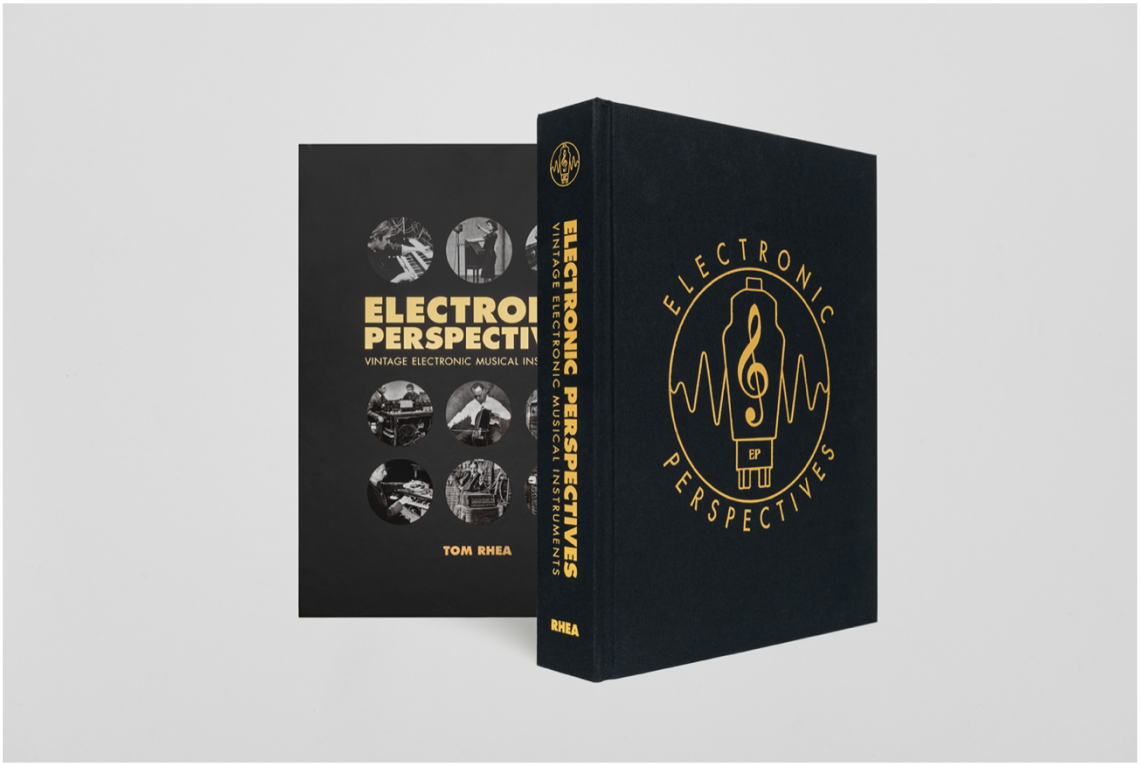

Electronic Perspectives

Vintage Electronic Musical Instruments

A Valentine for those who love electronic musical instruments (EMI)! Four hundred (400) pages of high resolution photographs, graphics, vintage magazine articles, patent drawings, and all 52 of Tom Rhea's "Electronic Perspectives"columns from *Keyboard* magazine (1977-1981). Augmented by (2) CDs of vintage and contemporary musical performances, demonstrations, with a number of very rare sonic examples. You will hear a number of these vintage electronic musical instruments for the first time! No expense has been spared. This beautiful clothbound book has been produced and printed using the highest quality materials, and it is enclosed in a striking and sturdy slipcase.

Electronic Perspectives: Vintage Electronic Musical Instruments

is destined to become a beloved keepsake. Limited 1st Edition now available.

