

THÖRESS

Puristic . Audio . Apparatus

=====

"Behind The Curtain"

.....

THÖRESS P.A.A. was founded after I graduated in mathematics (subsidiary subject physics) at the RWTH University of Aachen. My laboratory is located in the centre of Aachen in walking distance to the famous cathedral constituted by Charles the Great in the late seventh century. The fabulous core of the early medieval edifice, known as Carolingian Octagon, attracts tourists from all over the world. Founded by the Romans, Aachen is a city with a very long and turbulent history located close to the spot where nowadays the territories of Germany, Belgium and the Netherlands meet, about 50 miles away from Cologne and Düsseldorf. My hometown is blessed with an opera house, a modestly sized concert hall (both of which offer favorable acoustics) and a division of the Cologne Conservatory of Music. The orchestra and the choir of the Bach Society of Aachen gratify music lovers with passionate performances of J. S. Bach's sacred music in local churches regularly. Whereas the Society of Modern Music of Aachen presents appealing concert events of modern Jazz, avant-garde and experimental music held in a dedicated modestly sized auditorium, again endowed with enjoyable acoustics. Concert events in Düsseldorf and Cologne are within reach also. So the region of Aachen is by all means a favourable area for a music lover to strike root!

MUSIC...

Music has always played an important role in my life. I like all kinds of musical styles... Classical Music, Jazz, Rock, Blues, Metal, Fusion, Funk, Disco, Pop...! It never occurred to me that one particular music genre is more valuable than any of the others. There is only good and bad music. And I firmly stick to this attitude until the present day. Accordingly, it is my firm conviction that a truly world-class audio system should be designed to be NEUTRAL and UNIVERSAL in the sense that every kind of program can be reproduced in an equally appealing and convincing way. This particularly includes the requirement that the system is capable of reproducing the timbre of ACOUSTICAL instruments with utmost accuracy. Otherwise the system will narrow the musical horizon of the user, which from my point of view is an intolerable constraint, if not a sin!

In my childhood I was so fortunate to own one of those large 1960s vacuum tube AM+FM radiograms. Made by Philips. It was an outstanding if not avant-garde piece of audio gear which I only fully appreciated decades later on...featuring a 800 ohm

(!!!) oval paper cone full-range transducer fired by a unique single-ended-push-pull (!!!) output-transformer-less (!!!) vacuum tube power stage (launched by Philips along with the EL86 tube in the late 1950s, the famous so called EISENLOSE ENDSTUFE, iron-less power amplifier). I truly adored this old machine as it day-in-day-out delivered fantastic sound quality flawlessly. So no wonder that I had my beloved tube receiver still in use even when I reached my teens and solid state audio gear had become prevalent.

Since my early teenage years I have also attended all kinds of live concerts regularly and such became acquainted with numerous concert halls, opera houses, churches and jazz clubs within reachable distance to my home. In each auditorium of which I over the time had figured out specific sweet spots where I was keen to take seat on concert events. Fortunately, expensive seats were rarely blessed with extraordinary listening quality, which kept my concert affairs in the affordable range. After school classes, I used to travel to Düsseldorf frequently where I would hunt for hot vinyl records in various stores until closing time, so as to move on to TONHALLE, SCHUMANN SAAL or some local church to attend a thrilling concert event. On other occasions, I travelled to Cologne, to go to the opera house or the SENDESAAL DES WDR to listen to the world famous WDR Big Band or to take part in some avant-garde music happening. Well before these auditories opened their doors I usually dropped by the fabulous Saturn Media Store (which at that time was the biggest shop of this kind in Europe!) which I usually left with a bag full of vinyl records under my arm (and an empty purse in my pocket).

On one fine day my valued music teacher, a passionate music lover himself, assembled a herd of committed teenager scholars to go visiting the famous STUDIO FÜR ELEKTRONISCHE MUSIK at the Cologne Conservatory of Music (founded in the early 1950s by iconic avant-garde composer Karl-Heinz Stockhausen). I remember vividly that after a few tracks of freshly brewed electronic music had been presented to the gang, played back through a pair of vintage monitor loudspeakers, I found myself stepping forward and, after giving expression to my delight for the tracks we had auditioned, utter ruthless words of criticism about the deficiencies of the studio loudspeakers. Probably to the amazement (amusement... embarrassment...?!) of my class mates, our dear teacher and the superintendent of the famous studio.

Wild times.

In view of such a lifestyle it was only a matter of time until High Fidelity Audio would become a major point of concern in my life. After decades of involvement with live and recorded music, I have gained a crystal clear imagination about the sonic profile of a truly MUSICAL system. And all my design choices have always been ruled by this

ideal, whereas aspects of marketing and commerce have been predominantly neglected.

