Jim Thiel: A Coherent Source

John Atkinson | Mar 16, 1998

There was something odd about the clock on Jim Thiel's office wall. I didn't get it at first, other than noting that instead of the minutes being marked off at 12 five-minute intervals, Jim's clock had 24 markings. That was it: as well as the number "12" in its usual place at the top of the face, there was another "12" at the bottom, where the "6" usually is. The clock that Jim built was typical of everything this laconic loudspeaker engineer is involved in: logical, functional, and different from what anyone else in the same field does. In his cigarette-strained drawl, Jim explained that the short hand of his clock always points toward the sun: directly up at noon, directly down at midnight. That's the way a clock should be, declared Jim, and when you're in his company, it's hard to see how he could be wrong.

In 1998, Thiel Audio Products, the company that Jim owns with his long-time business partner Kathy Gornik, celebrates the 20th anniversary of its first Coherent Source loudspeaker, the Thiel 03, designed by Jim. And in January 1998, at the annual Consumer Electronics Show, Thiel announced its latest Coherent Source loudspeakers: the long-awaited replacement for the CS2 2, the CS2.3 ($3300/pair), and the CS7.2—both designed, of course, by Jim, and both manufactured, from soup to nuts, in Thiel's Lexington, Kentucky factory, in the heart of horse country.

I've talked speakers with Jim on many occasions over the past decade, and recently had two opportunities to pin him down on tape: once in Lexington and once in *Stereophile*'s office in Santa Fe. (Thiel President Kathy Gornik also makes a guest appearance.) But one thing I've never understood is why anyone other than a masochist would want to get involved in loudspeaker design. The hours are long, the work difficult, and the rewards hard to predict. Jim, who got into audio when he was 12 by repairing radios and audio gear, typically didn't see it that way:

Jim Thiel: I wanted to have my own business and thought that loudspeakers were something that I would enjoy doing. I had been experimenting with loudspeakers for years, designing loudspeakers for people in rock'n'roll bands and things like that. I got tired of putting more and more effort into the design stage to get a speaker just right, only to make one, two, or three units. If I was going to put a lot of work in designing a product, selling thousands of the same unit would be [more rewarding].

The first loudspeaker system that we marketed under the Thiel name was the Model 01, a small two-way system that used an electronic equalizer to extend the bass response down to 30 cycles. We started selling that in 1976. The next model, the 02, was a smaller speaker. Used a 6½" driver. And about that time, I started thinking a lot more seriously about not just making a good product, but making a product that I hoped would be better than any others available.

I started giving a lot of thought to the inherent limits and problems of dynamic speakers and identified one area: the phase and time distortion that's introduced by typical high-order crossover networks, and the fact that the drive-units are not mounted coincident with each other. I spent a lot of time trying to eliminate this phase distortion and eventually decided to bite the bullet and use the first-order crossover system approach. That gives you technically perfect results. Not only do you end up with no phase distortion, you also end up with a uniform power response and a uniform amplitude response. The downside is that the drivers have to operate over a much wider bandwidth.

John Atkinson: But if you have spaced drive-units, aren't there going to be axes where you get acoustic cancellation between those drive-units?

Thiel: Yes, this is true. But we must distinguish between the total power output of the drive-units and that of the speaker unit. [With a first-order system,] the total power output over all radiated angles is constant. So you do not suffer any deficiency in total power reverberant energy in the room at the crossover region—as you do, say, in the fourth-order system, where you have a 3dB depression of total power output of the speakers through the crossover frequency range.

It's true that you have "lobing," where at certain angles you will get cancellations between two drive-units. How severe of a problem this is depends upon the spacing of the drivers compared to the wavelength at the crossover frequency. So the closer you can space the drivers on the baffle and the lower in frequency the crossover point can be, the less of a problem this is. For that reason, we have never made a speaker that has an upper crossover frequency higher than 3000 cycles. We don't make systems that have a 5000- or 7000- or 10,000-cycle upper crossover limit because the wavelengths get so small that the driver spacing becomes very, very significant. So because we have a relatively low upper-crossover frequency and we keep the driver spacing—particularly between the midrange driver and tweeter—very small, about one wavelength spacing, the lobing problem is relatively minor. But it still does exist. And that is one of the practical limitations of first-order crossover systems.

