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Hole Shaped World...

Craig Milnes of Wilson Benesch talks Torus with Roy Gregory

The Wilson Benesch Torus marked something of a departure for both the company and sub-woofer design in general. It's striking, drum-shaped structure and full diameter cone make for a dramatic appearance that only hints at just how different this product really is. Rather than trying to explain the thinking and technology behind the innovative unit, why not let the designer deliver that information direct from the horse's mouth, so to speak?

RG. How would you describe the Torus and its operation to somebody who has never seen it before?

CM. Imagine it as a kick drum with a motor either side of the skin. Only the skin isn't flat; it's shaped into a cone to deal with the compressive forces that result from the sealed enclosure. So essentially, think of it as a conventional driver, but with two motors, one either side of the diaphragm. Secondly, the energy generated in those motors travels straight to ground, not through the outer enclosure – a key element of the design and what makes it so different.

RG. So it's almost like an inversion or internalization of the force cancelling rods that people use between pairs of opposed drivers?

CM. It both internalizes it and divorces it from the enclosure.

If you take a conventional driver, it is supported by – it depends on – the external enclosure for its structural system. So, if that structure is intrinsically incapable of dealing with the huge energies that are pumped into it – and the low-frequency information produced by sub-woofers passes through concrete walls with ease – if you have an MDF cabinet trying to deal with that it simply becomes a vibrant part of the whole system. Rather than a solution it simply becomes an extension of the diaphragm itself. It's simply impossible for those materials to deal with that kind of energy.

RG. What is the actual structure of the Torus cabinet?

CM. It's laminated MDF with an internal steel structure to reinforce it.

RG. So, even though you are evacuating most of the mechanical energy directly from the driver, the cabinet itself is still extremely rigid?

CM. That's because it has to constrain the considerable air-pressure behind the diaphragm. It has no other function, but being a cylinder it can handle those stresses relatively easily – although it is still a significant structure in and of itself.

RG. What was the thinking behind, the process that led to the unique structure of the Torus and its use of a

separate controller and amp module?

CM. Well, the concept for the drive unit goes all the way back to the first driver we ever developed, the Tactic, because that was based around the idea of creating an isobaric arrangement. When we tried to extend the bottom end of the ACT One by using a 10" driver, everything that was good about the speaker was immediately destroyed. It wasn't until we employed isobaric loading that the bass had the same speed as the midrange and we got back the things that were good about the system again. So that realization set the company on a course that was different to what everybody else seemed to be doing. We were saying that you couldn't generate low-frequencies that were dynamically matched to the mid-band by using a large diaphragm, because the mechanical and dynamic behaviour of a big diaphragm is simply so different. Of course, as soon as you take that position you define an avenue that as far as a sub-woofer is concerned, is really hard to resolve. You could use a lot of isobaric elements, and I suppose that might be a solution, but it wouldn't be simple and it would be very expensive. With a minimum of eight drivers and the cost, reliability and matching problems that go with that, it's a complete non-starter.

So the solution started with the isobaric configuration, with its two ►

► motors, but trying to accelerate and decelerate one diaphragm rather than two was the thinking behind it. At first it appeared totally impossible. If you think about drive units, the biggest problem is the tolerances and consistency of the coil and the very narrow gap in which it operates. So how can you get two coils and two motors in perfect alignment? That was the apparent stumbling block. But in reality, when you machine the parts accurately, alignment becomes axiomatic. It happens by virtue of the way the thing is built...

RG. Around a single axis...

CM. Yes. But it wasn't possible to look into this without significant funding, so we got our second SMART Funding research grant, which allowed around \$115,000 worth of funding to develop it.

external, amongst other things in the design that are also quite different.

RG. Once you are working around a single axis, pretty soon you run out of places to put an amplifier.

CM. Well, there's nowhere to put it if you are working on a circular cabinet. But it was obvious to us anyway that you just do not put an amplifier or electronics in such an aggressive environment.

RG. Do you think that the fact that so many people do exactly that reflects a feeling that because it's "only" bass, quality and subtlety just don't matter?