DESIGN PRINCIPLES...

The THÖRESS story is about AMPLIFIERS AND LOUDSPEAKERS. A fact which has been frequently overlooked in the past. Perhaps the rather unique amplifier components had stolen attention from the loudspeaker creations...? Or maybe the radical and idiosyncratic solutions of my speaker design (regarding technical principles and appearance) did consternate...? In any case, I strongly believe that amplifier and loudspeaker design are so closely related to each other that they need to get treated simultaneously in order to reach the very top of musical reproduction. Decades of search and struggle for the right design principles have led me away from stereotyped mainstream design recipes to rather unique solutions such as undamped transmission line woofer loading...

cabinets made of low-density poplar plywood...

constant directionality horns...

underhung motor transducers...

crossovers optimised for maximally flat group delay...

Design choices foremost meant to optimise transient response, the cardinal point of loudspeaker design (and audio science in general). Music by its nature is nothing other than a (highly organized) universe of acoustical transients, after all. Meanwhile, THÖRESS loudspeakers gain increasing reputation aside from the amplifier products which I admittedly note with satisfaction and pride.

In case of amplification, I strongly believe in the supremacy of

MINIMALISTIC, SINGLE-ENDED, ZERO-FEEDBACK, VACUUM TUBE TOPOLOGY

while strictly avoiding balanced schematics, push-pull operation in particular. My Parametric Phono Equalizer (Phono Enhancer), for example, offers purely active MC amplification (no step up transformers!) with excellent signal-to-noise performance by solely employing two single triodes (per channel) operated in single-ended mode with HIGH IDLE CURRENT. Even the thought of forcing the phono signal through a sequence of integrated circuit chips (OPAmps, operational amplifiers) each of which consisting of a network of at least 30 on-chip transistors run at PIDDLY IDLE CURRENTS linked by loops of negative feedback makes me shudder.

BALANCED VERSUS SINGLE-ENDED TOPOLOGIES...

Balanced topology (roughly speaking) not only requires twice as many parts as comparable single-ended structures and as such contradict my minimalist design approach at the root (not to speak of arrays of transistors as they are highly common in balanced technology, which typically relies on OpAmp IC based schematics). Balanced structures exhibit a very particular distortion behaviour in sharp contradistinction to single-ended circuitry with regard to

HARMONIC CANCELLATION...

EVEN overtones (in principle harmless and pleasant impurities added to the wanted signal due to non-linear amplifier distortion) CANCEL AWAY, whereas UN-EVEN overtones (ugly haze) DOUBLE! Consequently, the sound impurities induced in the wanted signal by a sequence of balanced amplifier stages entirely consist of initially produced UN-even overtones, superimposed with UN-even overtones produced in the following stages, plus UN-even overtones OF UN-even overtones "inherited" from preceding stages... a devilish avalanche of ugly haze takes place, whereas ALL harmless EVEN overtones cancel away completely. Hereby EACH balanced stage adds twice, note TWICE(!!!) the amount of UN-even overtones to the wanted signal than a comparable single-ended structure (built around the same active elements under comparable operational conditions). Classic electronic engineering science concludes that this is not a point of concern because these hazardous distortion products can be reduced to almost nothing (yet admits that they cannot be eliminated completely) by furnishing excessive over-all gain and applying a large amount of NEGATIVE FEEDBACK. Curiously, the following simple common-sense considerations combine to suggest that the common theory of non-linear distortion and negative feedback is only a very rough approximation of reality, at its best...

The notion of distortion reduction via negative feedback essentially relies on the assumption that the frequencies of the overtone impurities added to a pure sine wave test signal by a distorting amplifier device (sine waves do not carry overtones themselves and as such can be considered as the ""indivisible atoms"" of arbitrary periodic signals, so to speak) are UNFLAWED fractions of the respective test signal frequency. Therefor non-linear distortion products of electronic amplifiers are often referred to as HARMONICS, suggesting a similarity of conditions between amplifiers and vibrating strings. But can this crucial assumption be in accordance with the real world conditions...?

CERTAINLY NOT!

Let me illustrate my point with the following allegory...