Atkinson: Something that does not appear to be widely appreciated is that a first-order crossover does not inherently make a speaker system time-coherent. You also have to arrange for the acoustic centers of all the drive-units to be the same distance from the listener.

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Thiel: That's correct. If the drive-units are not the same distance from the listener, you will still hear the sound from the drive-units separately in time. They have to be physically aligned.

Coincidentally, at about the same time [that I was thinking about time coherence], other companies were also starting to think about the problems caused by the differences of arrival time. We came up with the approach of mounting the drivers on a sloping baffle, which did not introduce the problems caused by the stepped baffles that were being used in some other designs. We introduced our Model 03, which achieved a lack of phase distortion, in 1978, and we still use this approach in all of our products.

Atkinson: How do the Thiel "Coherent Source" speakers differ in design philosophy from the original 03?

Thiel: In terms of the basics, there are really no differences. All of the products use a sloping baffle to align the drivers. All of the products use a first-order crossover system to achieve a lack of phase distortion, and all of the products have vertically aligned drivers so that, if a listener was off-axis, the relative distance to each of the drivers did not change appreciably. That was kind of unusual back in the '70s.

But all of our products have incorporated incremental advances in various aspects of their design: improvements in the quality of the crossover components, improvements in the drivers, improvement in the cabinet construction. The Model 04, for example, was the first unit where we went a little bit further to reduce cabinet-edge diffraction. The Model 03A went even further in that regard, and we started using higher-quality crossover components. And when the CS series came out, the CS3 was the first model where we used a cast driver chassis and a much thicker cabinet baffle. It was also the first product, I believe, where we used polypropylene capacitors in the crossover network. When we started development of the CS3 product, we originally referred to it as the "03B"—it was the third generation of our original Model 03. Similarly, our current CS3.6 is the sixth generation of that 10", three-way, floorstanding, phase-coherent, sloping-baffle design that we first introduced in 1978.

Atkinson: Is a first-order crossover as simple as just putting a series capacitor in the tweeter feed and a series inductor in the woofer feed?

Thiel: Unfortunately, no. If you look in the textbooks, that's what they may show you as a first-order crossover system. And that would be all that was required if the drivers had uniform frequency response for octaves beyond the nominal crossover frequencies. If the drivers had uniform impedance characteristics for octaves outside their nominal bandpass. And if cabinet diffraction effects were not significant. But in the real world, none of those conditions are true and all of those factors have to be taken into account. So in practice, the first-order crossover system can actually end up being more complicated than any other type because we have to compensate for and correct all the anomalies in amplitude and phase that exist through a much wider bandwidth than if the same driver were to be used in a more normal, high-slope crossover system.

Atkinson: Through how many octaves to either side of its passband does a drive-unit have to be flat to make it good for use in first-order systems?

Thiel: At least two.

Atkinson: So for a woofer that you're going to cross over at 3kHz, that means it would actually have to be flat to 12kHz.

Thiel: Right. And sometimes some compromises have to be made. Two-way systems are especially difficult to implement with first-order crossover systems. One of the things that becomes important is that the woofer-to-tweeter crossover point be as low as practical so that you can ease the requirement on the upper limit of the woofer. You need a tweeter that has very high output capability.

Atkinson: Like all new speaker companies, you were using OEM drive-units at first. However, you quickly got into partnerships with your suppliers where you started to specify exactly what you wanted.

Thiel: Yes. Early on, we started making small but important changes to off-the-shelf drivers. However, it's very easy for the driver manufacturer to change the voice-coil, say, or the stiffness of the suspension so that the speaker can be optimized for use in your system with your cabinet and your bass-tuning parameters. We started getting more and more into designing our own diaphragm profiles, tooling our own rubber surround

geometries, and making the drivers more and more specific to our systems.

