DAAD

THE REAL STORY

BY **ITALO ADAMI**

Back in March 2001, Fabio Liberatore – my friend and associate - and I were in Hong Kong to promote DAADs. Resulting from their lucky use in some rooms at CES in Las Vegas, a few of them had started to flow from Italy towards the ex English colony ……

Robert Ma, our distributor, had convened some journalists for the occasion. They're very formal there: you get into the room and sit in front of them who, composed and painstaking, have been waiting for you for a while. You introduce yourself in a dead silence. Then come the questions and you feel like the Minister of Foreign Affairs or the national football team coach and, if wasn't for your halting English, you'd tend to give yourself airs a bit. It'd be boring and useless to fill you in on everything that was said. You can easily imagine both their questions and our answers. I'd like to draw your attention on one point only: at a moment one of them stands up and puts the question you don't expect, the one out of the line. Because of course you don't expect someone to take the trouble to disassemble a DAAD to come well prepared to a defilated lecture organised by an importer of particular products for a minor market like hi-fi. I would have been stupid not to foresee it had it been a new kind of virus-proof computer, or a revolutionary automatic machine for ironing shirts flawlessly, considering that China is really close to such things. But we were talking about a device for home – listening improvement, for God's sake!! Innovative and interesting as it may be, it's still a very marginal thing, also considering that flats in Hong Kong, though costing as much as a whole building in Milan, are often smaller than the Mercedes, BMW and Ferrari placed in their garage.
His preamble: "*Excuse me Mr Adamo (?), DAADs are beautiful and maybe work well…*" – he was pretending: I sensed that he hadn't tried them – then he adds: "*There's little sound absorbent material inside ...*" - here's why he hadn't tried them. He had disassembled them before! - and finally he asks: "*why*?". You see, our

DAADs had a lot of fortune abroad until then. Never a criticism. If you get unexpected and enthusiast compliments from Audioquest, Classè Audio, Avalon, Roland and many other authoritative ones, how on earth can you expect that in Hong Kong, where there are tons of money but it's not even Silicon Valley, a grey journalist stands up and points his finger at you? As I was being providentially served a drink, I tried to organise my ideas to find an answer. To me, acoustics is a topic often dealt with in too professorial a way. Formulas, laws, narrow, old and heavy rules, no fun, short creativity, little sound practicability. Therefore, I have decided to tell you about DAADs through a little tale. Its subjects are all the positive and negative experiences leading the group of Acustica Applicata to the creation of this new device. Because this is exactly what we'll be dealing with: the fact that DAADs are a new thing not to be mistaken for a mere aesthetical readaptation of Tube Traps, and how DAADs are the result of our experience in the field of acoustics applied to audio reproduction.

Some authoritative personalities flatter us by claiming that they are the best device ever created for domestic environments. True? And, if so, why? I'll try to answer by telling, not explaining, trying not to be pedantic and scholastic. Hopefully I'll manage. Hong Kong journalist's question requires a more articulate answer than it may seem at first sight. Of course, I could get away with it by using only two simple explanations. But here I want to tell the whole truth and need more time. My interest in acoustics begins right after that in hi-fi, at the end of the '70s. Out of natural vocation? No. Pure necessity! My hi-fi system components were not so good and I didn't have enough money to buy better ones and, in order to improve my sound quality, I had to take other paths. There's more. Throughout a year and a half, I had to move out for three times. Hence, I realised the great difference in sound after the removal of my hi-fi system from one room to the other. And I found out my alternative way: asking myself questions and finding solutions in the acoustics field. But there was little to be studied, not to mention to be experimented, as market offered nothing. **The most fashionable solution was given by egg merchants who, not knowing where to throw out their left-over cardboard egg containers, recommended them to audiophiles for their rough acoustic treatments.** Some people covered their room walls with such containers. I was among these. **Few advantages, many disadvantages.** Speaking inside a room treated with egg containers, the voice was warmer and rounder as these containers took away a part of the high frequencies and diffused a little of the medium ones. This persuaded many about the effectiveness of the result. But stereophonic reproduction has other acoustic necessities and egg containers were soon thrown into the sea. If you absorb just a narrow range of high frequencies, you get of course more warmth, but at the cost of a lack of air, free circulation of sound and the increase in the low frequencies. This can be amazing at first sight. But the point is that if you work only with tonal balance (I underline BALANCE), **if you take the high frequencies away, it's like you raised the low ones.** Tonal balance must be thought of as a swing where two children are playing sitting on each end. In the very middle is the fulcrum, set in our case at 440 Hz. Basses on one side, highs on the other. If you put a weight on one side (for example, the one of highs), the scale will swing downwards on that side (highs go down), but it goes up on the other side (basses go up). The volume knob determines the height of the whole swing from the ground as if its fulcrum was telescopic, but it doesn't affect the board swinging (it's not exactly this way, but allow me to simplify..) unless the volume is so low and the board so sloping as to touch ground on one side and stop swinging. Then the swing is not itself any more and the system goes haywire. The human ear tolerates tonal balance pretty well, but when the swing touches ground the ear can't stand such a sound mess. An incautious use of egg containers, sound absorbent material or curtaining can trigger it. A more scientific intervention strategy is needed.