View the 3 minute YouTube video at: https://www.youtube.com/watch?v=5Xj2kgGOv_U

ELECTRONIC PERSPECTIVES

VINTAGE ELECTRONIC MUSICAL INSTRUMENTS

TOM RHEA

Portions of this book are adapted from articles that originally appeared in *Contemporary Keyboard* & *Keyboard* magazine in 1977-1981, © Thomas L. Rhea.

www.electronicperspectives.com
www.drtomrhea.com

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Contents

Principals' Bios

Brian Kehew

A polymath in music and audio: musician, author, historian, keyboardist, synthesist, mixer, stage technician, and producer. He's no jack of all trades—he has stellar credits in these interests: tour technician for The Who since 2002, and sub for John Bundrick. Performer with Air, Hole, Dave Davies and Moog Cookbook; co-producer for Fiona Apple's *Extraordinary Machine*; studio work with glitterati from Aretha Franklin to Tiny Tim; consultant-programmer for Moog, Alesis, Casio, Solaris, and Polyfusion; author for *Tape Op, Keyboard* magazine, and *Beatlefan*. Brian and Kevin Ryan spent 15 years researching & writing *Recording The Beatles: The Studio Equipment and Techniques Used to Create Their Classic Albums* (2006). A book on Sir George Martin's music is in process. He mixed Rhino's *Woodstock 50–Back to the Garden: The Definitive 50th Anniversary Archive*, a 38 CD collection. Brian Kehew curated and produced the audio tracks for this publication, and is a significant contributor of historical artifacts for this project.

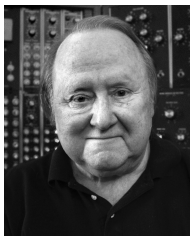
www.briankehew.com

Joseph Bastardo

An artist and musician whose eye for detail, indefatigable energy, and thorough mastery of pertinent tools mark him as a true graphic arts professional. His design portfolio includes work for clients all around the world and he has released several albums of electronic music on various independent record labels. Joe provided graphic design for this book and the associated website. His fastidious restorations of photographs and graphics brought worn images (seen in all too many places) to sparkling new life. His layouts seem to intuitively manifest what Susanne K. Langer calls *significant form*. His experience as a synthesist, composer, and performer informed his work for this publication. He worked his magic quickly and efficiently, and he shows budding capabilities as an historian in the field. I look forward to working with Joe in the future.

www.josephbastardo.com

Tom Rhea



Introduced analog synthesizers internationally as a Moog clinician, functional design consultant, artist relations specialist, documentation writer, and marketing executive. He authored articles in *Computer Music Journal*, and wrote owner's manuals, e.g. *Minimoog Model D Operation Manual* (1974). A noted historian, his PhD *The Evolution of Electronic Musical Instruments in the United States* (1972), and *Keyboard* magazine "Electronic Perspectives" columns are cited in *The New Harvard Dictionary of Music, The New Grove Dictionary of Musical Instruments,* and *The Grove Dictionary of Musical Instruments, 2nd edition*. He conceived of, and wrote the first music for *Oxylights,* the world's largest permanent music & light installation (Niagara Falls, NY), recognized in *The Guinness Book of World Records*.

www.drtomrhea.com

Foreword by Larry Fast

Creative people using tools in an expressive medium such as those employed by electronic musicians often don't have the luxury or the inclination to spend time contemplating the origins of those tools. The excitement of the "new" too often overshadows everything else. All too often, when a technology is rapidly emerging, its origins are lost. Or the landmarks and even the dead ends are not recognized for what they are as they are happening. It is only once someone has the perspective, knowledge and insight to chronicle the recent past that the various threads can be woven to create a meaningful history.

When "Electronic Perspectives" first appeared in *Contemporary Keyboard* magazine in 1977, the modern era of synthesizers was only a little more than a decade old. The longer pre-narrative of sonic creation by electronic means was woven into developments of less than a century of electrical and electronic history. And yet Tom Rhea managed to probe those elements of a history which was still in the making. The historian in me was captivated with this slice of history of a field in which I was already immersed and was developing at lightning speed.

I thought I knew a good deal about the origins and development of electronic instruments. Maybe I did about the theoretical underpinnings of the best-known digital and analog instruments. But so many clever, and a few not-so-clever, designers had invented and developed instruments that I was only marginally aware of. And a surprising number were completely new to me. Tom Rhea's articles during the years the column ran provided a wonderful first draft survey of the emerging history across the field of electronic instruments.