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Atkinson: One of your goals appeared to be reduced woofer distortion. You reinvented the idea of using a copper shorted turn on the magnet pole-piece.

Thiel: What that does is stabilize the strength of the magnetic field in the gap. The ferrite permanent magnets that almost everyone uses are not perfectly stable under load. And when you run many amps of current through the driver's voice-coil, the magnetic field it generates pushes against the permanent field of the ferrite magnet and actually demagnetizes it to some degree. So the magnetic reference point that the voice-coil is interacting with is constantly changing. This results in power compression and also in distortion.

By incorporating a heavy ring of copper around the central pole-piece of the driver, you can reduce dramatically the changes in the magnetic field strength that are induced by the current from the power amplifier. You get a more dynamic, less compressed result, with lower distortion. So the bass reproduction is more tonal and has more impact.

Atkinson: One of the things you've done to reduce distortion has been to go from a conventional voice-coil topology, where you have a long coil that overlaps a short magnetic gap, to the opposite, where you have a very short coil operating in a long magnetic gap. What are the advantages of that?

Thiel: The entire coil is in the very uniform magnetic field within the gap at all times. And since the intensity of the magnetic field from the front to the back of the gap changes very, very little, and the entire coil is in that gap even during long excursions, the distortion is very, very low. You get a truly dramatic reduction in distortion. The disadvantage is that since you have a much longer magnetic gap, you need a much larger magnet to power that longer gap, and therefore, everything being equal, it will be a more expensive driver. But the advantages of the distortion reduction are really substantial.

Atkinson: I understand you've gotten heavily into modeling the magnetic circuits of your drive-units.

Thiel: Yes. By using finite-element analysis on a computer, we're able to actually simulate what the magnetic field distribution is in a hypothetical magnet system. So instead of actually having to construct an actual magnet system and do tedious measurements on it, we can run hundreds of experimental simulations on the computer to develop magnet-system geometries that have much more uniform and symmetrical magnetic fields and therefore have much lower distortion. Merely by changing the geometry of the center pole-piece and the magnet system, you can reduce distortion by an order of magnitude, to a tenth of what it otherwise would be.

It's really quite exciting, because these changes in the design of the driver cost virtually no money. You're tooling this center pole-piece on an automatic lathe anyway, and it makes very little difference what shape you're turning the metal into. But it makes a dramatic improvement to the behavior of the driver. The distortion that is introduced by the magnetic-system nonlinearities is no longer the determining factor in the overall driver distortion.

Usually in woofer design at higher output levels, the magnetic-system nonlinearities are by far the largest source of distortion. In our new woofer designs, this is no longer true. Distortion is introduced by minor suspension nonlinearities and by inductive effects in the voice-coil and its former, and even resonant behavior in the diaphragm becomes more significant than the distortion introduced by the magnetic system. So magnetic-system distortion is virtually eliminated.

Atkinson: But to see your theoretical ideas worked in practice, you were still ending up with a set of specifications that you sent to your drive-unit supplier for them to make and for you to then test?

Thiel: Yes. We would send them dimension drawings, tell them exactly how to make all the parts in the magnet system. Then they would build up samples for us and send them to us for evaluation.

Atkinson: How many iterative loops did you typically go through with the drive-unit supplier?

Thiel: In the early '80s it was probably only two or three. By the early '90s it was probably a dozen . . . it could take up to a year to optimize a driver design. If I wanted to try a different diaphragm profile or a different magnet-system geometry, from the time that I requested samples from them until I received the samples to test could easily be a month. So this would severely limit the number of experiments we could run to try to get a new product out. Most recently, we've started manufacturing our own drivers so that we can implement designs that are more exactly what I desire.

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Atkinson: The first drive-units you designed and made in-house were the passive radiators in the CS2 2 and CS3.6.

Thiel: Yes. And that was really very simple—not many parts involved and not many variables. The woofer for the CS7 was the first driver that we manufactured completely in-house.

Atkinson: And now the design loop is very much more efficient because you can model the drive-unit on your computer, your CNC machine tool produces the molds or whatever from your computer model, and you can actually go to many more iterations?