CM. I think that's probably true in the

for. It's easier to hear.

RG. So, you are getting quality of another kind, because of the speed of the driver? It's offering texture and micro-dynamic detail that simply escapes more conventional systems...

CM. That's been the biggest learning curve; the things that have happened with this product after its development. We've found a whole range of new people interested in its performance possibilities; people with electrostatics for instance – or horns – I would say are a major part of the customer base that's invested in this product, because of their need for speed, their desire to have something extremely fast and three dimensional to match their loudspeakers. Conventional subwoofers actually undermine and destroy the quality that attracted them to their loudspeakers in the first place. That's the kind of customer that we really didn't anticipate.

RG. What has the Torus taught you as a speaker designer?

CM. Well it gave birth to the Trinity, a speaker with extension way out beyond 20kHz – to around 100kHz in fact. It defined the idea that the way forward for our company wasn't to just design bigger and more expensive loudspeakers, but to produce products that could add to existing systems, ours or other peoples', and make quite a considerable difference. The Torus is not an inexpensive product, but in a realm where loudspeaker prices reach hundreds of thousands of pounds and you are offering something that's never been



We had to match that investment, so you're talking about a considerable cost in R&D.

It took three years to really get to grips with the concept of what we were trying to achieve. Once you get started and you consider the accuracy required, that defines other things; so it became obvious for instance that the amplifier should be

case of cinema systems, where people are less inclined to be so obsessed with timbre or quality of reproduction. They're looking for something more visceral. But in actual fact, the dynamics of the Torus are faster and more controlled, so you don't have the same need to blast or reinforce the edge that you're looking

► achieved before, it's also far from expensive.

With the Torus, it's not the frequencies it produces but the way it affects the main loudspeakers that is the most enchanting thing about the design. You hear the chest and body of the singer, rather than just the voice. It's the way it creates a far more physical and three-dimensional soundstage.

RG. The way it fleshes out the midrange?

CM. Everything is just so much more natural; exactly what high-end audio should be about – the illusion of recreating the sound from the original event.

RG. When you move to a much wider bandwidth system, as long as it's working then one of the things that always strikes me is how much more musically coherent it is in terms of the point and pace at which discrete events occur.

CM. Yes, the Trinity is all about point-source information. When we sell speakers to people we tell them that all our models sound the same – except for the bass. It's the bass that takes the most effort and is most difficult to extend and improve. We love the (simple, two-way) Arc, and in a design like that you get a lot of music for your money. But

for a company that's about creating sound-scapes and enhancing the sense of "being there", adding the Torus can create exceptional, spatial reproduction and some of the most realistic sound you'll ever hear – without making you change your speakers or power amp.

RG. Is there a line-level output from the Torus controller, allowing you to

below that, allowing you to drive the two modes that most rooms exhibit. It makes them more versatile in difficult situations.

RG. Is there a high-pass output from the controller?

CM. No. You always run the main speakers full-range and roll the Torus up underneath them. I think it's

now generally accepted that that gives the best results. If you look at the Trinity, there's no crossover on its main driver and so no phase shift, making it much easier to achieve the top-to-bottom coherence we were talking about earlier, making the results that much more dramatic. Likewise, the Sphere (super-tweeter). The Trinity is a design that demonstrates our views on wide-bandwidth, the way it improves dynamics and speed.



use a different amp for instance?

CM. No. No there isn't. There are line and high-level inputs but no line-output. In terms of actual control, it allows you to set the Torus's upper roll-off between 20Hz and 120Hz, and its lower roll-off below 35Hz in 5Hz increments. This actually allows you to use a pair of Torus either as a two stereo units, or to stack their outputs, running one from say, 45Hz down to 29Hz, and then the other

RG. How critical is the Torus of precise positioning?

CM. It is quite remarkable how sensitive it is to position – but that doesn't mean that it's hard to place. The best position is always centrally between the speakers and the same distance as they are from the listener. Move it back even a couple of feet and the effect on coherence is immediately obvious.



