muon*'s seamless, reflective torso-like exterior breaks up its mass, giving it a serene yet purposeful presence that will not dominate an interior unless you want it to. Lovegrove's innate ability to sculpt technology into sensual form has also provided the *Muon* with wonderful tactile qualities rarely associated with speaker design, while its elegant, undulating silhouette delights the eye from every angle.

All too often today the central tenet of Modernism, that form should follow function, is discarded in favour of random artistic expression or a slavish concern for current fashion. Lovegrove's approach to design could not be more different. The form he created for *Muon* was dictated by the physics of sound – which not only considerably enhances its audio performance, but also gives it an unmistakable aesthetic integrity. Like an abstract sculpture by Henry Moore or Barbara Hepworth, the *Muon* has a thoughtful and engaging presence, while the crispness and naturalness of its sound is extraordinarily energizing. It is hard to believe, as Ross Lovegrove acknowledges, that 'you can get such an incredible feeling of humanity from an inanimate form.'

Impossibly distant from the 'dumb boxes' of traditional speaker design, *Muon* provides the optimum shape for superlative performance, and in so doing raises the bar for audio equipment exponentially. Meticulously produced by skilled craftsmen on an individual basis at KEF's factory in Maidstone, England, the *Muon* speakers are exquisitely detailed and have an exceptional build-quality – the intention from the beginning being that these objects should enjoy a longevity akin to that of fine art. As a truly contemporary art form appropriate for 21st century living, and limited to an edition of just 100 pairs, the *Muon* is unequivocally at the apex of speaker design and technology. Quite simply, it is the best you can get.

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## The Work of Ross Lovegrove

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Ross Lovegrove is a visionary, an industrial designer *par excellence*, lauded by many in the design community as *the* master form-giver. First and foremost he is a materials-led designer whose entire career has been informed and galvanised by the form-inspiring and poetic qualities of materials and manufacturing processes. Beyond this, he is profoundly influenced by forms and structures found in the natural world. Entering his London studio is a voyage into an eclectic and ethereal parallel universe. Bones, fossils and nautilus shells lie neatly arrayed alongside space-age components in high-tech alloys, advanced composites and techno polymers. Like a giant strand of DNA, an astonishingly beautiful Lovegrove-designed staircase spirals downward to an uncluttered light-filled space where a row of computer screens reveal the careful gestation of future products. The sense of lightness and spirituality communicated by these surroundings is echoed on a smaller scale by Lovegrove's products, which often fit the hand like a well-worn talisman. What is virtually unique about Lovegrove is this holistic approach to design – his aim is always to create objects in which functional and ergonomic refinement are united with deep emotional magnetism. Lovegrove's underlying humanistic concerns imbue his work with a hopeful, optimistic belief in the future. And by skilfully combining state-of-the-art materials with sculptural organic forms, his designs have an almost alchemic quality – product solutions that he describes as 'Supernatural'.

One of Lovegrove's pre-eminent attributes is his highly developed sensitivity to the world around him. This key quality also enables him to predict future needs and concepts with the utmost prescience. Combined with an inventive mind and extraordinary drawing ability, these uncanny powers of foresight have oriented his entire professional life towards the goal of realizing his vision of the future. As he says, 'If you have an ability to communicate through drawings or whatever, you can envisage things that have never existed before. So you can dream in an incredible way... I have a good nose for things that are going to come.' One of the world's leading industrial designers he is, moreover, a highly creative thinker who at times feels confined by his chosen profession and longs to explore other areas, namely architecture, sculpture and automotive design. As Lovegrove readily acknowledges, operating as he does on the very edge of technical and aesthetic possibilities is never easy, and many ideas are inevitably too advanced to be realized. Nonetheless undaunted, Lovegrove shares Buckminster Fuller's imperative to crystallize dreams of the future, consciously rejecting the more easily trodden path of Raymond Loewy's famous MAYA (Most Advanced Yet Acceptable) philosophy.

Time and again his forecasts have been proved right. For example, his prediction that transparency would become a major theme in product design, heralded by his *Basic Thermos Flask* for Alfi (1987), was born out more than a decade later by the incredible success of Jonathan Ive's *iMac* (1998) for Apple Computer. Similarly, Lovegrove's innovative organic forms prefigured a return to a softer language of design during the mid-1990s, especially in car design. Furthermore, the use of cellular polymer structures for his Herman Miller office system, designed in the late 1990s, is currently being taken up by architects, though only by the most avant-garde.

However, the impact of Lovegrove's concept of Organic Essentialism will be still more fundamental to the future of design practice. For Lovegrove, this approach involves marrying sculptural forms, inspired by ergonomics and elements from the natural world (from whale bones to flow patterns in water), to a concern for the logical arrangement of only those elements that are absolutely necessary for the accomplishment of a particular purpose. His solutions are both anthropocentric and logical, and draw on the capacity of nature's designs to get the most from the least: surely exemplifying the responsible direction design should be taking for the 21st century. Unlike many minimalist designs, which more often than not are style-led and suffer from a rather insipid anorexic quality, Lovegrove's designs are lean yet as shapely as a well-toned body. These sensual and seductive forms characterise and define his products and, in turn, give his clients precisely what they are looking for – 'distributive uniqueness' – a means of differentiating their products from those by other designers and manufacturers. >



Throughout his career as a designer, Lovegrove has striven for a consistent approach based on the innovative application of materials (both manmade and natural) and technical processes, in order to create objects totally in tune with the human form and that delight the senses through their tactile qualities and visual impact. Whether designing furniture, packaging or wristwatches his goal remains the same – the creation of better, more efficient solutions. His methodology, however, changes according to the requirements of each project type. For example, a product that is going to be mass-produced will be guided by logic and utility so as to minimize environmental impact and waste, whereas a one-off piece of furniture or a limited-edition vase will represent a much greater freedom of aesthetic expression. At the same time, Lovegrove is never interested in designing just for the sake of designing. For him to commit time and energy to a project it must have a progressive element to it, whether aesthetic, technological or functional – or a combination of all three. The super-formed aluminium *Muon* loudspeaker for KEF is the most recent example of these concerns.

Lovegrove has always been fascinated and entranced by materials, whether a simple piece of bamboo or the latest high-tech ceramic. His work is powerfully informed by the possibilities of emerging materials and technologies, or by investigating new ways of using age-old alternatives, such as glass or wood. He believes that new, advanced materials will act as catalysts in the gradual convergence of art, design, communications and architecture, and he is stimulated by the merging of digital and materials technologies. In Lovegrove's words, 'There are already existing materials that if heated change colour. They could show if a building is warm or cool from the outside as the sun moves overhead... perhaps the decorative values of the future are more intrinsically inside things and not applied.' The world of materials science not only fuels his dreams, but also infuses his design work. Quite simply, he allows the intrinsic qualities of materials to help shape his products.