Thiel: Very many more. Especially in the development of the geometries for the diaphragms. At last count, we'd actually made 77 different experimental versions of the CS7's lower-midrange unit. In most cases the differences involved diaphragm geometry, but in other cases the voice-coil and magnet-system geometries were different. We were able to go through so many iterations that we can end up with a design that is much closer to what I want.

Atkinson: And that's in terms of wide drive-unit bandwidth . . .

Thiel: Yes.

Atkinson: . . . low distortion . . .

Thiel: Yes.

Atkinson: . . . and high excursion?

Thiel: Yes.

Atkinson: And the three-way CS6 is the first Thiel speaker where all the drive-units are manufactured in-house?

Thiel: That's correct. We manufacture the woofer, the midrange, and the tweeter.

Atkinson: The CS6's midrange/tweeter coaxial unit looks superficially similar to the one you used in the CS7, which was sourced out-of-house.

Thiel: It is similar to the unit used in the CS7 in that they're both coaxial midrange/tweeter units that use a 1" metal-dome tweeter and a midrange unit with an anodized aluminum diaphragm. However, the CS6 tweeter is quite different. It's a completely new unit with a very long magnetic gap. It incorporates many of the design features that until this time we've used only in woofers: the use of copper in the magnet system, the use of rubber rather than plastic for the tweeter surround, the use of Kapton as the voice-coil former material, the use of aluminum wire in the voice-coil. The result is that this new tweeter has substantially lower distortion and substantially higher output than anything we've made before.

Atkinson: One of the problems with a coaxial unit is that the tweeter sees a symmetrical environment in terms of dispersion and reflection, the result being some uneven behavior in the mid-treble. How did you solve problems like this?

Thiel: Sitting back in the throat of the midrange or woofer cone is not a good environment for a tweeter—its energy is altered and colored quite a bit. So we needed to develop a diaphragm geometry for the midrange driver that did not compromise the response of the tweeter. We made the flare angle of the midrange cone much shallower than is normally the case. The tweeter is not mounted in the throat of a typical, rather deep cone, but is in the center of a very-shallow-flare diaphragm. The problem then is that a cone with that shallow a geometry does not retain adequate strength and therefore exhibits undesirable high-frequency resonant behavior. The fundamental breakup of this diaphragm, even though it's rather small, is at about 2kHz.

What we ended up using is a sandwich construction: we have a front aluminum diaphragm with the best shape for the tweeter's energy to see, and then an aluminum rear cone with a normal conical shape, which is usefully stiff. And they're connected with an intermediate cast layer of expanded styrene foam. This allows the composite unit to have equal or greater strength than a normal diaphragm but still present an optimal shape to the tweeter.

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Atkinson: However, you've more than doubled the moving mass.

Thiel: Yes, the sensitivity of the unit would, everything else being equal, be quite low. We've had to compensate for that by utilizing two very large magnets to achieve the sensitivity we need. For obvious reasons, the cost is high—the diaphragm is expensive, and the large magnet system is quite expensive. But you end up with very good results. The styrofoam both damps the resonances [that metal cones can have] and adds a lot of stiffness to the composite system so that the resonances are moved well above the main operating range of the driver.

Atkinson: So even though you're using first-order crossovers with their low rejection of out-of-band artifacts, at least near crossover, your metal cones are well behaved for a couple of octaves out of band.

Thiel: It's very important that the diaphragm response is well controlled to a much higher frequency than the crossover frequency.

Atkinson: The woofer in the CS6 uses a metal cone—is that stiffened in any way?

Thiel: No, it's not really needed. First, there's no necessity of making the cone flare shallower than that required for optimum strength. And second of all, even without any additional treatment, the internal resonance of that cone is approximately three octaves above the crossover frequency of the driver. So we can achieve essentially perfect results from the CS6 woofer with more-or-less conventional technology.

Atkinson: Will the coaxial mid/HF drive-unit appear in other Thiel designs?