The Wilson Benesch Trinity/Torus Loudspeaker System

by Roy Gregory

A few issues ago I looked at (and was seriously impressed by) the Wilson Duette/Watchdog combination, a “double the price – more than double the performance” outgrowth from the original two-way stand-mounted design. Now comes the Wilson Benesch Trinity/Torus system, a three-box solution which, quite literally, extends the concept even further.

But before getting into the specifics, let’s just pause for a second and clarify what it is we’re dealing with here.

Traditionally, sub/sat systems that combine a pair of small satellite speakers with a separate sub-woofer to augment their limited low-frequency output, have been sold on the basis of their lower domestic or visual impact when compared to conventional floorstanders of equivalent bandwidth. It’s a marketing strategy that’s been taken to ever-greater extremes by the A/V crowd, with the satellites decreasing in size as they increase in numbers, and “site anywhere” subs getting smaller too. Of course, any sub/sat set up

enjoys the benefits of reduced size, but that’s not what drives systems like the Trinity/Torus combination. This is a pure performance based approach that seeks to outperform more conventional designs at similar (and

or balance into account. The same is true of the low-frequencies, where separating them means that approaches that would be difficult or impossible to implement in a conventional floorstanding design become possible – certainly true in the case of the Torus. Then there’s the ability to optimize placement of the sub(s) as well as build the complete system in a series of bite-sized chunks rather than as a one-time capital purchase. This combination of practicality with the ability to functionally specialize each element is what gives these systems their potential performance edge – as long as the designer gets it right.

Time then to look at the specifics. I’ve dealt with the unique design of the Torus in the preceding interview with its designer Craig Milnes, so let’s concentrate on the Trinity. Essentially a small two-way design incorporating a hemispherical gold-plated ceramic super-tweeter it could easily be mistaken for the company’s similarly sized (but far more affordable) Arc. But the Trinity is a far more ambitious design, developed specifically in response to the performance gains offered by the Torus. As we have frequently observed (and demonstrated) whilst adding a sub-woofer to almost any system will offer sonic advantages, to really exploit the benefits you need to extend the bandwidth at the opposite extreme as well, adding high and low-frequencies in balance. The sheer sonic quality of the Torus makes this even more apparent; hence the search for a ►



in some cases much higher) prices, by exploiting the benefits that come with the separation of their cabinets. So, a speaker like the

Trinity can be optimized for its specific frequency range, exploiting the stiffness of its small cabinet and the choice of materials that opens up. It can also be placed to best advantage, without having to take bass nodes

▶ satellite which could match the new sub-woofer for clarity and transparency as well as extension. So, whilst the Trinity is superficially similar to the Arc, it represents a far more sophisticated realization of that basic design concept.

Let's start with the cabinet. This is a complex, composite structure created from a range of different materials. Mechanically speaking, the key elements are the side cheeks that flank the baffle. Profiled aluminium extrusions, their smooth exterior curve helps minimize diffractive effects, but internally they are shaped to lock the various cabinet elements together. They are joined at the front by a 4mm steel plate that engages firmly with their extruded grooves. This is joined with a visco-elastic peripheral gasket to a precision milled 10mm aluminium plate that forms the front of the baffle and allows the three drivers to be positioned as close together as possible. The side and rear walls are constructed as a single unit from Wilson-Benesch A.C.T (Advanced Composite Technology), a carbon/glass sandwich with a high compression core. The curved walls and concave rear create an incredibly stiff but well damped structure, while the top and base plates are constructed from Perspex bonded to steel sheets. Extrusions aside, all machining and the extremely sophisticated composite construction is carried out in-house, ensuring consistent tolerances and performance.

Having taken all that trouble to create a carefully controlled, non-resonant structure for the cabinet,

it's not surprising that the care and attention to detail extends to the fixing of the drivers. Rather than simply bolting them into place, which creates pressure points and thus resonant nodes within their structure, Wilson-Benesch employ steel/aluminium plates to clamp the drivers in place, helping to spread the fixing load more evenly. A composite coupler and U.D. carbon-fibre tube

brace the rear of the bass/mid driver to the back of the cabinet, terminated by the large steel boss that carries the serial number and model designation. The dedicated stand bolts directly to the steel bass plate of the speaker, allowing the use of twin, downward firing reflex ports – something of a W-B trademark.