At the beginning of the '80s, some American researchers proposed the "Le. De." technique, which consisted in dividing the room into two parts, making one reverberating and the other one absorbing, and placing the speakers in the absorbent part. I tried to use sound absorbent materials set in the environment by Le.De. technique for many years. The outcome was not really satisfactory in the end. Yes, compared with the indiscriminate utilisation of sound absorbent surfaces, I had made some steps forward, but still I wasn't able to handle and control the low frequencies and soundstage.

We're in the mid '80s. Audio world is a prey to a long wave of euphoria. More accurate gears have appeared on the market. The pages of some specialised magazines bring a culture of a more mature listening with the real music as reference. The concept of stereophony is regaining its peculiarities, namely the fact that a correct stereophonic listening must also render the spatial characteristics of music and not only a sound louder than that of a TV or a wireless (as it had come about during the previous decade through Japanese hi-fi mass diffusion). In other words, **to listen well, one must search for a sound that is spatially organised, logic in proportions and temporally correct, so that it has dynamics, microcontrast and an acceptable tonal balance**. If soundstage is the mirror of the spatial rendering of a stereophonic system, the main problems about the temporal aspect are the resonances and the "acoustic slime" they caused.

Any room tends to "keep in memory" some frequencies to others detriment right after the sound comes out of the speakers. So, what happens is that the natural environmental "reinforcement" – which every home reproduction system needs – cannot be linear. Some frequencies are stressed. Subsequently, energy is stolen from other frequencies (because it is neither created nor destroyed, but transformed). The selection among the louder frequencies and the diminished ones is partly determined by the room size and its internal relations. Therefore, every room supports some frequencies, makes them play louder and keeps them alive in the environment for a time that is often so long as to overlap and mix with the next sound coming from the speakers. The famous reverberation time then appears to be not the same throughout the audio spectrum and often not physiological for stereophonic listening. Therefore, our sound perception, which results from the sound coming directly from the speakers and the sound reflected by the room, gets heavily affected by the unbalanced and "biased" behaviour of our room towards frequencies and their reverberation times. Acoustic slime, that turbid background noise preventing music from flowing out of silence, that feeling of swollen, dirty, confused, heavy and slow sound which leads music astray, diluting its emotional impact, has as only responsible one the room and its behaviour, which is not very accurate towards stereophony needs and scarcely "democratic" to the frequencies control. Le. De. system and the sound absorbent products of the first half of the '80s didn't solve the problem.