Thiel: We are developing a CS7.2, which will replace the CS7. The '7.2 incorporates some things we've learned from and developed for the CS6. The drivers have all been redesigned from scratch, and we will be making them in-house. The '7.2 uses the same tweeter moving system that we developed for the CS6. All CS7s, by the way, will be retro-upgradeable to the '7.2 by replacing the drivers and replacing the crossover network. But there are no changes in the cabinet or the baffle, and the upgrade can be done by shipping the speakers back to the factory. The CS7.2, however, will be considerably more expensive than the CS7.

Atkinson: What goals regarding both loudspeaker and drive-unit design have you still to achieve?

Thiel: One thing that would be ideal is for all the drivers in the three- or four-way system to be coincident. So you would have not only a coaxial unit, you would have a tri-axial unit, or four drivers that are mounted coaxially. That would be an improvement, if you could pull off such a thing. There are always improvements to make, with better diaphragm materials, lower-distortion, higher-quality components, better cabinet construction methods. We just have to see what new ideas we come up with in the future.

Atkinson: Something that you obviously take very seriously is measurements. What measurements do you consider relate best to the perceived sound quality of a speaker?

Thiel: I believe if you have experience, you can relate most of the measurements that are taken to one or another aspect of the listening experience. Most obviously, the frequency response relates to the overall spectral balance of the loudspeaker. It also relates, if you know how to interpret it, to colorations that the speaker may have due to various resonances. Frequency response is the most useful tool. But many other measurements relate very well to different aspects of speaker performance. For example, cumulative decay spectra relate very well as a tool for objectifying the audible resonant behavior of speakers. The dispersion characteristics of a product will relate to the imaging performance of the product. Distortion measurements relate to how clean the product sounds.

But on the other hand, there are some sonic aspects of a product that we don't really have very good measurements to interpret. Particularly the ability of a speaker to resolve low-level detail. There are some measurements that relate to it . . . the cumulative decay spectra will relate to some degree because, if a speaker has resonances, they will tend to mask subtle musical details.

Atkinson: A criticism of high-end audio that's sometimes made is that using listening as an evaluation tool cannot be taken seriously because it can't be calibrated, it can't be consistent. Yet all successful high-end audio manufacturers, in my experience, do careful, consistent listening. How do you carry out your critical listening? Say a supplier comes along with a new component that you are interested in trying, and there would be a significant cost saving that you can pass on to your customer by using it. How do you assess whether using it would be good for you or not?

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Thiel: I view the ear as a measurement tool. And you can use it to evaluate the differences between the sound of loudspeaker designs just as usefully as you can use a computer to evaluate objective differences. Take the different materials that can be used for woofer chassis, for example. We use cast aluminum chassis in all of our woofers. I know of no measurement that can tell you that this driver basket will sound better than that one. But in fact, it's very easily audible. Cast aluminum sounds much better than stamped steel. Now maybe it's because aluminum's nonmagnetic and there's less interaction with the magnet system; maybe it's because its resonant behavior is different. It doesn't really matter to me necessarily what the reasons are. The only thing I have to do is to determine for myself if the performance is better and make a decision, based on performance and cost, whether I want to incorporate it into my design.

I have an advantage over users of loudspeakers, or even reviewers of loudspeakers, because I've been able to build up a lot of experience that can correlate measurements with listening. I can make a change to the crossover circuitry and measure the effect that has on performance, then go and listen to what effect it has on the subjective performance. And I've done that tens of thousands of times over the years. You can build up quite an understanding of the correlations between measurements and subjective impressions.

Atkinson: How does it make you feel when you have to deal with issues for which you don't have any engineering tools?

Thiel: I enjoy it. If I could do all of the engineering work with computers and calculations, I would not find it as enjoyable. I like that there's also an intuitive aspect, where you have to incorporate the knowledge that you've gained from experience in addition to what you objectively know. Just because you're doing a subjective evaluation does not mean it's incorrect or different for each person.