The two-part aluminium column is inherently self-damping and also houses the crossover, removing it from the mechanically hostile environment within the cabinet itself. The W-B designed bi-wiring terminals are located at the base of the pillar, and will accept 4mm plugs, spades or bare-wire. The stand is supported on three sharp steel spikes, the

rear two being adjustable from above and lockable using

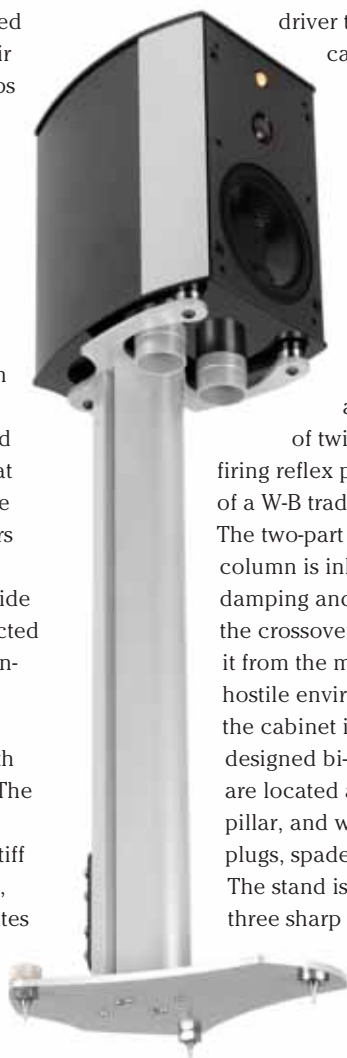
substantial nuts below the thick steel base-plate. You even get a spanner to fit both these and the terminals.

Nor are the drivers familiar, off-the-shelf units drawn from the usual suspects. Key Wilson-Benesch design

goals are wide-bandwidth and consistent phase response, which has led them to adopt directly connected midrange drivers, running full-range. The smooth mechanical roll-offs such an approach demands pretty much necessitate the creation of dedicated drivers and the Trinity's bass-mid unit is a prime example. Dubbed the W.B.One (Wide Bandwidth One) this uses a woven polymer cone (based on Isotactic Polypropylene) and a vented motor assembly, all built in-house. The tweeter is the same modified Scanspeak unit used in all the other W-B speakers, retained because Craig Milnes feels that its performance advantages (especially when it comes to interfacing with the bass/mid driver with a simple, first-order crossover) outweigh those delivered by more recent, wider bandwidth designs. Instead, he employs the increasingly common Murata super tweeter, dubbed The Sphere in W-B parlance.

Put all this together and you have a conceptually simple speaker – electrically speaking it's about as simple as it can be – but executed with extraordinary precision and the application of considerable materials technology. But what I find really interesting is the parallels that exist between the Trinity/Torus system, the Wilson set-up and another speaker that's impressed me recently – the Reference 3A Grand Veena.

The Duette/Trinity comparison is fairly obvious: both are high-quality standmounts with dedicated supports and the option to add a sub-woofer (extending both their bandwidth and ambition). But despite clear differences in the design of those sub-woofers, both are used in conjunction with main speakers run full-range, their respective controllers simply rolling the low-frequencies in underneath. Likewise, both encompass (even encourage) the use of a second sub-woofer for ▶



▶ ultimate performance. But where the WatchDog is a passive design demanding the user to provide amplification (which does allow complete electronic continuity across the full bandwidth), the Torus controller has inbuilt amplification that can be run from high or low-level inputs. Both units benefit from placing their electronic elements external to the sub-

balance considerably. Excellent with basic electronics, they flourish and grow with better source and amplification components, turning traditional notions of system priorities on their head.

