Who believes in audio quality?
Making circuits that the industry don't sell!

Marcelo Johann

More Interesting, perhaps:
You are just listening to

- 16-bit, 44.1KHz, Non-OverSampling
- PhilipsTDA1543, economy DAC from 1991
- THD between -60 and -70dB
- Noise around -70dB

- Home made, of course

Outline

- Preamble and Goals
- History 1: Hi-Fi evolution, references
- History 2: A dentist in Porto Alegre
- History 3: How I got involved
- The industrial/commercial approach
- DIYers, audiophiles, engineers, mods
- Measurements, listening, subjective quality
- The sound of components
- Brands, sites, links, advices
- Final messages, and open for discussion

Preamble

- Like in a painting
- The image starts rough
- It makes more sense as it is being completed
- Don’t be too alarmed with my bold statements

http://www.youtube.com/watch?v=j9SRKaJam6U
Or Beyonce iPad Finger Painting by Kyle Lambert HD
http://www.youtube.com/watch?v=_tPrTWv54q

Preamble

- Bold statements
- I will make a lot of them…
- But there are wonderful products
- There are wonderful people
- Companies with poor sound quality help a lot

However:
- My task here is to criticize, not acknowledge
- Let us reconsider, rethink, learn
- Don’t endorse the “theory of ignorance” (1)
Provoking...

- No one is caring about audio quality
- Industry is selling cheap stuff
- Digital is worse than analog
- Transistor is worse than tubes
- And top audio quality has been decreasing in the last decades...
- Remember: all this is relative
- And you don’t need to believe me
- Did you ever listen to high-end analog, tube?

Goals and Coverage

1. Hi-Fi History ... Stories
2. Big Messages to us
3. Technical Knowledge

CONTEXT

SOUND

Mechanics

Electronics

Computing

Historical

Economical

Technical

Cultural
The Golden Age of Hi-Fi: 50s
- English school versus American School
- The name of Gilbert Briggs became a reference at the English scene

More: A Tiny History of High Fidelity
http://www.nutshelhifi.com/library/tinyhistory1.html

Wharfedale, from 1932
- High sensitivity speakers
- Alnico magnet and square aluminum coil
- The old English way
- Individually tested and tuned

More:

HISTORY
Part 1
Golden age and references
Gilbert Briggs as father of Hi-Fi

- He was not the first
- He was not alone, but…
- Briggs famous tour promoting Hi-Fi

More:
http://www.wharfedale.co.uk/About/History/tabid/66/Default.aspx

Why Hi-Fi?

Is it for millionaires?

Our awesome auditory system

- Art is sensible
- Why fine cuisine?
- Can we just eat hamburgers?

- But we are going towards it!
- We are on it!
- “Theory of Ignorance” - part 2

HISTORY

Part 2
A dentist in Porto Alegre

What happened in Porto Alegre?

- A dentist followed Briggs and other masters, as well as his own experiments
  Marcello Sfoggia
- Since he was young
- Passion, dedication
- Spent many decades building circuits
- Became a famous recording expert

What are Sfoggia’s main guidelines

- Custom
- Analog and tubes
- Simple - less is better
- Oversized - no compromise
- Quality components
- Testing and Tuning
- Don’t rely on price
- Dedicated PSUs
- It is the sound

...my personal view
Everyone involved with music in POA knows him

Some of Sfoggia’s stories
• It must be the green one
• Taking piano’s top out
• Blankets
• Coins + screw
• Watch’s chain
• Mic at floor
• How to fix this room?

Part 3
How I got involved

It’s a long story...

Trying to build a top-quality studio

Hit the wall w/ US$2K ADC/DAC

My problems
• I was listening to the ULN-2 in the living-room
• And it ruined my analog sound at the studio
Cooperation: 1

Marcello Sfoggia

- He needed a computer!!!
- I already implemented a mixer with his help
- Now I needed to solve my new problems

Cooperation: 2

Márcio Chiaramonte

- (EE, UCS @ Bento)

Home made DACs

Started to become more popular after Mr. Kusunoki’s MJ/96 paper

How does it work?