Studying cooking at secondary school first stimulated Lovegrove's understanding of materials and their inherent properties. Working with simple organic ingredients such as flour, butter and potatoes, he was spellbound by the 'amazing differences of physicality, colour, transparency, solidity and so on. You could eat them or leave them to biodegrade. There is an incredibly rich world of materials in foodstuffs. From a hard slab of butter to the transparency and plasticity of jelly in a cellophane wrapper.' Crucially for his later design career, these early forays into domestic science taught him that you could take a single medium and produce a variety of 'physicalities' from it – a lesson that he continually applies to the materials he works with, from bamboo, plywood and glass to carbon fibre, plastics and aluminium. At times this can be frustrating for the manufacturers who work with him as he often expects them to use materials in a totally innovative and unexpected way. When it works, however, the payoff is a product that pulls the future into the present – such as his remarkable, magnesium-injected *Go* chair of 2001. Perhaps tellingly, Lovegrove's favourite personal motto is, 'It's only the future if it can't be made.'

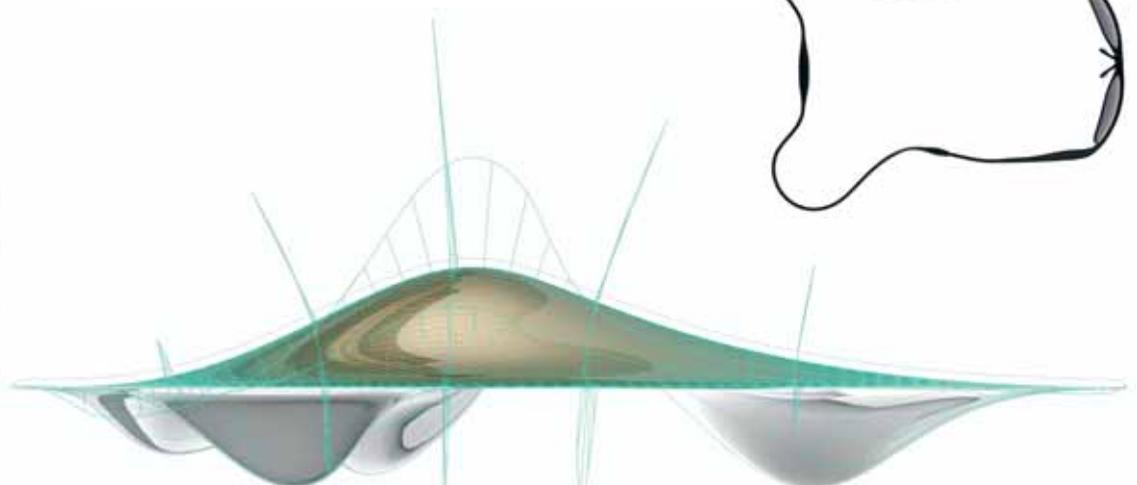
During his foundation studies at art college, Lovegrove became convinced both of the importance of industrial design and its 'incredibly vital effect on the quality of life' – key points that are often submerged in the circus of contemporary design. Badly designed objects are, indeed, not only wasteful of resources but are potentially downright dangerous, while well-designed products can enhance life. By understanding the overarching role and responsibilities of design, Lovegrove has sought to create products that have aesthetic, functional and physical durability – objects that are 'fat free' and functionally healthy. His belief in the vibrancy and variety of life also underscores his distrust of minimalism: 'it doesn't really exist in nature; it suggests straight lines, linear surfaces, a coolness, a lack of emotional response. I think life is not minimalist, generally it is quite complicated and detailed.'

Keenly aware of the environmental impact of over-consumption, Lovegrove prefers to develop products with a long lifespan, and which employ a minimum of material for maximum effect. He is also convinced that if people form an emotional attachment with a product they will then be less likely to throw it away or replace it. This has deepened Lovegrove's opposition to minimalism, a style he sees as less able to forge an emotional bond between object and user. He dismisses the recent vogue for safe, bland minimalist products, believing that designers must create objects that are pared down but not dull. As he notes, 'You cannot be self-indulgent as a product designer. But at the same time you have to bring a certain vitality and joy to these objects.' Lovegrove admires industrial designers – such as Dieter Rams, Ettore Sottsass and Marco Zanuso – who extracted from the same materials and technologies used by other practitioners, a connective emotional appeal that did not compromise the functionality of their products.

Because of the built-in obsolescence of most mainstream consumer electronic products, Lovegrove has tended to concentrate on longer-lived products, less susceptible to the inexorability of technological advance. When KEF approached him to design their next generation loudspeaker, however, he knew that this was a company steeped in manufacturing and technological excellence and that their aim was to create a long-lasting, paradigm-shifting product. The functional durability of the concept was a clinching factor in Lovegrove's acceptance of the brief.

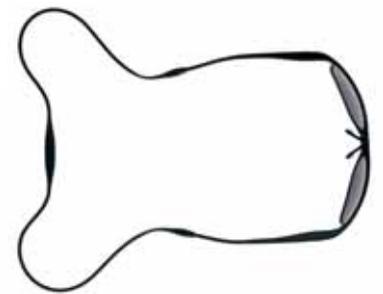


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One of the primary influences on Lovegrove's work has been the natural world and its wonderful array of 'purpositive' (purposeful + positive) structures. From the veining of a leaf to the iridescence of a beetle, nature evolves with a directness of purpose that designers today would be wise to emulate if they want to create better products. As a child growing up in Wales, Lovegrove spent much of his spare time on a beach near his home looking for fossils and unusual pebbles. The endless hours beachcombing helped him develop not just an 'eye', but also an awareness of natural systems. He was struck by how so many pebbles fitted his hand, yet were all shaped differently. Relating this formative influence to his work as a designer, he remarks, 'I'm interested in ergonomics, but not in anything remotely categoric... we need to accept that man is still a very primitive animal. Our approaches to sitting, eating or carrying haven't really changed that much... there are certain things in life, which are universal and don't need to be complicated.' With this belief, Lovegrove designs tools for living that can be used intuitively and that possess a deep primordial quality and high sensual value. He has observed that people don't often look at products when they are using them, so there have to be other non-visual sensory aspects at play. More than any other designer working today, Lovegrove understands the importance of tactility in a world that is becoming increasingly overwhelmed by visual stimuli.

Often distinguished by an almost transcendental beauty, the primal quality of Lovegrove's forms project a sense of calm. Lovegrove has long revered the sculptors Henry Moore and Isamu Noguchi for their remarkable ability to capture the abstract essence of nature, something he continually strives to express in his own work. By studying the natural world, Lovegrove has also come to understand the function of cellular structures as efficient building blocks, and has applied this system to his own work, most notably in his proposal for the Villa Matoso. He would certainly concur with the great Finnish architect-designer, Alvar Aalto, that: 'The best standardization committee in the world is nature herself, but in nature standardization occurs mainly in connection with the smallest possible units, cells. The result is millions of flexible combinations in which one never encounters the stereotyped.' It is the inherent flexibility of cellular structures that appeals to Lovegrove, as does their efficient use of materials.