My task as a loudspeaker engineer/designer is not to prove to skeptics that these things matter. I don't care if they believe it or not. And I'm not restricted to only using tools that I can prove to them are correct. I only have to prove to myself that these differences are important.

Atkinson: And your chief financial officer.

Thiel: And my customers! [*laughs*]

Atkinson: What are your priorities in sound quality? Are you trying to get high sensitivity above everything else? Or do you start by trying to get the best stereo imaging? Or are you going for tonal neutrality? Which is most important?

Thiel: I like to think that there's not one that's most important, that there are four broad performance areas that are all important: the tonal fidelity, the spatial fidelity, the transient fidelity, and the dynamic fidelity. There are examples on the market of speakers that are very good in one or two of these areas but poor in other areas, and I don't think that any of those products are truly good products for most people. If a product has a serious limitation in even one of those areas, it makes it very difficult for most people to truly enjoy the musical performance of the product, I feel.

I'd rather have a product that was merely "good" in all respects than one that was great in one respect and poor in another respect. (Of course, I'd prefer to have a product that's great in every respect.) For example, I'm not willing to forgive tonal-response errors in a product just because it images very, very well. Imaging in itself is not a sufficient reason to like a product. And the same would be true of every other performance aspect. I think a speaker needs to be very good in all respects, or at least equally good in all respects.

Atkinson: One thing you find with loudspeakers that are overdeveloped in one area but lacking in others is that they start to drastically restrict the types of music that their owner plays.

Thiel: Our goal is the opposite—we want to open the customer up to more musical enjoyment of more types of music.

Atkinson: But as a designer, you don't have an unlimited budget for any of your models, even the most expensive. How do you compromise what you are trying to achieve with the CS6 in order to get a much-more-affordable speaker like the little CS.5?

Thiel: The first thing we'll sacrifice is quantity rather than quality. The first thing I trade off is how loudly will the speaker play, and how big of a room is it intended to play in. The next thing I will trade off is bass extension. I'll be willing to trade off a half-octave, or an octave, or one and a half octaves of deep bass. And at this point, I don't feel that I have yet sacrificed anything in terms of the sound quality. You can go quite far in reducing costs by trading off quantity.

Atkinson: Presumably because there's not a linear relation between bass extension and cost. It's probably more like a square law. Halve the low-frequency extension and you reduce the cost by a factor of four.

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Thiel: Not only have you reduced costs because of the reduction in cabinet and woofer size, you very likely have been able to decrease the speaker from a three-way to a two-way, or a four-way to a three-way, because of the reduced requirements in moving air that you need for deep-bass reproduction. And the fewer number of drivers and the consequent reduction in the complexity of the crossover network all contribute to greatly reducing the costs. Beyond that point, I'm willing to make a product for a lower price that doesn't achieve quite the degree of sonic qualities that the more expensive products do. But I think you can usually achieve 90% of the performance for 50% of the cost.

Still, at some point we're not willing to make a product that doesn't provide a level of sonic performance that we consider very good. This is the reason that we do not make products under the Thiel name that sell for $500 per pair. We have no plans ever to produce a product in that price range. Not because products in that price range are necessarily not worth having, but because it's not the type of quality of performance that we're interested in producing.

Atkinson: With the SCS2, you're now producing a speaker that is intended for use in home-theater systems. Are there different requirements for a speaker that will be used mainly to reproduce movie soundtracks?

Thiel: There are differences. Number one, it has to be magnetically shielded so that it can be used near a television without distorting the picture. Also, the physical proportions have to be such that the speaker is suitable for mounting on its side for center-channel applications. Also, we have to pay a little more attention to ensure that the speaker is capable of playing at the output levels that some people demand when they're listening to movies. But other than those factors, which are pretty much external to the sonic performance, we did not treat the project any differently than we would have had we been designing a music-only product.

Atkinson: One of the things that worries me about retailers selling home theater is they might tell a customer who has a really good pair of music loudspeakers that they have to replace them with five "home-theater" speakers. Whereas it seems to me a much more sensible strategy to take the existing high-quality stereo speakers and build a home-theater system around them.