But the second half of that decade saw the introduction on the market of **two important products: the diffusion baffles, designed according to the principle, borrowed from optics, of the phase grating, commercially known as RPGs, and the Tube Traps by Acoustic Sciences Corporation (ASC).** The formers diffract: they're devices that, collided with a wave, redistribute it into space to every direction and postpone it. These lags are obtained through channelling whose spacing in width and depth is based on a sequence of quadratic remainders. Hence, a room treated with RPGs should be able to offer a more linear and "democratic" control of frequencies, both as energy and as temporal delay, thus assuring a sensation of more spatiality. I must confess that this theory has always fascinated me. With stereophony (but with multichannel systems as well) here's what happens to the listener:

1. To begin with, they get the sound coming directly from the speakers. This is good.
2. Then, right after, almost at the same time, they get the early reflections, that is to say those which fall within the so – called "period of sound fusion". This is bad.

The primary reflections have a lot of energy and add up to the direct sound without leaving any chance of differentiation to the listener's brain. Stereophony is based on the fact that when the listener's brain receives two sounds coming from two or more sources (the speakers) within a range of time below 20 milliseconds, he/she cannot sense them as two different sounds, but as one sound only. If they have an equal energetic content, the listener will perceive only one sound coming from exactly between his/her two loudspeakers. If one is louder than the other, the listener will hear just one sound moved to the louder one side and so on. The energy and the source of the two single sound signals coming during the time fusion period determine the displacement in space of the virtual figures inside the soundstage. Through this trick, which exploits a characteristic of our perception, stereophony attempts to reconstruct the recorded event. The early reflections, the cancer of stereophony, interfere with the stereophonic balance of the reproduction system by behaving as extra speakers featuring a very bad quality and a sound that is delayed and a bit different from the real one. Their problem is that not only do they ruin the spatial aspects of stereophony, but also the temporal ones, because, as a matter of fact, when the sound has come to the listener's brain it's an all – the – same sound and there cannot be an awful imaging if there are marvellous dynamics, an outstanding microcontrast and a perfect tonal balance and vice versa. Soundstage and focusing are the spatial face of the sound temporal aspects.

3. After the early reflections come the delayed ones, which give the right reinforcement to the direct sound and a positive dose of room ambience and "freedom". This is good.
4. Finally, but only in very big environments, come the very delayed reflections, that is echo. This is not so good, but statistically not very meaningful. Furthermore, if an environment is so big as to echo, it won't have any early reflections, because the distance the sound has to run starting from the speakers to bounce onto a wall and arrive at the listener will be so long as not to allow the reflected sound to pile up a delay over 20 milliseconds (tracts over 9 metres) and won't be able to blend with the direct sound.

The sound events following the direct sound enable us to establish the difference (in terms of stereophony problems) between a "small" and a "big" environment. In the former, the reflections of type 2 are predominant and there is none of type 4. In the latter, there are no reflections of type 2; type 4 ones outnumber type 3 ones. I believe that the ideal environment for stereophony listening is the one where reflections of type 3 prevail. Here's RPGs fascination: the possibility of turning reflections of type 2 into reflections of type 3. During my journey in the field of acoustics applied to stereophony, very rarely have I come across environments of type 4. Often I had to deal with those of type 2. Unfortunately, I have noticed that quadratic remainder baffles can't turn a type 2 environment into a type 3 one. On the other hand, I experienced some good results in environments of type 3 already (typically, average size recording studios). Statistically, most of the domestic environments with a stereophonic or multi-channel system are type 2 tending to 3. In this kind of rooms, quadratic remainder baffles have no influence on the low frequency problems and yield limited results when they attempt to convert the strong energy of the first very early reflections into diffused and much more delayed energy. To sum it up, RPGs turned out to be very interesting as a principle, but they work convincingly as they're supposed to do only in big environments.

Tube Traps represent the first example of "intelligent passive acoustic trap" able to face the low frequencies problem. Why intelligent? Every environment has its own resonances. The resonance is the attempt of the room to preserve energy by organising it in some frequency areas to others detriment and it shows itself as an increase in sound pressure at some frequencies and in some spots of the room. The room corners are that place where all the resounding frequencies have their greater pressure. In the mid point of a wall is the greater pressure of the resonances of even order (2^{nd}, 4^{th}, etc), but not of the odd ones which manifest themselves with more intensity in other spots and so on. When we seek for the best position for speakers and listening area by moving them across the room, we are actually searching for the most balanced excitation and perception among the various resonances in relation to the direct and reflected sound.