Each monthly installment provided another piece of the complex mosaic making up the field. We got to read Tom's wonderfully researched accounts of instruments that would make up the dominant trends and others which were the equivalents of those branches on the human evolutionary tree which split off to nowhere. Tom's approach wasn't to pass judgment, but to present what had happened. Dreamer inventors and visionaries experienced success, failure or something in-between with their creations. And Tom's mini-histories of the individual instruments related a bigger story where instruments which weren't a rousing commercial success, or maybe never came to market, could still have outsized influence on later developments.

My background as an historian recognized that in his multi-part series, extending over several years, Tom was giving us the foundation for making sense out of the stew of creative electronic designer/inventors. Musicians using these tools were bringing electronic creativity to a boil in the commercial market and recording and live music touring industry. In Tom's vignettes of electronic music history, the long view of technology history, puts this evolution into context. The snapshots of history collected in this book have increased in usefulness with the passage of time.

-Larry Fast

Larry Fast pioneered the celebrated series of electronic music albums under the aegis of Synergy. He worked with Peter Gabriel for some 10 years, and contributed to numerous platinum selling recordings by other world-renowned artists. Larry's commissions include those from Disney, XM Satellite Radio, and Tribune Broadcasting. His feature film and documentary work includes Saving The Great Swamp: Battle to Defeat the Jetport *broadcast by PBS, for which he served as co-producer and historian/writer. He is a recognized technology history specialist who serves on the Board of the Thomas Edison National Historical Park. His developments in infrared audio technology have earned several patents.*

Foreword by Brian Kehew

Tom Rhea's "Electronic Perspectives" columns were unexpected when they first appeared. In those days (1977-1981), they stood in sharp contrast to the forward-looking pages of *Contemporary Keyboard* magazine. The rest of the magazine leaned toward the newest electronic instruments, the coming of software. Even the ads were promoting The Big Future.

Keyboard magazine—as it came to be called—was largely a forward-looking venture. The concept of "vintage electronic musical instruments" was not really sensible yet. This was technology, and *forward* means *better* . . . older technology would therefore be *worse*–and useless to study.

Yet, here was a different direction altogether, with this picture of a grinning man—Tom Rhea, who seemed to know everything there was to know about early electronic musical instruments. Barring the Theremin and Hammond organ, I had never heard of most of these instruments, and certainly they were *all* difficult subjects to find anything about. This Rhea man was certainly a scholar (he had a PhD in this) and had certainly spent a lot of time unearthing this information—and getting it *the hard way*.

These were the pre-internet days for researchers like Tom, with card catalogs, engineering and music indices, telephone books, letters written, books in library stacks, old newspapers and magazines, flights to interview pioneers using his cassette tape recorder. The most "modern" thing Tom had was *microfilm*, with which he researched the entire *New York Times* from its inception to the date he completed his dissertation (1972). Imagine trying to find out how a never-manufactured European instrument existed, much less finding any reliable information on its technology or uses. Gathering such detail was well-nigh impossible when Tom started in the late 'sixties.

Today—some 50 years later—we have gone further with most of these instrument histories. Others have taken up the torch and followed any one branch of the tree as far as possible. Some of the instruments now have their own books or web pages, and more is being uncovered daily. But this was the start—someone chiseling his way through granite—and one of the first looks *backward* to understand the course of electronics in music. It was—and *still* is—a great opportunity to learn something from those creative attempts at developing newer and better sound.

Sometimes Tom's column still shows us all there was to find—the one photo that exists—or the few stories of an extinct instrument that no one alive today has ever heard. His columns are but a skeleton, to be fleshed out—a great starting point for other work. Other books, dissertations, and websites have relied heavily on Tom's research to build their own deeper stories. It might be difficult to find "new" places that don't have Tom's latent fingerprints.

While the history of electronic music has often been written from a parochial *American* viewpoint, Tom's dissertation, and this popularization through the pages of *Keyboard* magazine, lean toward a balanced view that includes contributions worldwide. American inventions are here (as they should be) but European instruments are just as evident. This alone made Tom's early research different—and opened doors to other researchers to follow the less-traveled path.

