

More Hot Air

by Tony Kordyban



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INTRODUCTION: EVERYONE NEEDS A HUMAN BRAIN UNIT

Everything you write is a confession.

You can't help revealing something about yourself in even the most innocuous scribble or note. Your grocery list exposes your weakness for fatty and salty snacks. That e-mail thank-you note to your mother-in-law shows the true depth of your appreciation for the exercise video she gave you for your birthday. And even that seemingly objective engineering test report you wrote says more about how you expected the product to perform than what it actually did.

I will make my confession right up front, so you won't have to infer it from the upcoming chapters. What I really wanted to write was a science fiction novel called *The Human Brain Unit*. It was going to be this really cool, Stephen King-type story. The phone company discovers a small segment of the population that is telepathic. Instead of sharing their discovery with the world, the company turned it into a telecom development project (since that is all they know how to do, anyway.) Their scientists find a way of harnessing the telepathic powers of these relatively rare psychics to replace segments of the telephone network. Instead of sending signals over traditional cables,

microwaves, satellite links or optical fibers, they can be instantly communicated from one brain to another. The main hitch in the idea of such a product is that if people could communicate directly with one another telepathically, how could the phone company charge them for it?

Their solution is that they don't replace the entire phone network. Your grandma in Toledo still has to pick up her handset and dial a number and talk into a microphone and listen to a tiny speaker. But after her phone call gets to the central office, it goes through an electro-psycho converter, and gets sent from the human brain unit (HBU) in Toledo telepathically to a corresponding HBU in Fresno, where it is converted back to ordinary electronic signals that reach the phone of your auntie with the gall bladder trouble.

A boring idea by itself, I admit. Most people don't know how the real telephone network works anyhow, so they wouldn't much care if it were replaced by a bunch of brains hooked up to electrodes. Maybe I could have spiced up the story by having the evil phone company snatching peoples' brains and sticking them in glass casserole dishes filled with bubbling green fluid. And later, somehow the network of brains would start to take on a life of their own, grab control of the network and mete out a whole slew of poetic justice to the evil telephone company engineers.

You can see why I never got anywhere with that novel. There just wasn't any way to work in a hot love story when most of the characters are evil engineers (no believable love story there) or disembodied brains.

That leads to another point of confession. I said earlier that most people haven't got a clue how the phone network works. I worked in the telecom industry for nearly 17 years, and I have to count myself among that number. I worked on literally dozens of projects that developed new electronic hardware for the telephone network. I was aware that they generally had something to do with cell phone switching, or conglomerating the phone calls from many lines onto one. But other than that kind of vague notion, I didn't understand what the circuits were supposed to do. As a thermal engineer, I knew they had one thing in common: They converted electrical power into

heat, and it was my job to figure out how to get that heat out, so the circuit would not overheat.

When I started to write about my adventures in the newsletter articles that would eventually become this book, there were two problems. First, I had to disguise the project I was writing about, because usually I was writing about some embarrassing thermal design mistake. I didn't want to use real names of people and projects, even if I could get permission from management, because I didn't want to hurt anybody's feelings or reputations. I did want to write about the blunders to share their educational value with others in the hopes that others would avoid those same boo-boos. The second problem was that I didn't understand the real projects well enough to describe them without making myself look stupid.

My answer to that double dilemma was to just make up fictional projects. Instead of the double-density echo-canceling circuit cards and fiber-optic switch matrices I actually worked on, you will find yourself reading about Lost Dog Finding Systems and Telemarketer Disabling Circuits. And time and again, you will find the human brain unit as the backdrop of the thermal lessons.

That's your introduction. The purpose of the introduction is to tell you about things that just pop up out of nowhere in the book with no explanation. The human brain unit is one of those things. I keep referring to it as one of Herbie's projects. Now that I've told you where it came from, it won't be so confusing when you run across it later.

Oh yes, Herbie. If you haven't read my first book, *Hot Air Rises and Heat Sinks*, you don't know who Herbie is. Herbie is my friend. He is fictional. He is an engineering archetype. He is that guy who is not quite as good at thermal design as you are, so you can blame all the thermal mistakes on him. You know somebody like Herbie where you work. He is enthusiastic, gets things done and is willing to work beyond his many limitations.

Herbie is important. If I had not invented him, God would have had to create him. Herbie is a bit thick, but he serves as our teacher, because we learn from his mistakes. Without him, we would have to make these mistakes ourselves.

He also serves as a living warning. “Don’t be me,” says he, “Learn. Read this book.”

Organization of the Book

You should have noticed by now that this is not an engineering textbook. It is not going to start by introducing Conduction, Convection and Radiation, and then have you work out homework problems. This is a collection of short case histories, mostly based on things that really happened, although if I’ve done my homework, you’ll never be able to trace them back to the real people and projects they are based on. There is no logical progression through the book. Each chapter was originally an article in a monthly thermal design newsletter called *HOTNEWS*. I wrote about whatever had caught my attention recently. So if it strikes you that the chapters are somewhat disconnected, congratulations, you are right.

The chapters are loosely organized into seven sections. They were organized in the same way that laundry gets organized after it comes out of the dryer. I pulled chapters out of the pile and held them up next to each other to see what went with what. The chapters that didn’t seem to go with any other chapters were thrown together in their own section, like a drawer full of unmatched socks. Maybe those chapters are still useful as sock puppets or something. This is how the piles of chapters are sorted out:

- Section 1. Measurement and Test: Getting the Wrong Answer
Direct from the Lab
- Section 2. Fans: Increasing the Air Flow and the Trickiness of Your Cooling System
- Section 3. Components and Materials: the Sum of the Parts Is Sometimes Just a Big Hole
- Section 4. Radiation. No, Stefan and Boltzmann were not a ’70s German heavy metal band!
- Section 5. Tales of the JEDEC Knight – a Crusade Against the Industry Standard Definition for Component Thermal Resistance
- Section 6. A Collection of Not Even Loosely Related Stories
- Section 7. Telecom: A Field with Myths and Mistakes All Its Own

This last section has a lot of jargon and thermal concepts specifically related to the telecom industry. I lumped them together to allow the readers from the automotive, aerospace and consumer electronics industries to skip them easily. As with the other chapters, though, they are written for the general reader, and even if you can't glean any relevant technical lessons from them, you might find one or two puns to reward your effort.

Now please read, enjoy, learn, share what you find with your colleagues. Just don't base your product thermal design solely on what you read in this book. Check it out with your own analysis and testing! Just because I assert that "everything you know is wrong," doesn't mean that the corollary is true, that "everything I know is right." Remember, if I have learned enough to be able to write two books on this subject, I must have made my share of mistakes. You can count on one or two new ones to be in this book.

That's right, I'm not perfect. I confess.