Do I see a theme developing here? Certainly there's an emerging



Wilson-Benesch, allowing me to bi-amp the Trinities to great effect. Although the intrinsic adjustability of the Torus means that it has the same go-anywhere versatility that has made the Landrover a worldwide success, in practice it performs best placed between the speakers and with its "hub" the same distance from the listening position, significantly easing integration. In my dedicated listening space (dedicated in the sense that hi-fi sensibilities trump all others) that presented no problem. In less forgiving environments a less obtrusive placement is possible, while using paired subs would certainly open the possibility of less symmetrical arrangements configured to exploit the room modes. With the sub between the speakers, set-up is extremely simple;

the further it (or they) strays from that position, the harder you are going to have to work. In that respect the Torus can't rewrite the laws of sub-physics – performance will be defined by the quality of the set up and integration.

Faced with any sub-woofer it's awfully tempting to reach for the biggest, baddest discs you possess. But in fact, if you really want to understand what it is that subs bring to the musical party then what you really need is small-scale works, just a voice and a few acoustic instruments. Conversely, for a small speaker to work effectively it has to possess sufficient weight and scale to satisfy with larger works, and if the Trinity is to serve as an effective stepping-stone to a full three or four box speaker system, then that's where we need to start.

Playing everything from Elgar to Rimsky-Korsakov, the Trinities faired surprisingly well on even the most bombastic works. Even the explosive pyrotechnics of the shipwreck from the Reiner *Scheherzade* ▶

appreciation of the importance of extended bandwidth coupled to good phase and dynamic coherence. Having said that, each of these speakers is also quite distinctive, and the Trinity/Torus system is no exception. Run both as a 2.0 and a 2.1 set-up, they were used with a variety of electronics, including VAS and Emille valve amps, the Belles MB200 mono-blocs, Hovland RADIA and also an Audionet Amp V, a five-channel unit supplied (and distributed) by

woofer cabinet proper, and given the clear audible benefits of running the WatchDog with the same amp that drives the main speakers it would be nice if the Torus could offer the same facility – especially as the controller already incorporates a (currently unfiltered) low-level output.

Similarities between the Trinity/Torus system and the Grand Veena might be less obvious but if anything are even closer: Both systems employ a direct connected, in-house midrange driver; Each use a specifically modified version of the same Scan tweeter with a first-order crossover; Both employ a Murata super-tweeter and both add extra bass to the mix to extend the system bandwidth around the clarity of that filterless mid-band.

What's more, all these speakers are astonishingly comfortable with even quite modest amplification, a factor that changes the budget



► were delivered with an enthusiasm that belies the size of the tiny cabinets, clarity, speed and positional precision off-setting the lack of real low-frequency power, the sheer speed of the dynamic response making up for a lack of genuine heft. Of course, the results depend on the matching amplifier, as with any small speaker, and here the benefits of bi-amping the Trinities with the modestly priced

Audionet really came into their own, maximizing the crisp dynamics and surprising sense of substance, making this an astonishingly cost effective combination. Indeed, the extending, grumbling bass passage that opens the Gorecki *3rd Symphony* showed a measured sense of swelling power, of even ebb and flow that escapes many a larger speaker, while the immediacy of a small-scale track like Bill Maloney's 'Solar System' has a tactile intimacy and lucid clarity that talks straight to the listener.

Nonetheless, moving up to the RADIA or Belles mono-blocs produced a greater sense of foundation and richer tonal balance, a deeper, more woody tone from the bowed basses in the Gorecki, more chest from Bill, a more emphatic thwack from the snare – at a not inconsiderable increase in price, it has to be said.

Even so, the volume and dimensionality that these amps bring to images, the warmth and easy pace they deliver, really brings a track like 'Solar System' right into the room. Maloney's guitar becomes a living, vibrant thing, its harmonic signature comprised of so much more than just the strings, while the

space around and behind him goes a long way to conjuring a believable sense of presence (and not a little personality). As stepping stones go, the Audionet provides a pretty firm footing, but with a speaker that possesses the lucid clarity and resolution, the poise and precision of the Trinity,



the added scale and more sophisticated tonality delivered by bigger amps is readily apparent, actually making the satellites an even more credible standalone option. So, perhaps you don't need a Torus at all? Spend the money on a bigger, better amp and you'll be laughing? Err... not exactly; in fact, not even close...