In order to understand the reason why Tube Traps are intelligent, we must not forget that inside a room there are frequencies that don't resound at all.

In fact, they don't show any extra acoustic pressure on the nodal points of the room.

Tube Traps are cylindrical traps made up of an external part made with a material offering resistance to sound and an internal part which is full of … air. This one is sealed. It can communicate with the outside only through the resistance surface. If you have been able to follow me so far, you'll very soon understand how a broad trap works. Tube Traps, an acoustic device that, despite its presence in Italy for 15 years by now and their success all over the world, has not been comprehended yet.

Tube Traps work by acoustic pressure difference.

When the sound wave comes, the pressure outside the trap is higher than the pressure of the air inside. The attempt of nature to balance inside and outside pressure makes the resistance material work hard. The same quantity and type of material placed in free air conditions would work much less and at a much higher frequency, but, as part of an acoustic trap, it turns into a super-material able to absorb more energy and at a lower frequency (as the BBC technicians had probably already guessed in the '50s). The new changes were: the utilization and the cylindrical shape, allowing a comfortable placement in the corners and the possibility to have a hemi-surface diffusing the frequencies over 400 Hz inside the trap. The use: if in the corners is the higher acoustic pressure for all the resounding frequencies, they are obviously the most appropriate place for a trap that works by using the outside sound pressure. It also stands to reason that, placed in a corner, an acoustic trap of this kind works only on the resounding frequencies fitting that room itself and not for the non – resounding ones. In theory, Tube Traps are therefore a device that tends to equalize the reverberated sound energy by selectively absorbing where there is excess. What I've just said stresses the difference between a resounding device and a broad-band trap: the latter works only on the resounding frequencies present in a given room that are higher than its cut frequency at low frequency, by selecting them out of the non - resounding ones; the former works only on the narrow range of frequencies it was designed for. If the starting acoustic situation is unknown or hasn't been examined accurately, if the resounding device calculation or manual execution are slightly wrong, if it is misplaced across the room, not only does it not work, but it can be noxious!

Adjustable sound diffusion: **Tube Traps are the first acoustic trap able to offer some flexibility to the user, so that they can tune up their room acoustics to their own listening needs.** This is achievable thanks to a surface reflecting the frequencies over 400 Hz, wrapping half cylinder. This way, by rotating the acoustic trap on itself, it is possible to increase or decrease the energy diffused in the environment. We're in the second half of the '80s. Cd is getting a footing, vinyl still rules, my audio equipment is evolving; I'm working at Sound and Music, Tube Traps have convinced us. We're about to begin their production for the European market after coming to an agreement with the manufacturers in the U.S.A.. Earlier as Sound and Music and then later as Acustica Applicata, we have been producing Tube Traps so far and we're still able to supply them. We have learned everything about Tube Traps, firstly by taking lessons from those who were better than us, secondly by becoming experts ourselves. Many things have happened during these years. I'll just tell you about it very briefly. Digital devices have prevailed over analogue ones. Hi-fi components (especially CD players and loudspeakers) have gotten better. Listening tastes have changed. You'll be wondering what all this has got to do with acoustics. Frankly, some time ago I would have wondered about it, too, because I was convinced that acoustics was something independent from what I mentioned above. But, today, I think there is a close relation among the sound components.

The quality of stereophony or multi-channel listening depends on these factors:

A. The recording quality
B. The quality of the reproduction system from the source to the speakers
C. The quality of acoustics in the room where that sound is reproduced
D. The user's ability to know how to get the best out of their reproduction system and to be able to match them with the acoustic peculiarities of the room available.

From 1987 to 1993, Tube Traps achieved widespread commercial success and met with the favour of the critics. Then, things started to get complicated. The kind of sound resulting from the acoustic adjustment done with Tube Traps began to have some detractors. The most frequent criticism was that, for some people, **with Tube Traps the sound became precise and controlled, but closed (scarcely airy) and not very exciting.**

We would answered that it depended on the peculiarities of some recordings and some reproduction systems, not on the acoustic treatment, because it doesn't affect the direct sound. Were we right or wrong? Both. Why hadn't we been criticised earlier?

