Book Review

Exploring Vanderveen Trans Tube Amplifiers

What should a reader expect from *Vanderveen Trans Tube Amplifiers* by Menno van der Veen? Elektor.com describes it as an “adventure story” recounting van der Veen’s discoveries during his research into transconductance (trans) tube amplifiers, and implies the book will present designs “suitable for hobbyist construction.” The back cover declares that in *Trans Tube Amplifiers*, van der Veen describes how—while researching transconductance amplifier design—he developed the “Transie 1” and “Transie 2,” which are both sweet-sounding, DC-coupled single-ended amplifiers, and eventually “struck gold” with the Vanderveen Trans 30.

Review By
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Before we crack open *Vanderveen Trans Tube Amplifiers* and decide for ourselves, let’s talk a little about Menno van der Veen’s background and his accomplishments to date. More than 30 years ago, van der Veen combined the technical background he gained from his university degree in physics and electronics with his love of high-fidelity audio to develop high-performance toroidal output transformers for vacuum tube amplifiers. These have been available from several manufacturers for many years, and they truly are of the highest quality—both in manufacture and performance.

He has studied, developed, and built vacuum tube audio amplifiers for even longer, and has published hundreds of papers on the subject. Probably his best-known work is his book, *Modern High End Valve Amplifiers* (Elektor, 1999). In 1986, van der Veen formed his research and development consulting company, and in 2006 he established the Dutch TubeSociety school to teach audio amplifier design. Clearly, van der Veen has the knowledge and experience to be an authority on performance improvements to vacuum tube (and hybrid solid-state/vacuum tube) audio amplifiers.

His latest book, *Vanderveen Trans Tube Amplifiers* is a crisp, silver and grey paperback, about a quarter-of-an-inch thick, with a beautifully constructed tube amplifier’s top deck artfully displayed on its cover.

The book delivers in many areas. It is engagingly written, and generally easy to read. *Vanderveen Trans Tube Amplifiers* moves quickly through an explanation of the author’s specific transimpedance amplifier application to his simple “Transie 1” and “Transie 2” low-power, single-ended common-cathode audio amplifiers that are easy to understand, and relatively simple to build. These amplifier designs clearly illustrate the implementation of the transimpedance concept.

By driving a current (rather than voltage) signal into the local feedback loop around an amplifier’s output power tube, and thus lowering the amplifier’s output impedance, van der Veen effectively applies high-gain local feedback around the output power.
tube to reduce distortion and improves low-frequency performance (both in the tube and the output transformer that it is driving), all without the stability concerns associated with a global feedback loop.

On the downside, van der Veen's initial explanation of what he means by a transconductance amplifier is too succinct for most people to understand as they read the text. I had to get out a pencil and paper and re-derive an inverting amplifier's output impedance, and then replace the input resistor with a voltage-controlled-current source to understand how the current source's high-output impedance reduces the amplifier's output impedance by increasing the loop gain. From there, it was a simple step to model and derive the feedback equation for a common-cathode tube amplifier driven in the same way.

As a suggestion for a second edition, replacing the existing appendices (which seem only tangentially related to the book's technical theme) with some step-by-step derivations of the transconductance amplifier theory as well as some analyses of the transconductance designs presented in the book would further empower readers to apply the transconductance concept to their own original designs.

Just a technical nit: the back cover states, “... transconductance...means converting current into voltage or voltage into current.” This isn’t true. Transconductance is the conversion of voltage into current. Transimpedance is the conversion of current into voltage. Current flowing through an impedance develops a voltage. A resistor (which represents the real—that is, phase independent, part of impedance) is the simplest transimpedance amplifier. Conductance is the inverse of resistance, and transconductance amplifiers (which convert voltage into current) are active devices.

The literature and history of vacuum tube audio amplifiers is extensive, and multifaceted, and Vanderveen Trans Tube Amplifiers is a worthy addition to that body of work.

Quite often, modern articles and books on high-performance audio amplifiers are exercises in egotism and elitism, but van der Veen avoids these pitfalls. His presentation is factual and humble. In addition to transfer functions, he includes many harmonic distortion and linearity measurement results, and these quantitative evaluations of amplifier performance are greatly appreciated. His distortion vs. frequency plots are difficult to interpret because they were probably originally generated in color but printed in black and white. However, they get the point across. His subjective evaluations of the tonal quality, dynamic range, and clarity of his amplifier designs are...well...subjective, but that cannot be avoided. However, van der Veen's objectivity is strengthened by his criticism of—based upon his own subjective listening to—one of his own designs. I was glad he included the example of an amplifier he developed using the “trans” concept that did not sound good. That unsuccessful experiment—which put too much high-gain, solid-state circuitry directly in the audio signal path—will save other experimenters time and guide their creative developments.

Consistent with the literature (and actually tube amplifiers themselves), this book’s topics and designs are esoteric. The techniques presented for lowering tube-driven output transformer distortion solve a problem that most commercial manufacturers avoid by using solid-state power drivers—but those drivers are not for everyone. The beautiful sound, the signal path simplicity, and the challenge of designing and building our own audio amplifiers pull us toward the emotional comfort of glowing vacuum tubes. Menno van der Veen’s books and papers present new ideas and new implementations of old ideas to provoke creativity and stimulate experimentation.

In summary, Vanderveen Trans Tube Amplifiers contains technical content worthy of a paper, or a chapter in a larger book—but van der Veen expanded the material to include valuable descriptions of multiple amplifier designs that actually are “suitable for hobbyist construction” and the experimental paths that were dead ends (to save others from having to learn those lessons themselves). This expansion to book format is valuable for a few reasons. First, books typically reach a larger audience than technical papers. Second, the broader exploration of successful, and unsuccessful, amplifier designs makes the trans topology much more accessible to amateur experimenters, designers, and constructors.

Vanderveen Trans Tube Amplifiers is a worthy read, and it provides provocative ideas that readers can experiment with and expand upon to create their own sweet-sounding vacuum tube amplifiers.