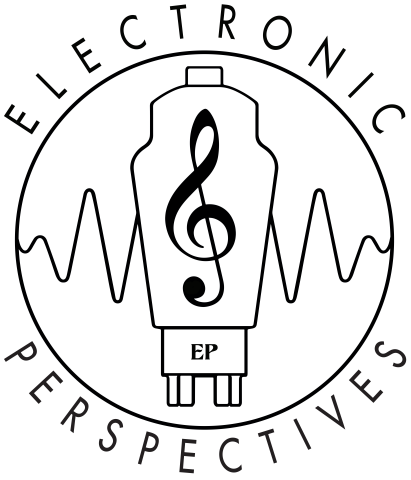
The title word *Perspectives* in his columns is the key here. "History *helps* you . . ." Tom has said. Those who can *see behind* are more likely to understand where the forward-looking paths will be. There are also deeper concepts to be learned from this work in your hands. Significant or not, the "dead-ends" of history are fascinating stories. Consider the *human* side—the costs, the time, the emotional toll on a hopeful inventor whose work never reached an audience. Some of their works had been totally neglected until these columns came out. Sometimes the greatest innovations failed, yet more pedestrian ideas persevered, and even influenced others' work.

As you go through these pages, step back and ask yourself about the deeper concepts beyond the simple story. The Cahill Telharmonium held great promise and took massive investments of capital and time, but its promise never flowered. But, it did echo *later* in the Hammond organs of the 1930s—which continue to function as totally valid instruments in today's world. It is fascinating to weigh the work spent to amplify a basic piano tone in those days—an effort which is truly trivial today. One can study the many devices designed just to create new waveforms, or the creation of human-instrument interfaces that made an instrument appealing—or not.

Tom Rhea retains a deep reservoir of information on this history. As with any good researcher, he went further into the subjects than the minimal necessity—and he continues to collect information on a few key subjects. Tom's depth of knowledge, and the gift of gab he learned as a synthesizer "clinician," make him an excellent panelist or lecturer at history-based events. He's spent his life in and around music, easily communicating all the myriad things he has learned. This book is a small sampling of what he still carries around in his head. It is a stepping-off point for the things he has learned and taught worldwide. Step off!

-Brian Kehew

Brian Kehew is a Los Angeles-based producer, author, and musician. His book Recording The Beatles *(with Kevin Ryan) is a classic in the field of audio technology. Much of his work involves archiving and mixing classic historical music for Warner Brothers Records. He also specializes in the history of synthesizer development and vintage audio technology.*



Introduction and Acknowledgments

I'm not certain it takes a village to raise a child, but it seems to take one to get a book into print.

There. That's just one of my many opinions, or should we say perspectives? "No, I'm not biased, I'm opinionated." That's what I said to a heckler who challenged my preference for the Moog synthesizer at one of my many public demonstrations, or "clinics." I've earned the right to have opinions—at least about electronic musical instruments and their history. This book outlines a few of those opinions, and a slice of that history. It's certainly not a comprehensive history—it's a Valentine for those who love electronic musical instruments. I know too much about the field to imagine that a definitive history could ever be written. Now, that's something that definitely would take a village! My friend and fellow researcher, the late **Hugh Davies** came closest, albeit in non-narrative form, by authoring many entries in *The New Grove Dictionary of Musical Instruments,* and in *The Grove Dictionary of Musical Instruments, Second Edition.* Hugh offered to share authorship of those articles, so I may be the only "academic" in history who turned down writing for *Grove* (due to what I considered to be their scandalously low pay scale). Thanks Hugh, for citing my research so generously and voluminously.

First of all, profound thanks to my parents **Charles K. Rhea, Sr.** and **Ellyn Cecelia Paradiso Rhea** for always being there for me (one or both of them, as they were divorced from each other twice, and married to each other three times)! This reminds me of my "career" working for Moog Music and Moog Electronics—I was fired twice and quit three times. (Bob Moog never fired me.) Reckon I learned something about love from Mom and Dad. Not sure what it is . . .

It has been my great fortune to have had many good teachers, and not a few powerful mentors. To enumerate the former would take a lot of ink, but I would like to mention some of the latter who helped shape my *life* as well as my intellect. I'm leaving out academic titles, as I've never used mine. I had to choose "drtomrhea.com" as my website only because some graphics artist out in the Midwest has the temerity to have *my* name locked up.