In a nutshell

- Phillips TDA1543
- 4 in parallel, 8.5V
- Non Over Sampling (filterless)
- Passive I/V
- Texas DIR9001 (low jitter)
- Good PSU (150.000uF)
- Direct Coupled (my contribution)

Now back to Sfoggia’s problem…

…and also mine:

- How to find a good interface (AD/DA)?
- For “the master”!!!
What is there available

- Audio Interfaces
- AD/DA, 2ch, 8ch
- Protocols
- M-Audio, MOTU, Echo, TCE, Focusrite, …
- Digidesign, Apogee, RME, Metric Halo, Lynx…
- And Behringer!

What they have inside?

- Caps, Res, opamps, converter, DSP, SW

Quality and Price for components

- Capacitors
  - $0.08
  - $0.03
  - $59.83
  - $27.95
  - $2.95
  - $0.65
  - $42.95
  - $1.67
  - $1.216.90

- Resistors
  - $0.015
  - $0.006
  - $0.60
  - $0.60
  - $0.60
  - $0.25
  - $27.95
  - $2.95

- Opamps
  - AK4620BV (~4-8$ each)

- ADC chips
  - $1.00
  - $3.00
  - $16.45
  - ???

Example of entry level interface

- PreSonus AudioBox-USB
  - $149 for 2ch
  - 24-bit 48KHz
  - Guess which Caps
  - Guess which Opamps
  - Good converter chips

  – Nice!

Example of “pro” studio interface

- SSL Alpha Link AX
  - $2699.00 for 24ch
  - 24-bit 96KHz MADI
  - Guess which Caps
  - Guess which Opamps
  - Good converter chips

  – newer
  – Better specs…
  – Not necessarily better sounding
  – Inside…
  – Nice!!!

The industrial/commercial approach

- What you find inside a $200 interface
  - Cheapest caps and res
  - “audio” opamps
  - Good converter chips

- What you find in a $2000 interface
  - Cheapest caps and res
  - Most the same “audio” opamps, long path?
  - New converter chips

- Is there a $20000 interface?
  - Only if you build one (DIY, mods, custom)
  - Remind: there are exceptions…
Really?

• Yes, and a computer guy like me can take a $200 unit, change a few components, and make it sound much better than a $2000 one!

• Hard to explain why the industry does not
• Or easy…

• Let’s see it:
  www.inf.ufrgs.br/~johann/ada8000

MODIFYING THE ADA8000

• Replacement of ceramic caps at the power supply for high isolation voltage ones;
• Installation of a fan on the top cover to cool down the regulators that run very hot;
• Bypass the input mic preamps, going directly to the main board with some resistors;
• Opamps replacement: I put LT1359 at the inputs and OPA4134 at the outputs;
• Uncrossing the outputs, because the positive passed through two opamps, and the negative, only one.

Listening

Can I do the same with other gear?

YES!

Why engineers don’t do it for me? :o(

Title - Who believes in audio quality?

• People don’t accept this too easy
• Let’s try to see why

(no one is caring about quality)
(we seek features and low cost)

Trying to explain…

• Industry needs profit
  – Maximize sales and minimize production costs
  – They will always use the cheapest component
  – True for consumer, true for pro
  – Even for niche markets - the charge you the name
• Users are equally responsible
  – We bargain for the lowest cost
  – We seek features, robustness
  – We force “quality companies” to sell cheaper stuff
• Remember: there are exceptions…
Exceptions

- Mercenary Audio
  very uncommon
  my "methodology"
- John Hardy
- David Royer
- JCF
- …

Mods and Custom

- Black Lion Audio
- Audio Upgrades
- Like guitar amp mods
- People like Sfoggia in some countries
  NYC, London, Denmark, …

Trying to explain: engineering facts

- Is it so expensive to make a better sound?
- Not all modifications are expensive…

Two theories:
1. Engineers know and could do better
   Burson Audio
2. Engineers only care for specifications
   Rod Elliot
3. Or Digital Rupture