Because there was the vinyl! Not the rare today's very costly analogue sound, reproduced by superlative turntables and by thick and heavy LPs that don't have any mechanical imperfection, even if you search for it through the electron microscope. There used to be the LPs, turntables, needles and arms of those years (substantially much less accurate than those come up in the '90s), with their euphonic, rich and roundish sound. This kind of system excited the environment more on the low frequencies side (not only because LPs had a lot of them, but also because turntables and arms not perfectly set up swell the sound), while there was less need to control the high frequencies. In this context, Tube Traps were very good. But then came the first CDs, with their dry sound, aggressive high frequencies and with low frequencies less deep and cleaner. Therefore, the average audiophile's acoustic needs changed: less necessity to control the low frequencies (because the room was excited less intensively) and more need to get a more enjoyable and round sound at the high frequencies. Tube Traps work very well when it comes to absorbing the low frequencies but, with the first CDs generation, the needs in this frequency range became more narrow. At very high frequencies, the presence of the cloth wrapping the Tube Traps produces a constant absorption. A massive and casual utilization of Tube Traps can cause an excessive abatement of the energy at very high frequency, thus "hardening" the medium- high frequency range where the first CDs (hardware and software) had problems on their own. This, possibly, explains the success of valve amplifiers after the coming of the digital era. The spreading of this kind of devices, often equipped with little power, results in further problems for Tube Traps.

It’s because they take away the sound in excess and induce you to turn up the volume. With low-power valve devices, turning the volume up to a certain limit means facing a certain and audible distortion. Having to choose between the distortion produced by electronics and that induced by the acoustics of their listening room, many chose to keep the latter. Wrongly, to me! Because, aiming at an utopistic sound perfection, it’s not ideologically acceptable that a defect can correct another one. Apart from the problems with aesthetical aspects, the change of the recorded supports and the reproduction machines had wrong-footed Tube Traps. **Ever since the digital sound was introduced on the market, almost unwillingly, all the audio movement has been searching for the analogue sound.** Thus, amplifiers, even the solid-state ones, have had to sound more smoothly, the speakers have had to deliver rounder high frequencies and so on. Everything that could mitigate the main defects of the first-generation digital sound was good, even when it managed to do it by introducing other sonic problems (I don’t want to give any examples for love of my country). Unfortunately for them, Tube Traps offer a “digital” sound. They don’t round it. I’ll try to clear this up by an example not to be taken literally. Music is a group of transients, that is impulsive sounds. Let’s take a room well treated with Tube Traps and play a CD with percussion instruments. Let’s extrapolate only one drumstick stroke on the drums. It will be a sensation of an impulsive sound: silence, sound, silence. With a vinyl LP, it wouldn’t have been exactly like this: firstly, an LP sound is never totally silent, the opening transient could also be sudden, but the impulse descent, because of mechanical reasons, would have a less accentuated slope and, again, the next silence wouldn’t be absolute. The analogue transient has an “aura” that makes it more acceptable, for it gives a feeling of relaxation to the sound.

But, when the analogue aura is excessive by taking away dynamics and concealing micorocontrast, Tube Traps work of cleaning and equalization is successful. But, with CDs, Tube Traps enhance the tendency of the digital transient to be lacking in aura. Hence, the sensation of excessively dry and bound sound.

What does this “digital” behaviour of Tube Traps depend on? Why do Tube Traps sometimes behave as a sort of sound “black hole”? I’ll tell you very soon, speaking about…. my mother-in-law’s vegetable soup and DAADs. What you’ve been reading about Tube Traps is not the result of one-day reflections, (and, anyway, they are not generalizable to all situations). It has taken a process of accurate reflection and slow research through some years during which we also involved the creator of Tube Traps, who has never been willing to change his 1985 design. None of us wants to ignore the value and the importance - historical, too - of Tube Traps, even because I still think that rooms equipped with ASC cylindrical traps have, in general, better acoustics that those not treated.