With his lifelong interest in the natural sciences – and his particular debt to James Lovelock's Gaia theory (in which the earth is presented as a self-regulating organism) – Lovegrove has, in recent years, been entranced by the emerging sphere of biomimicry, in which nature is taken as the model and mentor for human activity. As Lovegrove sees it, by learning from nature and its evolutionary adaptations we can devise design solutions that are not only better suited to the human condition, but also more sustainable. By translating the laws governing biological systems into a framework for the practice of design, we should also be able to create products that have a superior natural logic. Ultimately, the earth's limited resources will have to be used with the utmost care, and studying nature's own solutions we may well provide the best answers to tomorrow's ecological problems.

Lovegrove is deeply concerned about the over-consumption of products, believing it to be fuelled by false economies. As he observes, 'Something has to give. You do not get something from nothing.' Because he believes in product durability (double the lifespan of a product and you can halve its net environmental impact) Lovegrove's products, such as his bathroom fixtures for Vitra, are distinguished by a structural and material integrity as well as being ideally configured for manufacture. Today's consumerist society is based on short-term thinking that cannot be sustained, but Lovegrove endeavours to counter the thoughtlessness of our throw-away culture by promoting a more mindful approach to design, manufacture and consumption. Lovegrove's designs, with their self-evident quality and authority, should become icons of better practice, celebrated, loved and used over decades. And this is exactly what Lovegrove set out to achieve with his design for the *Muon* speaker.

The design world has always needed visionaries who lead by example, and Ross Lovegrove is one of these rare individuals. His 'Supernatural' products and projections blur the distinctions between art and science, and fuse the manmade with the natural. They tangibly demonstrate that a higher level of unity between form, function and materials can be achieved. Reflecting on his work, Lovegrove states: 'I, for one, need a foundation for my design that I believe in as something relevant, questioning and progressive. This is something that I feel I can express to others with an underlying logic that does not undermine the intelligence of people who view the world through thinking eyes.'

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## The History of KEF

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For decades audiophiles around the world have revered KEF for its innovative, high-performance loudspeakers. The company was founded in 1961 by Raymond Cooke MBE (1925–1996), a former BBC electrical engineer, widely acknowledged in the audio industry as a leading authority in transducer technology. In fact, Cooke was not merely a visionary engineer, but was also a deeply practical man keen to experiment with new materials and technologies in order to create products with superior acoustic quality. His firm was initially headquartered in a Nissen Hut on the premises of Kent Engineering & Foundry (from where the name KEF is derived) – a metal-working company on the banks of the River Medway, near Maidstone in Kent. From the very beginning, the pioneering inventiveness of KEF loudspeakers was undeniable.

Cooke's first speaker design manufactured by KEF, the *K1*, incorporated foil-stiffened, vacuum-formed polystyrene diaphragms and a revolutionary tweeter made of Mylar or Melinex – thin but strong polyester films, which were then state-of-the-art materials. The compact shelf version of this ground-breaking design, known as the *Celeste*, was the first really small hi-fi speaker. It went on to huge commercial success, ensuring the financial viability of the fledging company. With its sturdy wood-veneered case and textile front covering it had a modern yet unobtrusive aesthetic that allowed it to be placed anywhere, while its smooth frequency response and wide sound dispersion gave it a functional edge over competitor products.

In 1966, and following the success of the *K1* and *Celeste*, Cooke re-established his working relationship with the BBC in order to develop speakers with even greater clarity of sound. To this end, he exploited the intrinsic elastic qualities of Neoprene, a synthetic rubber, using it to encase the new loudspeaker's diaphragm in order to maintain sound quality throughout the mid-band range. For the diaphragm itself, he set upon an entirely new material – Bextrene – a lightweight acetate plastic sheet derived from wood pulp and developed at the BBC. As well as possessing flexibility, Bextrene was sufficiently stable to keep its shape at a variety of temperatures and in different levels of humidity. Bextrene woofer cones also produced a consistency of sound over a wide bandwidth, qualities which ensured their widespread adoption by other speaker manufacturers in the years that followed.

After a period of intensive research and development in conjunction with some of the best sound technicians and electrical engineers at the BBC, KEF launched two new drive units in 1967, the 5 inch *B110* and 8 inch *B200*. These were subsequently incorporated into about 3 million loudspeakers produced around the world by KEF and a number of other manufacturers. A new and smaller tweeter was also invented, known as the *T27*, which in turn led to the development of the diminutive but incredibly powerful *LS3/5a* loudspeaker – without doubt the most important result of KEF's collaboration with the BBC. This revolutionary product set the 'BBC Standard for Loudspeakers', and has since acquired an almost mythic status among audio-lovers. Indeed, many still believe that its neutral tonal balance, extended treble response and surprisingly rich depth of bass established a benchmark for small speaker technology. Reviewing the legendary *LS3/5a* for *Hi-Fi News* in June 2001, Ken Kessler reported, 'We sat there amazed as the speakers continued to deliver sound which, even by [today's] standards, defies belief'. Some 2 million *LS3/5a* units were sold globally, many under the Rogers brand name, and the model was also manufactured under license by Chartwell, Audiomaster, Harbeth, Spendor as well as by KEF itself when customers demanded that the speaker stayed in production during the nineties. >



KEF continued to expand during the late 1960s and early 1970s, and its reputation was further enhanced by the technical performance of new products such as the *Concerto*, *Cresta* and *Chorale*. In 1970, KEF received the first of two prestigious Queen's Awards for Export Achievement. Three years later, KEF became the first loudspeaker manufacturer in the world to implement computer-assisted 'total system design'. New types of digital testing equipment gave KEF's engineers access to relevant crossover and drive unit data at a glance, assisting them enormously in the development of a highly advanced generation of audio equipment.

This pioneering use of computer-generated data enabled KEF's engineers to match pairs of speakers to within one half of a decibel, so that they became the audio-technology equivalent of identical twins. Exact pair matching results in perfect stereo and these revolutionary speaker systems became renowned for their superior acoustic accuracy. Models in the range included the *Corelli*, *Calinda*, and *Cantata* as well as the widely celebrated *Model 104* – the first domestic unit to match the standards of a broadcast monitor loudspeaker. Remarkable for its outstanding acoustic precision and wonderfully clean bass performance, despite its relatively small size, the *Model 104* 'swept reviewers, distributors, retailers and customers off their feet' when it was launched in 1973. As a classic high-output yet high-sensitivity system using an innovative three driver arrangement and synthetic, laminated diaphragms, the *Model 104* was also the first product from KEF's world-famous *Reference Series*.