It is well known that the overtones of REAL vibrating strings are IN-HARMONIC in the frequency domain! This is to say that the frequency of each individual overtone of a real world string deviates to a certain (very small) degree from the unflawed frequency of an IDEAL (textbook) vibrating string, as predicted by the basic physical theory. In spite of its tiny magnitude in-harmonicity of strings is a measurable quantity and the grade of in-harmonicity was found to be dependent on length, diameter, tension and material of the string in question. Even a formula has been put forward which explicitly describes the dependency between in-harmonicity and the concrete properties of the living object. Furthermore, in-harmonicity is a

commonly accepted notion in the field of instrument making and solidly incorporated in the design and the tuning practice of all kinds of string instruments. Interestingly, strings exhibit the lowest grade of in-harmonicity if they are long, thin and exposed to the highest possible tension. Obviously conflicting requirements which have to be accounted for and brought into balance in string instrument design. So it is no wonder that grand pianos incorporate a heavy steel frame to take the enormous tension arising from hundreds of long metal strings stretched out nearly to their breaking point. And that harpsichord players use brass strings (instead of steel strings) on those positions where they can withstand the required tension. In the light of these findings, it would be quite a miracle if real world amplifying elements yield UN-flawed perfectly harmonic overtones as distortion impurities...

The overtones arising in electronic amplifiers due to non-linear distortion
MUST BE IN-HARMONIC in the frequency domain!

Furthermore, it is easy to imagine that the various amplification elements such as vacuum tubes, FETs, MOSFETs and bipolar transistors exhibit different grades of in-harmonicity under different operational conditions. Curiously, I have not come across a single scientific paper in which even the notion of in-harmonicity has been brought up. Not to speak of a comprehensive investigation of the phenomenon itself, although it can be safely assumed that the measuring tools of the digital age are sufficiently sophisticated and sensitive to permit a revealing analysis of the conditions.

Astonishingly, the concept of in-harmonicity seems to be totally unknown in the field of audio electronics, until the present day!

But what happens to distortion products in the form of IN-HARMONIC overtones in the presence of negative feedback...???

Their amount is reduced, that is certain, as it is clearly shown by common distortion measurement. A measuring procedure which is by far too coarse to ever observe or even quantize the tiny frequency shift given by the in-harmonicity effect, due to the very limited frequency resolution of the band pass filters used for extracting the sequence of harmonics from the test signal. On the other hand, it is equally certain that the reduction of non-linearity overtones via negative feedback as demonstrated by the standard theory with the aid of the so called Fourier Series Transformation COLLAPSES if one declines the unflawed frequency assumption and admits in-harmonicity in the frequency domain! This naturally gives rise to intriguing yet uncomfortable and awkward questions like...

What are the technical and PSYCHOLOGICAL impacts of in-harmonicity in audio...???

Does negative feedback reduce harmonic distortion while introducing or increasing some other unknown form of signal degradation...???

Is it possible to extend the existing theory of linear distortion and feed-back in a meaningful way by including the concept of in-harmonicity in electronic science...???

Do vacuum tubes exhibit lower in-harmonicity than solid state devices...???

With such considerations in my mind, I have over the years evaluated all circuit topology one can think of as a practitioner, by ear and measurement, and clearly found that balanced technology and negative feed-back are sound degrading concepts. Especially when it comes to power amplification. Consequently, I decided to devote myself EXCLUSIVELY to single-ended zero-feedback topology...

The sonic coherence and beauty attainable with this kind of circuit architecture is matchless!

From my perspective, the one and only purely technical merit and right to exist of balanced technology is the immunity of the associated signal transfer scheme against electromagnetic interference (EMI) based on the so called COMMON MODE NOISE CANCELLATION effect. In order to make use of this effect a dual signal (composed of the wanted signal and a 180-degrees phase shifted clone) needs to get transmitted from the sender to the receiver component (accordingly cable lines for balanced signal transfer require 3 leads: hot1, hot2, ground). Hereby the receiver device has to present an active differential amplifier stage (with dual input, inverting and non-inverting, mostly performed by an OpAmp IC) or an audio transformer with centre-tapped primary winding to the incoming balanced signal. Balanced technology might be indispensable in sound studio and public address applications where cable lines likely have to run through environments polluted with electromagnetic smog. Yet it means unnecessary technical overkill in domestic audio installation. Overkill accompanied by sonic degradation!

THÖRESS is not about dogmatic tube circuit design. Despite the golden age subtitle associated with my brand, it is not my aim to glorify the bygone age of vacuum tube technology. I dedicate myself to vacuum tubes, particularly triodes, because they are outstandingly linear amplification devices which in addition (like field effect transistors) offer the advantage of powerless modulation... solely voltage swing yet no current flow is needed for exciting these devices! Making vacuum tubes perfectly suitable for minimalist zero-feedback circuit design by their very nature! Nonetheless, my amplifiers and crossover networks are made with meticulous hand construction using CLASSIC/ANCIENT point-to-point wiring techniques, exactly suiting a radical purist design approach.