On the other hand, I believe it has been right to spot their current limits. I also think it’s been opportune, at some point of our analysis, wondering why some rooms without acoustic treatment sounded, not without defects but, surely pleasant! It’s because you can sufficiently well control the tonal balance of the low and the lower-medium frequencies through a skilful set-up of the listening point and the speakers and you can have a good reverberated field if the room allows principally type 3 reflections to come to the listener’s ears. As I was saying before, they’re not perfect rooms and their sound is not firm and precise, but these environments are easy to handle with few acoustic interventions to obtain a sound which is truthful, dynamic, free and clear, without acoustic slime. These rooms are pretty big and therefore type 3 reflections prevail, but I’m not by any means stating that there are rooms able to offer excellent acoustics thanks to predetermined favourable dimensional ratios, or because they don’t have any parallel walls or because they’re asymmetrical. Believing exactly the contrary, some friends of mine (a Dutch and an American) have staked everything on them and have built listening environments with all the walls not parallel (ceiling included). Well, even in this situation, they had to face the existence of stationary waves, acoustic slime and the fact that the resounding frequencies and early reflections keep on being there anyway. **Even such “extreme” listening environments, to excel, had to be acoustically treated.** Some other acquaintances of mine, fanatical defenders of asymmetrical rooms, have had to fight against an unsteady and without substance soundstage, along with all the other problems with listening to the music reproduced in an enclosed environment: resonances and early reflection. Not even the rooms with an irregular plan represent the "definitive" acoustic solution. **Despite our technological modernity, today we still live in a sort of Middle Ages of acoustics applied to the field of audio reproduction, where we have plenty of magic potions, spells, sorceresses, clairvoyants and legends.** In this context, if we don't want to go wrong, we can only have two certainties: in stereophony, a geometrically regular environment (both as position of the speakers towards the environment and as geometry of the part of the room where the speakers are placed up to the listening point) is by far more reliable than an irregular one; and, I repeat, the rooms with mainly type 3 reflections are the most acoustically comfortable and mild regardless of the ratios among the rooms dimensions. I can sense the question coming: *"and what if I don't have a room with type 3 reflections mainly? Shall I shut up shop?"* Easy, one thing at a time. About 1995, we began to work on a new type of acoustic device. We had spotted the cloth covering Tube Traps something we had to work on. We needed a trap with a more linear behaviour, that is something that was as effective in the low frequencies as Tube Traps were, but much more diffusing at the high frequencies. After some researching and testing we came to the conclusion that the micro-fretworked pressed net was just what we needed. This kind of material lets air come to contact with the resistance material and makes a big amount of high frequency sound reverberate. OK. But what kind of net? And what was the right ratio between open and closed surface? These questions could sound simplistic and silly. I can feel the stinging blow coming: *" In this world of hi-end hi-fidelity, made of golden connectors and silver cables, ionized tweeters, ceramic woofers, magnetic repulsions and many other wonders, you guys of Acustica Applicata rack your brains over trivial plate more or less perforated"*. The thing is that we very soon realised that the "density" of the net is really influential. To tell you about the roughest thing, if the holes were too thick and narrow, the “s’s” would get excessively hissing. If they were too large, the vowels would darken. But not only the high frequencies were involved. The low ones behaved differently, too. If the net let more air come inside the trap, that air would work by absorbing higher quantities of frequencies over 100 Hz, but it would become less effective below. Using thicker net, the quantity of absorption would diminish drastically, but the trap could work at lower frequencies also. In other words, the kind of net determined the quantity and quality of absorption at low frequencies. In a trap that works by pressure difference this is logical. For example, when the net is thicker, the quantity of air coming to the resistance material is smaller than it is in the pattern of the net with bigger holes. The quantity of resistance material is fixed. Therefore, the air, entering the trap through thicker and more narrow holes, “sees” a greater quantity of sound absorbent material and has a higher pressure. This way, the trap absorbs a smaller quantity of sound because less air “works”, but it activates itself at lower frequencies. On the contrary, if it has bigger holes, the trap receives more air, absorbs a greater quantity of sound but because the pressure is lower, it activates itself at higher frequencies. The micro-fretworked pressed sheet metal was turning out to be a more “powerful” and flexible material. Put in place of the Tube Traps cloth it offered better results. We were not satisfied, though. The sensation of “digital” sound had not disappeared and we wanted a sound with “analogue” transients: we were searching for a device that could improve the reverberation of home environments, making it more adequate for sound reproduction. Basically, we wanted it to turn type 2 reflections into type 3.