Subjectivity

The Big Debate

Different cultures, views, communities

1. Professionals
   robust, known, for market
2. Audiophiles
   Eternal search for perfection
3. Engineers
   Better specs, numbers

break in 10 min

back in 10 min
Learning (1)

- Sense of presence
- Placement
- Depth of field
- Want to hear more
- Low level detail
- Forget the speakers
- Brings a smile
- Relaxed

Learning (2)

The sound of each component
1. Resistors
   http://www.altavistaudio.com/resistors.html
2. Capacitors
   http://www.humblehomemadehifi.com/Cap.html
3. OpAmps
4. Everything

Importance (again)

If the difference is so small does it matter at all?
1. LAYERS
   Long signal paths
2. LAYERS
   Mixing adds up errors
3. LAYERS
   Listening for hours

How to design

What is the right balance between specifications and listening?

Old Phillips methodology

Friend or Foe?
High-End designers reassess the importance of audio measurements
BY MYLES B. ASTOR
ULTiMaTE AUDIO, Spring 1999

Many other issues

Technical

- Pro
- High-quality
- Pristine
- Digital transparency
- 24/96
- -120db SNR
- “name” as a value to sell
Why transistor?

- cheap

:o)

Why digital?

- From dbx 386’s manual
  - Promise
  - Factual
  - Digital = practical
  - And this is very nice! :o)))

Clock

- Synch signal
- Time reference
- Digital amplitude
- But an analog signal in time!!

A problem posed to programmers

- Analog mixing
- Digital addition sounds bad!
- Floating point arithmetic vs 80-bit integers

Simplicity

- From John Hardy’s M1 manual

www.johnhardyco.com

Simplicity: going further

- Can I remove this part?

- How does it sound?
Exceptions again: DC

- Metric Halo’s “new” interfaces
- John Hardy preamps
- JCF
- Any other?

PSU

- Very important
- Size, caps, diodes, “cheap” rule again
- Interaction
- Sound uses all the PSU
- Example
  - BMC DAC
  - www.bmc-audio.de

Cables

- This is part of the debate…
  - Be prepared to fight over, against
- Test: if you don’t hear, there is no problem
- The volume pot is much worse, anyway
- Try both!

Audiophile stuff

- Well built electronics
- The best components
- VPI’s db-5: magic brick
- Gold, teflon, $nK cables

...to...

- Science fiction!

Please, stop somewhere in between

Big Messages to us

- Industry seeks profit only
- You can always do better at home
- We must educate ourselves, learn, listen
- We must know and follow the references
- There is nothing like a perfect system
- We need to find an acceptable balance
- But we cannot tolerate “miserable” sound
- It can be wild, but always inspiring
- New social and economic model
Messages to musicians

- Learn, listen...
- Care a little bit about quality - not too much
- Know a little bit about technology
- Do not simply trust industry
- Try for yourself, trust your ears
- Don’t put the load on the editing

Messages to programmers

- Learn, listen...
- Digital is not better than analog: is easier
- Digital is not even free from errors
- 32-bit float is not 32-bit
- Clock is not digital
- Help us to find why the computer does not make an addition correctly…
  …or don’t use it, much easier!

Messages to engineers

- Learn, listen...
- Audio is not easy
- Audio is not “solved”
- Transistor is not better than tube: is cheaper
- Models are models: Cap, VDC, PSU…
- Know the sound of each component
- Try, change, listen (Phillips way)

Messages to audio professionals

- Learn, listen...
- Don’t pay too much for words/brands
- Know who is speaking
- Look for mods
- Care for the cables
- Care for the PSUs
- Keep it simple (short)
- Let the knobs at center

My Current Activities in Audio

- C&M courses
- LAC - CNPq
- 4 undergrads
  - Audio and Computer Music
- Making DC ins outs, Texas ADC
- Mixers, preamps
- Lots of perspectives
  - AD/DA simplifications
  - Changing opamps everywhere
  - Making better PSUs

The Institute Marcello Sfoggia

- Proposed by Hique Gomez
- Preserve principles, equipment, techniques, recordings
- Interviews, learning from him
Open for Discussion...

LETS TALK!

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Making circuits that the industry don’t sell!

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Thank you!