Thiel: Absolutely. A speaker is a speaker. A speaker reproduces its input signal. And if it's a great speaker, it'll reproduce its input signal very accurately. It does not care if the input signal comes from a music CD or a laserdisc. Now it may be true that some of the subtler points of imaging are not as important when you're reproducing a movie as they are in reproducing music. But that doesn't mean that the speaker cannot work very, very well.

Music speakers and home-theater speakers should not be thought of as being different types of products any more than the old argument that there were "rock" loudspeakers and "classical" loudspeakers. What they used to mean was that a good rock speaker was a speaker that had good dynamics and maybe good bass. And people didn't really care if its tonal response was accurate or if its imaging characteristics were good. Whereas in reproducing classical music, the imaging and tonal characteristics are much more important and maybe the dynamic characteristics are not as important. But a good speaker that has good tonal characteristics and good dynamic characteristics will reproduce both types of music very well. The same thing is true of this music versus home-theater situation. If you have a speaker that's truly good in all respects, it'll reproduce any input signal very well and work in any application very well.

Atkinson: Thiel is an American company manufacturing in the United States, increasing your vertical integration to the point where you build everything in-house, including your cabinets, your drive-units, and your complete systems. Yet the conventional wisdom would be that that's not feasible. How do you swim against the stream of popular opinion? How do you make your products in America and stay competitive in price and performance?

Thiel: The answer's complicated. One thing we always do is take a very long-term approach to the decisions we make. We do not necessarily expect any investments that we make to pay off in the short term. So we're willing to invest in machinery, equipment, methods, and training that will achieve economies in the long run, even though they may not be particularly cheap in the short run. Also, the focus of our company has always involved a very high value placed on the cost/performance of our product in the marketplace.

You mentioned in passing that we manufacture our own cabinets. Well, this is a good example, because it would certainly have been easier for us to set up a manufacturing operation that did not include cabinet manufacturing. But in investigating it in our early years, we discovered that if we were to out-source the cabinets, the cost would be much higher in the long run. There was a lot of investment required, but the end

result is that, in the long run, provided that our quantities are fairly high, we can achieve much lower costs than we could by out-sourcing cabinets. That would not be true if we made very standard, common, square, small vinyl-wrapped boxes. We could undoubtedly buy them much cheaper than we can make them ourselves. But considering the fact that our cabinets are quite complicated and unusual, we can make them much cheaper than anyone else can make them.

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Atkinson: There seems to be a lack of recognition outside of our small audiophile world that very good hi-fi equipment is made here in the United States.

Thiel: I think American culture does not do a very good job of appreciating quality. This is one of the advantages high-end audio companies have in the Asian market, where quality has a lot stronger place in the cultural wisdom. In the mainstream American culture, things are treated more as commodities, and our culture is more price-oriented. It's very noticeable that in Eastern cultures, more people have an appreciation of differences of quality rather than quantity.

Atkinson: Perhaps because quality is a rare thing in the East. I remember being shocked, the first time I went to Japan, to see cities where, to the people there, it must be like living on the set of *Blade Runner*. Yet in the midst of the industrial mayhem and overcrowding, you'll find a tiny but perfect rock garden. As the quality is rarer, it is appreciated more.

Thiel: That may be so. In this country, by comparison, there is a general assumption that a car is a car, a screwdriver is a screwdriver, and so on.

Atkinson: In a seminar I recently attended, the management guru Tom Peters said that the one thing every American industry has to resist is the commoditization of its product—that if you *remove* quality, then all you have left to compete on is price. Then the game is over. Do you think there will always be a place for a company like Thiel, which tries to engineer quality into every one of its products, in a world where the concept of quality seems increasingly less valued?

Thiel: In the US, most audio has always been a commodity. It's bought only on the basis of features and price, without any awareness even that there's a huge range of difference in the intrinsic quality that cannot be easily identified. But on the other hand, there is certainly an adequate market for higher-quality products. [*laughs*] It's easy to think that the world as a whole values quality less and less. But I don't know if that's really the case, or if it's just that we're becoming more and more aware of the segments of the market that do not particularly value quality.