Even in their richer, warmer, more expansive mode with the bigger amps, adding the Torus to the mix



produces a far from subtle increase in quality and performance. For the first minute of the Bill Maloney track there are no bass fundamentals to speak of, just acoustic guitar, voice and snare. Yet, adding the Torus transforms the timing and integration of the instruments. The picked melody is more fluid, quicker and more sinuous, the snare more snappy and insistent, the space around the instruments much more apparent, with walls and a floor.

Suddenly the music takes on a feeling of underlying urgency that dovetails perfectly with the lyrics.

Now, anybody who has played with subs before should be far from surprised by this – at least if they got a sub to work properly. Time and again people expect a sub to add more whereas what it actually does is deliver more, a nice but crucial difference. So, if we look at the Bill Maloney track, what we're hearing from the increased bandwidth is a greater sense of spatial and temporal accuracy; things are happening when and where they should. Actually, to some extent they always were, it's just that now you can hear that much more clearly.

So yes, when you play that long, meandering opening passage from the Gorecki you'll hear more weight and texture from the basses, the floor and walls of the auditorium, but it's the added sense of shape, direction and purpose that's more important, the dark, brooding tension that hangs behind the music. Without it the opening bars quickly drag, the attention wanders, the music meanders... Add the sub and you'll be riveted to your seat, the brooding menace of the

► performance commanding your attention, gripping you deep inside. Yes, you get more bass – but it's what the system does with it (or what it allows the system to do) that's more important than the simply presence of quantity.

Which brings us naturally to the question of quality.

The Torus goes very, very deep – especially for a unit that's so compact (I'm not sure any sub can really claim the label "elegant" but the Wilson Benesch gets way closer than most) but what's really impressive is the transparency, harmonic detail and texture of the notes it produces.

pitch and placement of the notes becomes super critical, a quality that comes from the top-end extension provided by the sphere, as well as the phase coherence of the system as a whole. Faith can be sluggish, even turgid on way too many systems, yet there's no ignoring the driving urgency and frenetic insistence of

a track like 'Primary' – just so long as you get the bass right. Here, those rapid, chopped chords, played low on the neck have a tangible solidity and purpose, propelling the track to its inevitable, off-beat, off-key, off-kilter finale. At no point across the album do proceeds lag. The space that envelops 'Other Voices', the multi-textured layers of 'Faith' itself, the craft that's gone into Mike Hedges' production, all are effortlessly unraveled, to the benefit of these tight and carefully woven songs. Just listen to the spatial array created by the drum pattern that opens 'All Cats Are Grey' and you'll hear exactly what I mean.

I've always been aware of it, always loved its ability to catch the attention. What I've never been aware of before is the way it evolves throughout this haunting track – a bit like hearing McCoy Tyner's piano artistry emerging from 'My Favorite Things' for the first time, something the Trinity and Torus also unravel with consummate ease (and thanks DDD, the mono pressing is fantastic!).

Moving to the other end of the scale and that storm sequence from *Scheherazade*, the Torus adds scale, foundation but most importantly of all, a feeling of majestic inevitability to proceedings.

There's that same ease, but this time hitched to a feeling of unbridled power; you can almost picture the sea smashing against the huge rock, creating a dramatic picture and an equally dramatic contrast with the delicacy and tranquility of the closing violin part.