In the 1980s, KEF made inroads into the lucrative US audio market through the founding of KEF Electronics of America, and maintained its reputation for excellence through a series of technical enhancements to the highly-respected *Reference Series*. These included: a coupled-cavity bass loading system that considerably boosted bass performance; a 'force cancelling rod' that eliminated cabinet acoustic interference from woofer vibrations; and most importantly the revolutionary Uni-Q system, introduced in 1988, incorporating a new neodymium/iron/boron magnetic material developed by NASA with ten times the power of standard speaker magnets. Crucially, this major innovation allowed KEF's engineers to make a tweeter small enough to be mounted at the acoustic heart of the bass unit coil, providing for the first time a single point source of sound. In layman's terms, this considerably enlarged the optimum listening area in any room – searching for that elusive acoustic 'sweet spot' was now a thing of the past.

KEF's subsequent *105/3* loudspeakers featured second-generation Uni-Q technology, and were voted 'Best Imported Speaker' by the Japanese press in 1992. That same year the company came under new ownership and a fresh chapter of excellence and innovation began, adding further lustre to KEF's impressive reputation. New ranges of sleekly styled but affordable designs were soon introduced, including the *Q Series* speaker range, the *Home Theatre System* and the award-winning *Coda 7* loudspeaker.

KEF's visionary founder, Raymond Cooke, sadly died in 1996. However, he left the company with firm guiding principles encapsulated in his core values of 'Quality, Honesty, Dedication and Innovation'. That same year the *Reference Series Model Four*, with its fourth-generation Uni-Q drive unit, attracted worldwide acclaim and numerous plaudits from the industry press. *Stereophile* magazine's chief reviewer noted that it was 'the best I've had in my listening room', while *Hi-Fi News* dubbed it 'KEF's best yet'. Two years later, the next generation *Q Series* and the new *Monitor Series* were introduced – both outstanding testaments to Cooke's legacy.

Now under in its 46th year, KEF is still developing world-beating products. Scientific innovation and hands-on experimentation – in particular, the landmark technologies pioneered by Dr Andrew Watson (KEF's Senior Acoustics Engineer) and his team – continue to underwrite its reputation as the audiophile's ultimate loudspeaker manufacturer.

As a company that has produced some of the best examples of form marrying function, KEF is well aware that capturing the attention not simply of the audio equipment *cognoscenti* but of a wider audience, requires the talents of a world-class designer. With the company's most recent generation of speakers his goal has been to create something truly extraordinary, and to this end he contacted the famous industrial designer Ross Lovegrove whose beautiful, essentialist, organic forms have won international recognition. The collaboration resulted in the *Muon* – an astonishing *tour-de-force* of 'can't believe your ears' audio-technology and 'can't believe your eyes' beauty. Like its illustrious predecessors, the *Muon* will undoubtedly enter the audio hall of fame, ensuring that the KEF brand remains synonymous with engineering and design achievements of the highest order.



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## What's behind the name?

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Even smaller than a quark, a 'muon' is an elementary particle with a negative electric charge that is classified within the lepton group of sub-atomic particles. This seemed an appropriate name for the loudspeaker as the audio components embedded in its super-formed aluminium body transform electrical energy into acoustical energy in order to produce sound – you just never see this happening, like you can't actually see elementary particles even though they are the building blocks of all matter.

The name also refers to Mu – a mythical lost continent thought to have once been located in the Pacific Ocean, but believed to have sunk beneath the waves long ago like Atlantis. Certainly, the form of the *Muon* speaker has a totemic presence, which resonates nobly like the haunting and mysterious monolithic structures erected by ancient civilizations, perhaps even those of Mu.

Yet another inspiration for the name is the Japanese word *mu*. Related to Zen Buddhism, this word can be roughly translated as 'none' or 'without' and is used as a reply to a question that cannot be answered – an enigmatic response that sums up the otherworldly acoustics and aesthetics of *Muon*.