This device, at the same time, should guarantee a pretty good control over the resounding frequencies.

The Tube Traps covered with pressed sheet metal offered a good control over the resounding frequencies, an acceptable sound diffusion at high frequencies, but they did not turn type 2 early reflections into type 3 reflections, that is to say they still didn’t let music breathe as we desired. Things were getting complicated.

Then, one day, my mother-in-law made vegetable soup. She was turning a handle with her right hand and inserting the vegetables in the apposite machine with her left hand. After a few moments, the vegetables came out minced, mixed, smooth and spaghetti-shaped. They had lost their original shape, but the substance, except for some remains, was all still there. This is what we needed: something that could receive the sound rapidly, keep it there for a while and give it back mixed, just like the machine for vegetable soup or like the acoustics of a church does to the sound. And, with something like that, we would have a new sound!

Tube Traps make vegetable soup? The resistance material of Tube Traps is glass wool that has excellent properties as sound absorbent. Its thickness is calculated on the basis of the air volume inside the trap. By introducing compressed air inside a Tube Trap (thus creating a practically reversed situation compared to normal utilization), the air comes out of the trap in a meagre quantity. In other words, the air inserted is for the most part converted by the glass wool into heat through a powerful friction. But, if you think it over, this also means that the trap will take longer to return to its original pressure state. Compared to a set of sound transients, a device with a considerable quantity of sound absorbent material is likely to succeed in working out the first pressure difference, but it is not likely to manage to prepare itself in time for the second one and for some of the following ones. Therefore, a slow trap works by intermittence. This bore out our suspicion, that is Tube Traps are "slow" and don't "purée vegetables". To get what we wanted, we had to experiment with other materials and thicknesses that enabled air to penetrate the trap quickly and get out after a given time. These new materials shouldn't cause an excessive friction to the air going through them in order not to slow down the functioning of the whole acoustic device in connection with the music transients following one another temporally. **We wanted a "fast" trap!**

After a lot of research, we found a satisfactory combination of the two materials. At that point, and we're in 1998, we had found two important ingredients: the micro-pressed net for the surface in view and an interesting combination of materials for the resistance layer. These two things, besides being extremely interesting as far as acoustics is concerned, offered future, meaningful practical advantages. The micro-pressed sheet metal looks better and is easier to clean than the cloth of Tube Traps. The new resistance material doesn't dust and, therefore, it's not necessary to wrap it in a protective mantle as occurs for the Tube Traps glass wool. Now, we only had to define our acoustic device final shape.

The lobe shape seemed the most suitable one. For the following reasons:

1. Internal volume being equal, compared with a cylinder, a lobe – shaped device "penetrates" the corner more deeply, thus capturing the resounding frequencies more easily.
2. This shape facilitates the contemporaneous utilization of different materials for the resistance layer of the device.
3. Like the cylinder, unlike the level baffle, a lobe device enables one to have an air inner volume and a thickness able to create "acoustic shade". In other words: very good ratio between space used and outcome.
4. Like the cylinder, unlike a level baffle, a lobe device can be rotated on itself. By having a lobe with diffusion characteristics that are different from the others, this can be used to vary the room acoustics according to the needs or tastes.