It's hard to review a sub-woofer based system without discussing even focusing on the bass, but that's not really the

point. What a system like the Torus and Trinity deliver is balance, seamless extension at both frequency extremes that embraces and enhances the mid-band, creating a coherent whole that makes greater sense of the musical performance – and gives greater access to it. There's a clarity and poise to the musical proceedings that makes the structure

– the notes, the phrases, the parts – easier to hear, easier to slot together. It's easier to hear the contribution of each player, easier to separate each voice and instrument. All of which ►



The familiar, deep, pellucid drops of the bass riff that opens the Cure's magnum opus *Faith*, have a shape and attack that I've heard only rarely indeed,

and then from speaker systems at many times the price of the Trinity and Torus. And I include the Trinity advisedly; when so much of the melody is both carried and driven by the bass guitar,


► is nice to have, I'm sure you'll agree – especially when you consider the jumbled and confused tumble of sound that most hi-fi systems generate when compared to live music. But the easiest thing of all with the Trinity and Torus, is understanding the intent behind the music and why whoever wrote it bothered in the first place. The vivid, almost pictorial impressions created by *Scheherazade* are no accident. Nor are the stark drama and contrast created by the alchemy of Beethoven and Heifetz as the latter blazes



through the *Kreutzer sonata*, his pauses and stately grace in the slower passages bringing a subterranean tension as he coils himself for the next blindingly fast flight, his trajectory marked by the spray of notes scattered in his wake. The solid, funky, dirty groove of 'Las Cuevas De Mario' leave you in no doubt that eggs is definitely eggs, while the monochromatic angst of Robert Smith's vocal transports you back to the depressed and decaying terrain of early 80's Britain and the Thatcher years; 'Tramp The Earth Down' indeed.

Music works on many levels: the emotional, the spiritual, the

intellectual, the facile. It matters not why we listen, the Tourists enjoying exactly the same status as Telemann or Tchaikovsky. What matters is that we receive the message we seek, the reward within. We might want Marco Pierre White, we might want classic Roux brothers cuisine – or we might want candy-floss; sometimes all we want is a bit of fluff. And my point is? A wide bandwidth, phase coherent, high-resolution and dynamically coherent system should be able to deliver without fear or favour. The Trinity/Torus set-up does exactly that. It's a select group of speakers that provide such access, such musical credibility and do so with so little residual character. Like the Duette and WatchDog the Wilson-Benesch combination gives up ultimate transparency and textural resolution to the biggest and best. But at the price being asked that's a trifling concern which need only bother those with a burning need to drop another 20 or 30 grand – and that's just on the speakers. Because in some ways the best thing about the Trinity and Torus isn't how good they sound with the best possible ancillaries (and they are well worthy of the best); no, the best thing about them is just how well they work in isolation, how willingly they work with amps that shouldn't really be allowed anywhere near speakers of this quality. This is one sub/sat system that really does deliver on the promise, both in terms of superb sonic results and bite-sized financial practicality. Full-range, effortlessly engaging, addictively entertaining, musically sophisticated, unflappably capable but still prepared to let its hair down, at around £13K plus an amp the Wilson-Benesch Trinity and Torus have set the bar awfully high

for speaker systems confined to just a pair of boxes. Forget domestic acceptability, these are speakers you buy for their performance – everything else is just icing on the cake! 

TECHNICAL SPECIFICATIONS

Trinity Loudspeaker

Type:	Twin reflex loaded loudspeaker with integral super-tweeter and stand
Driver Complement:	1x 170mm W.B. One MF 1x 25mm coated silk HF 1 x sphere gold plated ceramic UHF
Bandwidth:	46Hz - 80 kHz ± 2db
Sensitivity:	89dB
Impedance:	6 Ohms nominal 4 Ohms minimum
Crossover Frequency:	5 kHz
Dimensions (WxHxD):	235 x 1080 x 300mm
Weight:	16 kg ea.
Finishes:	Too many options to list, with bespoke finishes also available
Price:	from £4,700

Torus Bass Generator

Type:	Sub-bass speaker with separate amp and controller
Driver Complement:	18" Integral Unit
Bandwidth:	20 - 120 kHz ± 6db
Amplifier:	200 Watts
Dimensions:	450mm diam. 350 mm high
Weight:	15 kg
Finishes:	Black
Prices –	
Torus Speaker:	£3,000
Control Amp:	£2,240

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