# Muon

100R



## The Story of the Prototype

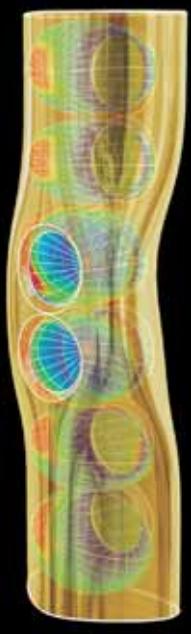
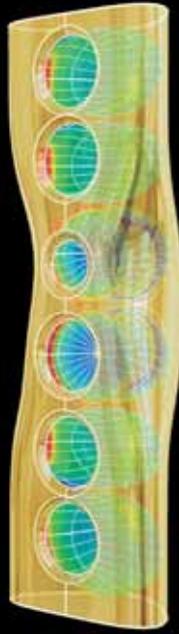
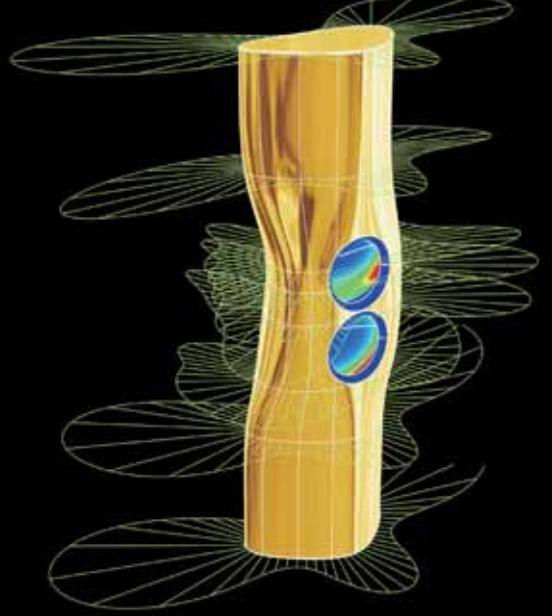
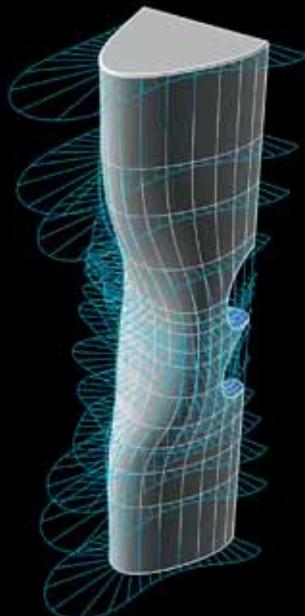
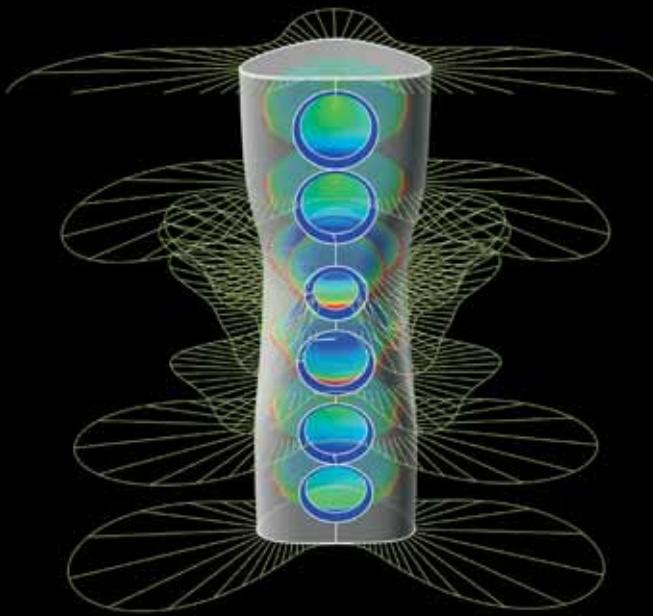
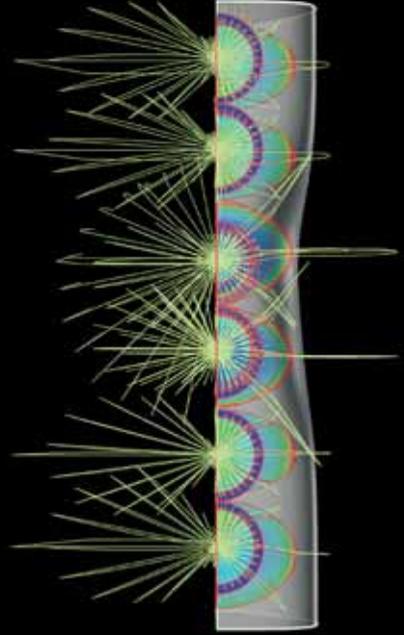
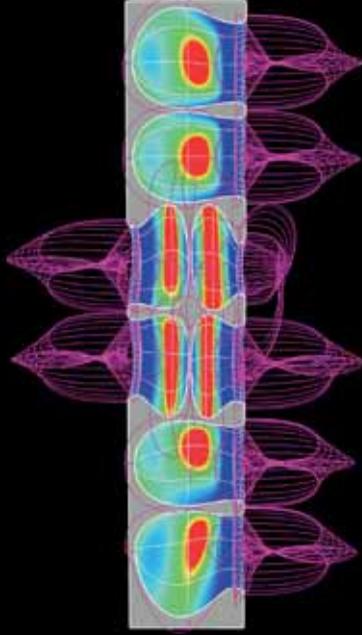
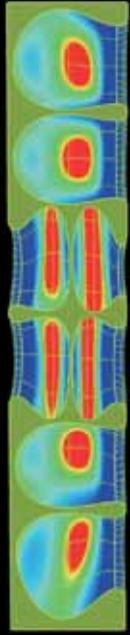
Before the production models of the *Muon* loudspeaker could be fabricated in super-formed aluminum, a full-sized prototype had to be created. As Ross Lovegrove explains, 'you need to build a prototype to show your intent.' The journey from initial concept to fully working prototype took about a year and involved a great deal of research and painstaking development. Initially, Lovegrove looked to the abstract sculptures of Henry Moore, Barbara Hepworth and Anish Kapoor for formal inspiration, his aim being to arrive at a solution that existed somewhere between art and design. As is usual for Lovegrove, many forms were beautifully sketched in his notebooks until a number were resolved enough to be converted into 3D computer models. In the end, four potential designs were generated, each beautifully resolved but quite different in appearance.

These design concepts were the result of, as Lovegrove puts it, 'learning from the niche and applying higher aesthetics'. In other words, he absorbed the acoustic engineering constraints determined by KEF's engineers and applied his design language to them. When the four potential designs were presented to KEF, a unanimous decision was quickly reached on which solution to develop. This was the concept that became *Muon*.

The subsequent meetings between KEF's engineers and Lovegrove were not only educative to both parties, but also stimulated much synergy and mutual respect. The first prototype, christened 'Austin', was essentially a rough mock-up by KEF's engineers to demonstrate the optimum driver positions for the four-way loudspeaker system. Lovegrove also learnt about the need for dampening and the complex physics of sound, and consequently with the assistance of his studio IT experts began to digitally 'sandpaper' the 3D computer-generated model of *Muon* in order to create planes that allowed the sound to move away from the loudspeakers embedded in its structure – the objective being to 'enhance both the performance and the intelligence of the technology'. In effect, Lovegrove was sculpting the sound by skinning the technology with purposeful form. The final shape was created through an evolutionary process that ensured 'it could only be the form that it is.'

In parallel with the process of refining the form of *Muon* Lovegrove spent weeks brainstorming with KEF's engineers ideas about potential materials that it could be made of. Eventually, the high-tech solution of super-formed aluminium was deemed ideal. This is a similar moulding process to vacuum forming, which uses malleable sheets of heated aluminium to achieve otherwise impossible shapes. It was essential to fabricate a full-scale prototype to allow work on exactly how the acoustic treatment of the inside and the mounting of the drive units could be done. A UK-based company that has strong links with the automotive and aeronautic industries milled the prototype from an enormous billet of solid aluminum. Using state-of-the-art CAM (computer-aided manufacture) software the machine precisely cut away the excess material from the six-foot-long block of solid metal to eventually reveal the final form. In total, the milling took about a week, even though the cutting machine was running 24 hours a day. As Lovegrove observes the whole process was like 'a celebration of hidden beauty'. And according to KEF's senior engineer, Barry Dock, seeing the resultant prototype for the first time was 'shocking but in a really good way!'





## The Technology Behind Muon

The *Muon* loudspeaker is a technology-driven design that has established a major benchmark in acoustic clarity. It has achieved this through several key innovations in form, function and materials. As KEF's Senior Acoustic Engineer, Dr Andrew Watson puts it, 'we wanted to take our technology to the limit and then develop some more on the way.' The upshot is an unparalleled loudspeaker that will bring serious audiophiles as well as regular music lovers sound quality that defies belief. As far as this product goes, hearing really is believing.