At a rather early stage of my career it became evident to me that I had to fuse the ancient vacuum technology with the contemporary solid state technology in order to reach ultimate sonics. Accordingly, I freely dispose of the whole palette of ingredients and spices the universe of electronics offers to me, except for integrated circuits and printed circuit boards which are employed beyond the audio circuitry for remote volume control purpose only. As a matter of consequence, in my circuits vacuum tubes are often complemented by solid state devices like light emission diodes, JFETs, MOSFETs or bipolar transistors as side elements in order to create optimal high current operation conditions for the tubes, aiming at the lowest possible distortion figures and in-harmonicity in complete absence of negative feedback correction. Just as in case of piano strings stretched close to their breaking point, tubes (amplifying elements in general) ought to get operated at the highest practical idle current in order to deliver the most harmonious performance! Such an approach can be classified as...

**CON/TEMPORARY S/SOLID ST/ATE I/INTERLEAVED TU/BE TE/CHNOLOGY,
CON/S/ST/I/TU/TE.**

CONSSTITUTE should by no means get mistaken for the more common vacuum tube transistor hybrid technology, where tube and transistor stages are merely combined rather than interleaved and entangled. In case of my EHT based amplifier models, I take the CONSSTITUTE approach to the next level by applying it in the context of a unique minimalist tube MOSFET hybrid topology, which I call EHT Topology (E/intakt H/ybrid T/riode, single-ended hybrid triode). The EHT topology is a two-stage scheme...a SINGLE-ENDED (class-A) TRIODE GAIN STAGE followed by a unity gain MOSFET POWER BUFFER also operated in single-ended (class-A) mode with high idle current. It represents the SIMPLIEST and PUREST form of all possible single-ended triode power amplifier configurations and allows to fully exploit and mate the most desirable characteristics of both vacuum tubes and solid state devices determined by their very nature! Despite of its elegance and extremely high sonic capability, the EHT topology has never been utilized in a serial audio product before, as far as I know. Probably due to its low power efficiency and because its implementation is rather tricky.

TONE CONTROL...

Another peculiarity found on crucial components of the THÖRESS line is worth mentioning. Four amplifier models (Phono Enhancer, Dual Function Amplifier, EHT Integrated Amplifier and EHT Mono Amplifier) offer tone control functions implemented via on-the-fly selectable sound presets (timbre registers). Notably, these timbre registers act in a much more subtle way than common bass-and-treble tone control facilities and do not rely on clumsy and sound degrading conventional tone control circuitry. In fact all such registers are realized by interposing solely one additional capacitor (per register and channel) to the respective neutral mode circuit! The timbre registers are useful for restoring tonal imperfections of the

listening program, for matching the tonality of the loudspeakers to the listening environment and, in case of the Dual Fuction Amplifier, for equalizing the response of individual headphones by adding bass and/or treble extension to a given component.

TRANSFORMERS...

All THÖRESS amplifiers are equipped with proprietary mains transformers, output transformers and filter chokes produced in-house to the highest possible standards, tailored to perfectly suit the respective circuit context. In fact every inductive part ever used to built up a THÖRESS amplifier carries a coil which has been fabricated by myself with the aid of a vintage winding machine made in the year 1964, which curiously happens to be the year of my birth.

APPEARANCE...

All components which nowadays form the THÖRESS product line were initially developed to serve my own needs. Hence their appearance and construction style bluntly display my personal taste and attitudes. The small 1D66 loudspeaker model is believed to represent an unobtrusive and timeless piece of style-neutral furniture. Whereas the large 2CD12 loudspeaker follows the example of the self-effacing appearance of a vintage JBL monitor loudspeaker. As for the amplifiers, I want them to get perceived as apparatus, PURISTIC AUDIO APPARATUS as I call them... precision gear meant to serve committed music lovers to broaden their musical horizon and acquaintance, rather than fancy luxurious toys for showing off. Components free of redundant frills solely dedicated to soulful, honest and accurate reproduction of recorded music. The undeniable more-or-less subtle retro touch my products emanate are understood as a TRIBUTE to the tradition of audio components from the vacuum tube era, which I admire and cherish since the day I inherited the fabulous tube radiogram that has awakened and inspired my everlasting fascination for music.

Greetings to All Music Lovers World Wide!

REINHARD THÖRESS

.....

THÖRESS...

**A Tribute to Professional Audio Components
from the Golden Age of the Vacuum Tube !**

.....