My foremost mentor was my late older brother **Charles K. Rhea, Jr.** He taught me how to be a *warrior* when working on a project. When one is precocious academically, and possibly musically, as I apparently was, it's easy to become complacent. I thought everything *had* to be easy—it certainly seemed that way. Only when Charlie told me " . . . when I'm working on a problem for a client, it *hurts* until I get the answer," did I realize that I had been just skating by, not really working. Deepest thanks, Charlie.

Those who successfully guide our initial forays deserve special credit. These include my first piano teacher **Mrs. Ethyl Williams** in Chattanooga, TN and my high school band director **Carlton Ray Morris** at Deshler High in Tuscumbia, AL.

At Florida State University (FSU) my trumpet teachers were **Robert T. Braunagel** and **Clifford K. Madsen.** Cliff taught me a great deal about playing the trumpet, but more about how to become a decent human being. Thank you "Brownie" and "Dr. Mad Sin" (strictly my appellation). I had so many excellent teachers there. A special shout out to **Rick Powell,** a mentor from that FSU period who became a lifelong friend, and a pioneer in the use of synthesizers in Christian music. Rick, we hardly knew ya . . .

At George Peabody College, now part of Vanderbilt University, members of my dissertation committee tried to pound some sense into my head about the realities of the world. (I was not a quick study in this regard.) Thanks to **Charles H. Ball, James H. Hogge,** and **Gilbert Trythall.** Particular thanks to Charlie Ball for urging me to write my Ph.D. dissertation using intelligible language rather than resorting to what he called "educanto." I had so many excellent teachers there, as well. **Sue Goss**, wife of Donald Goss, a fellow graduate student at George Peabody, taught me how to use the English language more effectively at her kitchen table. Thank you, Sue—those writing skills took me to many places.

During my many years working at Moog Music and Moog Electronics, I learned not only much about the principles of music technology, but valuable life lessons from **Robert A. Moog** and **David A. Luce,** known jocularly as "Mogen David" around the plant. I knew them as "a Moog," and "a Luce," and enjoyed deep friendship with both. Dave taught me to play golf, which I might get back to when this book is completed. I greatly enjoyed working with **Jim Scott,** for whom I acted as a functional design consultant. We made better musical instruments together, and he reinforced the necessity of instrument design "from the outside in," i.e. starting with the front panel and performance controls that the musician sees and touches. I became a better Owner's Manual writer for it. Thanks Jim, for putting up with my "bellowing with rage" (his description). Now, I'm "mellowing with age." Prior to those many years, I worked briefly for **Les Trubey** and **David Van Koevering,** early distributors of Moog synthesizers under the aegis of the Vako name. Les taught me to "hold steady" under pressure. Dave taught me his wild, wooly and effective brand of sales techniques, and to "not blur" when interacting with strong personalities. I can still hear David saying "don't blur–don't blur" any time I disagreed with him. No "Yes Men" for David Van Koevering! Thank you, gentlemen.

Thanks to my first wife **Mary Alice "Tricka" Treat Rhea** for sticking with me through thick and thin during those early years.

Of course, Librarians played a major role in shaping my dissertation and this book. **Jean Bowen,** Librarian, Museum of the Performing Arts, New York Public Library at Lincoln Center; **William Lichtenwanger,** Head of the Music Section, Library of Congress; and **Shirley M. Watts,** Head Librarian of the Music Department at George Peabody College assisted immeasurably. **Marillyn Craig, Lois Griest,** and **Miss Birdsong,** Reference Department at Joint Universities Libraries (JUL) of Vanderbilt University ferreted out sources for obscure publications I had uncovered and brought hard copies to me from places as distant as Russia via Interlibrary Loan. (Remember ILL in its heyday?) **Mr. McClelland,** who worked at Vanderbilt, produced some 80 large scale photographs of some of the images I had collected, and mounted these on archival acid-free stock. Thanks to all of you for taking a genuine interest in me and my Ph.D. dissertation *The Evolution of Electronic Musical Instruments in the United States* (1972 George Peabody College—now of Vanderbilt University). I realize that some may not resonate with my pedestrian "cabbages and Kings" viewpoint about historical research—photos from prestigious institutional archives found alongside graphics from **Popular Mechanix.** For those who seek a more rigorous treatment than this book provides—replete with footnotes and bibliography, please reference my dissertation—available on my *drtomrhea.com* website. These "Electronic Perspectives" columns are a popularization of that research.