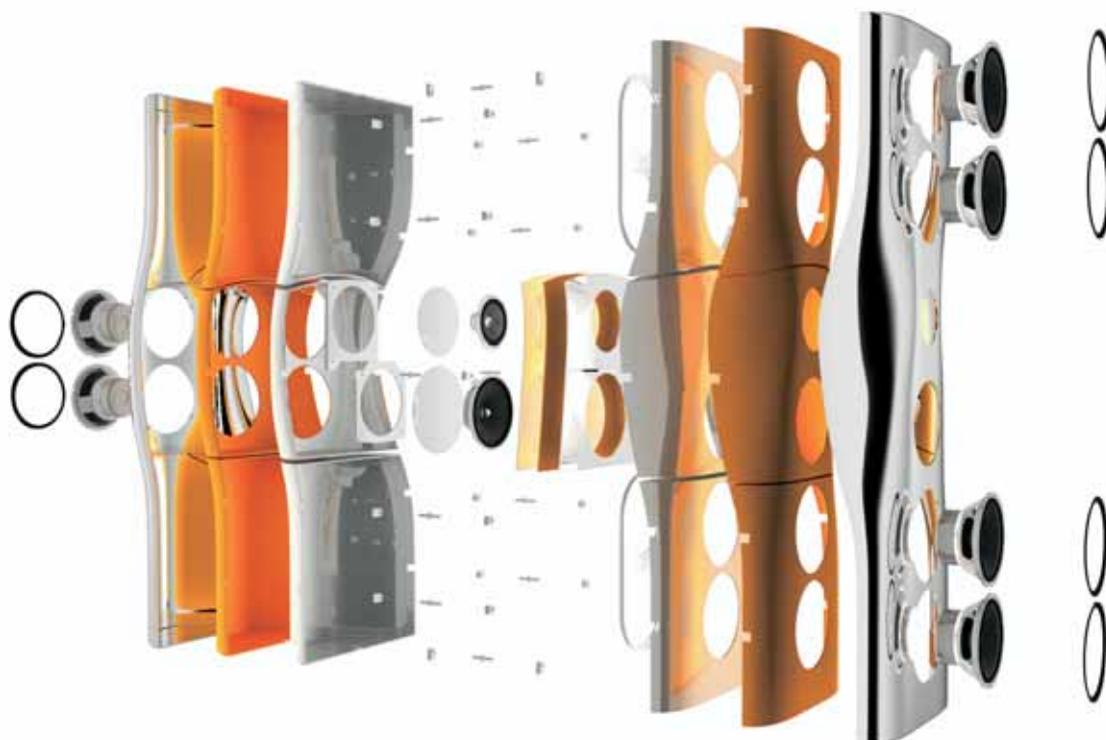
So what are the technological features that make *Muon* so special? To start with, its four-way system mounted into the front of the speaker's structure has four powerful bass drivers or 'woofers'. But it is in the upper mid-range and treble where some of the *Muon*'s key technology lies in the form of the Uni-Q drive unit array. This innovation is remarkable not only for its construction, but also for the way the HF unit is mounted. Because of the HF unit or 'tweeter's' unprecedented miniaturization it has been positioned uniquely in the middle of the MF cone, thereby creating less acoustic interference than other conventional tweeters. And with the resultant wider dispersion the Uni-Q also helps produce a much more natural sound.

There is, however, more to *Muon* than this. Take for example, KEF's proprietary ACE (Acoustic Compliance Enhancement) technology, which uses granules of activated carbon in the separate speaker enclosures so as to almost double the available volume through adsorption. This in turn can be directly correlated to maximizing the dynamic performance while eliminating any distortions. Dubbed 'magic dust' by the audio industry because it allows a bass far deeper than you would expect from the size of the cabinet. KEF's ACE technology, as the well-known hi-fi authority Alan Sircom explains, enables the *Muon* to 'comfortably achieve the near impossible – a loudspeaker that can reach down to 20Hz (the deepest bass the ear can hear), without recourse to using active subwoofers, equalization, powered bass drivers or any other forms of audiophile cheating.'

The two additional bass drivers mounted in the back of *Muon* similarly help to produce remarkably clean and open sound by controlling how the audio waves radiate around the room, while at the same time reducing reverberation. In effect, they ensure that an even bass energy is maintained and in so doing make, according to Sircom, 'the bass sounds appear to come from their correct position in the soundstage, rather than from the loudspeakers.' Through the use of sealed enclosures, all the drive units in *Muon* are separated from each other. Chambers of pure sound are thus created, which are virtually unaffected acoustically by their neighbours. This guarantees that the emitted sound is as free as possible from any unwanted acoustic colorations.

Additionally, the *Muon*'s 6mm thick aluminium shell provides a totally rigid structure that minimizes any sound-distorting vibrations. Inside the loudspeaker are strengthening braces and a coating of a special damping compound that make the whole unit remain completely inert even when the drivers are generating substantial sound pressure. And what is more, the sculptural organic form of *Muon* allows sound waves to travel freely away from the speakers and into the surrounding space so as to create a field of pure sound. Because flat surfaces and corners are bad for sound distribution an organic form was the most rational choice for optimum performance. The fact that *Muon* is so strikingly beautiful testifies to the integrity of its design – form has followed function.

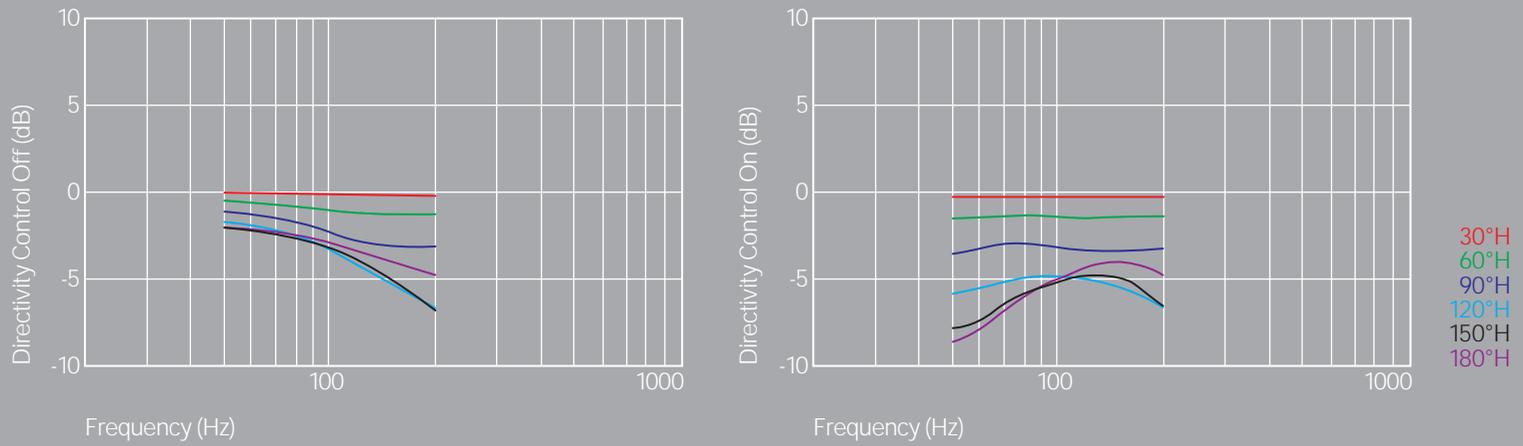
As the KEF R&D team acknowledges, 'the nub of our business is satisfying music lovers' and throughout the *Muon*'s development the goal was to create an unmatched crystalline acoustic clarity as well as an unprecedented three-dimensional depth of sound. The rich tonality and exquisite precision of the loudspeakers' reproduction of a piece of music evokes the ambience of the venue in an almost uncanny way, with each instrument being heard cleanly and separately. Dr Watson believes that acoustic technology is 'still as much an art as a science' and this conviction has led him to become one of the world's leading sound-shapers. By synthesizing his understanding of acoustics with the form-giving talents of Ross Lovegrove, KEF has created a magnificent and truly unique product.