I feel that it's always been true that only a relatively small part of any market values very high quality and is willing to pay for it. And that is the segment of the market that we design products for. We're well aware of the fact that a very high percentage of the music market or the sound reproduction market will not be interested in a product from our company. That's not a problem in itself. We're just making products for the segment of the market that is interested in very high quality. I don't know if that segment of the market is decreasing in terms of a percentage. I almost feel it might be the opposite—that over the last 20 years we've been in business, there's actually more awareness among the general population that quality levels, differences in quality levels, do exist, and that high-quality segments of markets do exist. It's certainly well known in many other fields—automobiles, whatever—that there are very-high-quality segments of the market. So I don't feel that the segment of the market that's attuned to very high quality is diminishing in terms of its percentage of the total market.

Kathy Gornik: My experience has been that if consumers who would otherwise not be aware become aware of what the high-end audio industry produces, high-quality music almost always becomes a priority in their lives. What I find sad is that there are people who I think would really enjoy the experience of high-quality sound in their lives, and would be willing to spend the money and have the money, but they do not even know that it exists. And I don't know the answer to that. Our goal has always been to try to find the best retailers who can create the best sound. Because we know that Thiel is not a household word and they're not going to come in asking for it, we have to blow their socks off.

Atkinson: Thiel is probably more of a household word in Taiwan!

Gornik: Yes. Our interface with the consumer is through the retailer. And that is a real bottleneck. It's like an hourglass—at the top you have all of these great American companies manufacturing terrific products, and at the bottom you have all of these consumers . . . We're the richest nation in the world, they have the means, and if they could be exposed, they would buy. And then the bottleneck in the middle is the distribution channel that we use to access those customers.

Atkinson: And that's because that distribution channel has limited resources?

Gornik: It has limited resources, and there aren't that many of them. We're all vying for a handful of qualifying retail outlets. I'm very pleased with the fact that Thiel has a very big number of those qualified retailers, but I sense that our company could easily be twice, three, four times as big as it is without compromising anything in terms of our quality. Yet we don't have any different way to access the consumer.

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Atkinson: The contrast is between the public perception of audio manufacturing, which is of large offshore companies producing commodities, and the reality, which is that America is a hotbed of relatively small, high-technology companies, like Thiel, making products with a huge amount of quality designed in. How does that perception get out to the wider America?

Thiel: That's a question I think no one has been able to answer, because our industries are not large enough to afford large advertising budgets. And also because the price ranges of the products are such that they are not really within the grasp of most people.

Gornik: Right. But we are more and more aware of the mass market because the mass market is becoming more interested in sound reproduction via new and different mediums. We're all going, "Gee, the world just seems to have gone to a new low level of mediocrity," but in fact I think that the opposite is true—that more people are getting into audio, and that a certain percentage of them will want to improve the quality once they've been exposed to it. I feel very optimistic. I think the opportunities are terrific for companies like ours.

Atkinson: Where is Thiel going to be in 10 years?

Thiel: I hope we will be continuing to advance the quality of music reproduction. I hope we will be producing speakers that sound so good that we will look back on the products that we're producing today and say, "Boy, that *really* doesn't sound very good." [*laughs*]

Atkinson: Will people still be listening to music in 10 years' time? Or will music just be a minor part of their integrated computer/web-crawler/HDTV/multimedia/home-entertainment experience?

Thiel: I believe they will. People have been listening to music for many thousands of years, and music is a very important part of a lot of people's lives—young people, old people. I certainly do believe that people will be listening to music in 10 years. And in 100 years. In 10,000 years!

Gornik: There is no way that music is going to go away. We currently live in a society where we are inundated with stimuli. We're like kids in a candy shop—we have to be aware of it, to own it, to interact with it, to have the latest and the greatest. This a very shallow and very broad kind of experience and does not address our humanity. And music clearly does. So once we tire of the current stimuli, I think that there will definitely be a renewed energy toward experiencing music because it addresses our spirits, it addresses our souls!