With these bases, we gave shape to **DAADs, acronym of Diffusion – Absorption – Acoustic – Device.**

But the luckiest and most interesting discovery was realising how this shape tended to "remix" energy: you send a sound wave to a DAAD and it works it so that not only it comes out delayed, but also homogeneously diffused all around it. We were on the home straight by then. We only had to find the right ratio between the resistance material thickness and the degree of permeability to air of the pressed sheet metal. The listening tests were following the changes we made to our prototypes at a very fast rate. We were focused on some aspects mainly: the quality of the voice reproduction, which had to be open and clear, without halos (to this matter, the vowels rendering held particular importance); the sensation of air, freedom, width of soundstage; the degree of cleaning of the acoustic slime at low frequencies and in the heat zone (100-300 Hz). We thought we had hit our target exclusively when we decided to reduce the thickness of the resistance material, that is when the device was put in condition to work faster. Obviously, the presence of the pressed sheet metal and the trap shape allow us to use sound absorbent material more moderately. It's the combination of these three things (shape, sheet metal, quality and thickness of the resistance material) that enables DAADs to behave both as a fast acoustic trap for the resounding low frequencies and as a diffusing – diffracting device able to turn the energy of the early reflections into more delayed reflections. **DAADs are the first acoustic device actually able to "change" the dimensions of a listening room, transforming it into a bigger one, with features suitable for audio reproduction.**

We have recently witnessed the fortunate digital sound quality improvement: both recordings and CD players are capable of rendering better sound performances. The improvements have aimed at a wider and deeper sound, more dynamics and micro-contrast, tonal balance and a rounder and more accurate sound. Out of a lucky temporal coincidence, thanks to DAADs, even the strategies of acoustic treatment of a domestic environment are able to pursue these results. Since the evolution of the direct and reflected sound run side by side nowadays, considering that the sound at the listening point is their sound sum, it's possible now to obtain a considerable audio quality improvement. To the higher accuracy of the direct sound, the reflected sound, with DAADs, offers the capability of being more open, linear, enjoyable and much less "corrupting". A certain number of DAADs positioned in the strategic spots of the listening room opens the sound space wide, contemporaneously returning a sensation of presence and liveliness to music. The rooms with mainly type 2 reflections are the ones that need a more conspicuous intervention. Those with mainly type 3 reflections need a moderate intervention. In those with prevalence of type 4 reflections, the effect of diffraction – diffusion of DAADs is practically of no use. In this kind of environments, the intervention is exclusively addressed to the treatment of stationary waves and echo. In order to face any acoustic problem with domestic environments, there are three kinds of DAADs: the most voluminous one (DAAD 4) is active from 50 Hz. The medium one (DAAD 3) from 80 Hz. The small one (DAAD 2) from 120 Hz. This last one is very suitable for type 2 environments, that is those that are more needy to turn type 2 reflections into type 3. For the corners, the choice of the kind of DAAD will take into consideration the room own resonances. In bigger environments, the most voluminous DAADs can be used according to needs and listening taste. Acustica Applicata offers a free service for the elaboration of customized plans of treatment you can address to in order to get the best out of DAADs. Furthermore, in the short term, there will be a new edition of the manual *Acustica dell'ambiente d'ascolto. - Il set up del sistema diffusori ambiente* (Acoustics of the listening environment – The set-up of the speakers-environment system) edited by Edizioni Demidoff, which is addressed to those who want to shape their environment acoustics and study in depth the listening parameters (soundstage, tonal balance, dynamics, microcontrast etc.) and what this discussion has been about.

It's still 2001 and we're still in Hong Kong. I'm drinking a seasoned tomato juice soup. Plunged in a noisy silence, the journalist is vigilantly waiting for my answer. Now you can understand my embarrassment: I cannot tell him that there's little sound absorbent material inside DAADs because of my mother – in – law's vegetable soup!

I'll have to make something up. I could answer that there's little of it because it's very singular. It could be *Pentaretico-lato di quartossimoro di cozonio* [Translator's note: the author is making up non-existent terms that sound like chemicals] harvested with deep blue heat. Some people are convinced that whatever is very heavy or very strange is good. Considering his question, he's probably one of these. I decide to go for it. If make it, I'll be even quicker. I am looking up the translation of our fantastic material in the vocabulary.

But I can't find it.

[Translation by LUCA BARSOTTI]