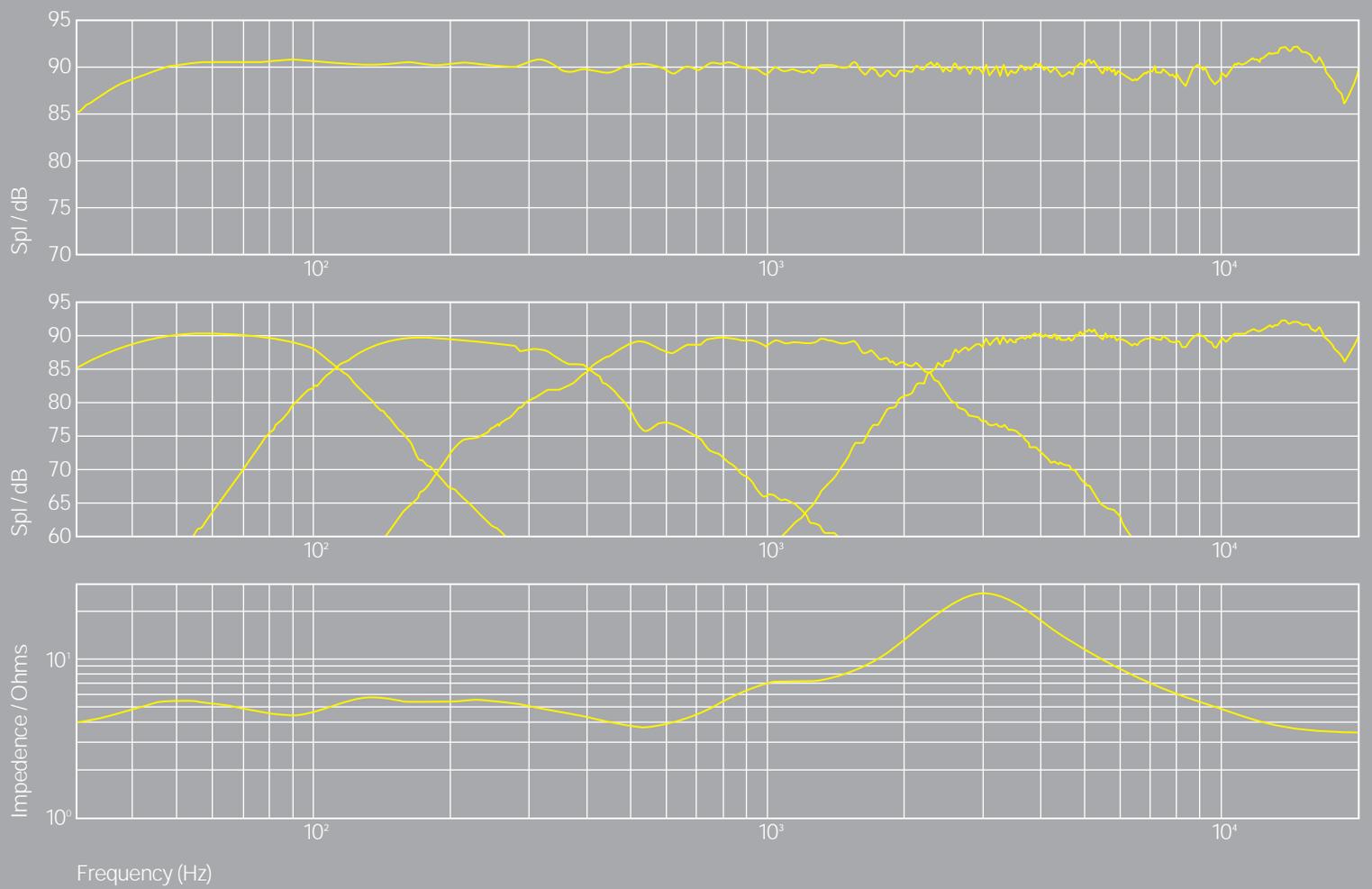


## Muon Measured Performance

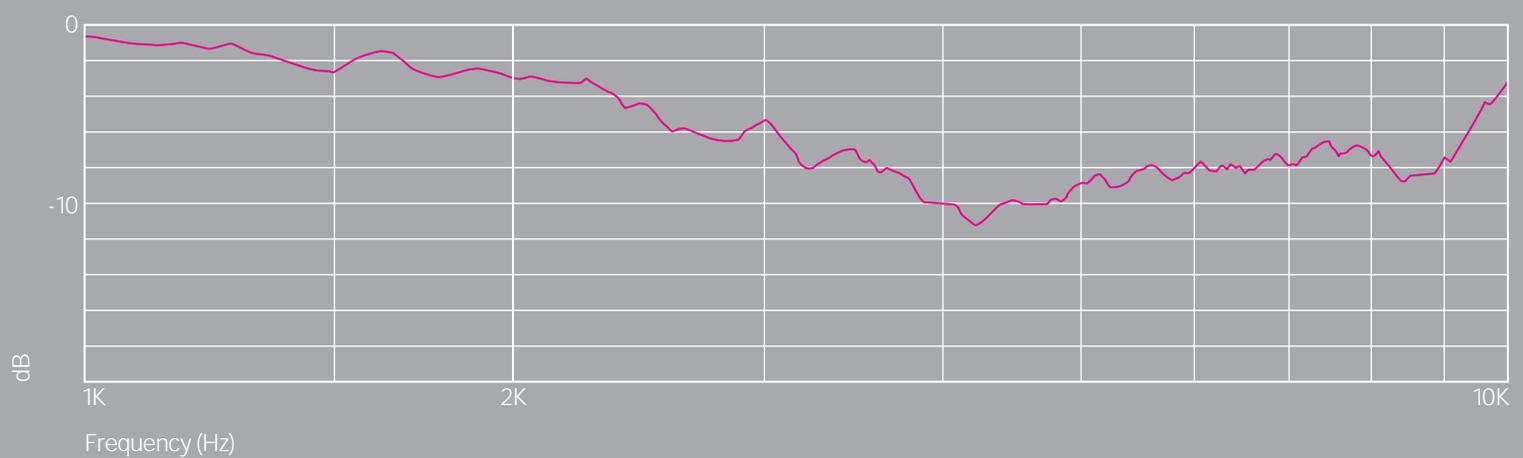
### Loudspeaker response at 30° intervals (relative to on-axis)



### Muon Anechoic Acoustic Response: On Axis



### Muon Uni-Q Dispersion – Tweeter Response at 45°H (relative to on-axis)



### Acoustical Specifications

4 x 250mm bass drive units with ultra low distortion neodymium magnet systems

1 x 250mm lower midrange drive unit with ultra low distortion neodymium magnet system and response tailoring, chromed phase plug

1 x 165mm Uni-Q driver array incorporating a 165mm midrange unit and a 25mm high frequency unit

2 x 250mm rear mounted bass drivers for low frequency directivity control

### Technical Specifications

Sensitivity:  
90dB / 2.83V / 1m

Input Impedance:  
4 Ohms

Frequency Response:  
25Hz to 60kHz (+/- 3dB)\*

Low Frequency Extension:  
20Hz (-6dB)\*

High Frequency Extension:  
100kHz (-10dB)

Maximum Output:  
118dB

Amplifier Requirements:  
100 to 400W (typical)

Crossover Frequencies:  
120Hz, 300Hz, 2.3kHz

\*Typical, in-room response

### Physical Construction

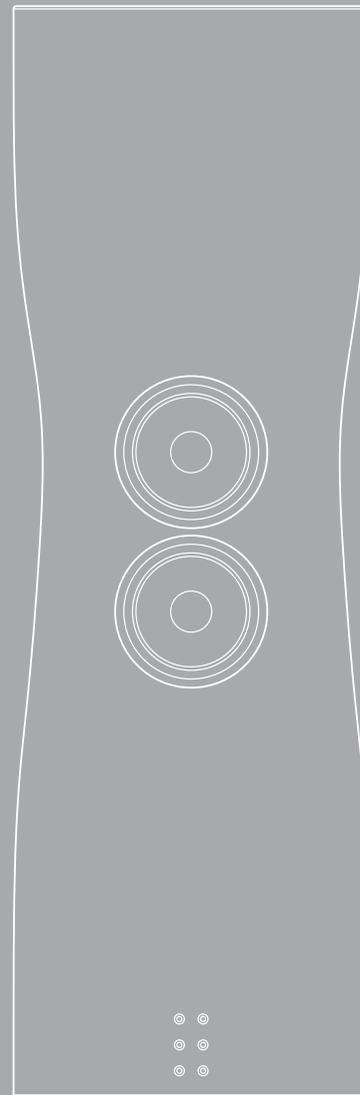
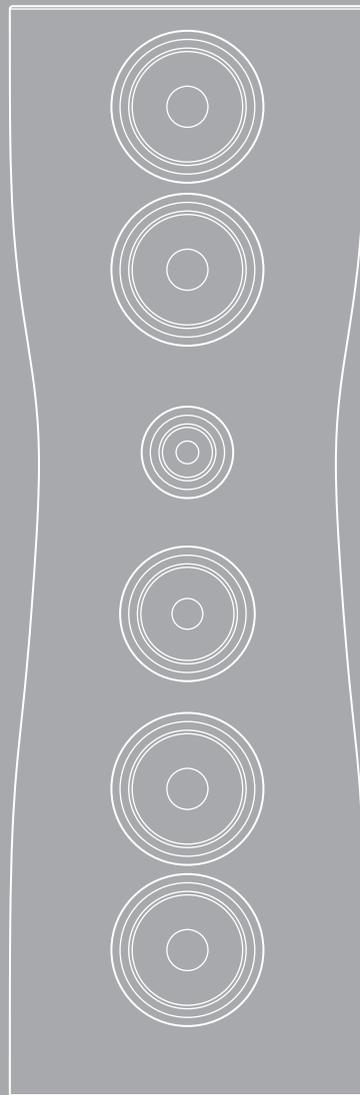
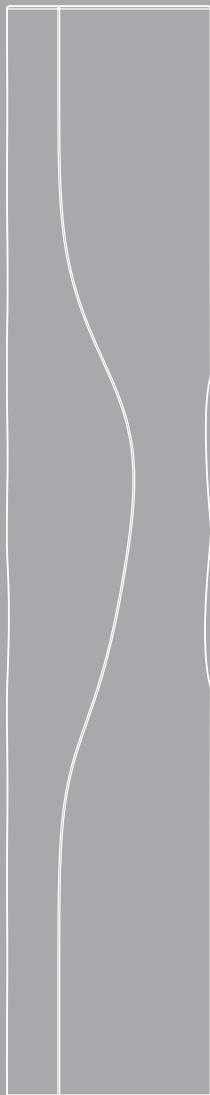
Enclosure constructed from 6mm, super-formed aluminium. Internally braced and critically treated with damping elements.

### Dimensions and Weight

Depth: 380mm / 15in

Width: 600mm / 23.6in

Net Weight: 115kg / 253lbs



Height: 2000mm / 78.8in

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## Muon

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The *Muon* is the most remarkable achievement of sound-engineering and cutting-edge design. Rarely in the world of commercial products does one find such a sublime marriage of form, function and manufacturing integrity. Carefully tested in KEF's highly accurate anechoic chambers, each *Muon* loudspeaker is individually crafted and comes with a certificate showing its unique frequency response curve, signed by the skilled craftsman who made it in KEF's workshop.

One of the reasons for the superlative sound quality of *Muon* is that it functions beyond the normal range of the sound frequency spectrum. What this means is that it reproduces sound so low or so high that the human ear cannot register it. Nonetheless this sound is still there and when included in the audio-mix it has an enriching effect, making what you hear more vibrant and more real. To this extent *Muon* radically enhances the listener's audio experience.

The beautiful form of *Muon* also sets a new aesthetic standard for the audio industry, which for too long has relied on either the 'dumb box' approach or over-the-top styling. Instead, Ross Lovegrove has intuitively wrapped form around sound to create a poly-sensorial convergence that gives the *Muon* a powerful yet elegant presence. This product can be seen as iconic of the 21st century not only because outwardly it is state-of-the art in every respect, but because its design and manufacture would not have been possible without the latest, highly sophisticated CAD/CAM software and technology. Guided by logic and aesthetics, the *Muon* is as much an extraordinary piece of sculpture as it is the ultimate sound provider – an exquisite example of British engineering and design at its very best.



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Muon Loudspeakers are  
handcrafted in the United Kingdom

KEF, Muon and Uni-Q are registered  
trademarks. Uni-Q is protected  
under GB Patent 2 236929, US  
Patent No 5 548 657 and other  
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Ross Lovegrove Product  
Photography: John Ross.