Thank You!

Who are those who have facilitated the *possibility* of this book's production? First, a tip of the hat to **Jim Aikin,** editor of my "Electronic Perspectives" columns that appeared monthly in *Keyboard* magazine during 1977–1981. Those eponymous columns are the spine of this book, and define its limits, both temporally—not much past 1981—and in subject matter. This book isn't comprehensive—particularly given the mandated *keyboard* focus, but I've stretched its scope well beyond those columns. Jim never made an edit that didn't improve my prose. Reckon we knew we were birds of a feather upon discovering that each of us knew how to use the verb "comprise" properly! ("Compose" and "comprise" are *not* synonyms.) Thanks, Jim.

Mark Vail, author of *The Synthesizer: A Comprehensive Guide to Understanding, Programming, Playing, and Recording The Ultimate Electronic Musical Instrument,* and other seminal books in the field, provided all the editions of *Keyboard* magazine that featured those 52 "Electronic Perspectives" columns. Mark sent those magazines to my dear friend and *uber-tech* **Stephen Masucci,** restoration expert for all things analog, musical, and electronic: synthesizers, instruments, recording consoles, amps, etc. Steve hand carried those magazines to **Wally De Backer** (stage name **Gotye**), for whom Steve has restored numerous Georges Jenny Ondiolines (see text), electronic percussion devices, and some very arcane instruments. Wally, who has published incredibly accurate and beautiful research in the field under the aegis of *Forgotten Futures,* has generously taken an interest in my historical research. He commissioned **Mike Buffington** to scan and clean up those "Electronic Perspectives" columns, which he did—meticulously. **Larry Fast** and **Brian Kehew** wrote insightful Forewords for this book. Many thanks to all of you.

Beaucoup thanks to **David Mash,** renowned educator, superb musician, and Wizard of all things musical and technical. He hired me initially as his Assistant Chair, and then ensured that I stayed on as a faculty member for some 30 years, even though we were both alpha males who didn't immediately realize just how much we were and *still are* in agreement. But for David, I wouldn't have my defined benefit retirement that makes it possible to fool around putting books such as this together. I hope to at least break even with this enterprise. If not, it's still a Zen-like mission, something that *ought to be done*. I can presently *afford* to create this book (and likely lose money in the bargain) thanks to you, David.

Special thanks to **Brian Kehew,** coauthor of the inestimable tome *Recording The Beatles,* famed audio restoration and remastering artist, and author of other landmark publications. Brian asked **John "Captain Nemo" Blackford** to dummy up some cover suggestions for this book prior to my even starting the process of production. John's ideas via Brian inspired me to actually get going on this formidable task and are the basis of the photo array on the front of the slipcover. Of course, Brian is also Curator and Producer of the audio portions of this publication—which may turn out to have greater value than the printed matter. **Brian Kehew** and **Wally De Backer** have digitized essentially all of my archive of audio interviews of pioneers, photographs, writings, and other artifacts. I hope to present these materials on my website in future. Maybe it only seems to take a village—perhaps it just takes a coterie who *burn with brilliance*.

Warmest thanks to **Wendy Carlos**, with a special shout out to **Annemarie Franklin**, for providing unique photographs, extending great wisdom, and for sharing our laughs—through clenched teeth—about the Comedy of Humanity.

Many people contributed to the nuts and bolts production of this book. First and foremost, my then-undiscovered gem of a graphics artist (and musician) **Joseph Bastardo,** who designed every page in this book. He pulled rabbits out of hats, often as we sat side by side creating layouts. Joe scanned and enhanced hundreds of artifacts for this project. His fastidious restorations of photos and graphics brought tired images—seen in all too many places—to sparkling new life. His layouts seem to intuitively manifest what Susanne K. Langer calls *significant form*. His eye for detail, indefatigable energy, and thorough mastery of pertinent tools mark him as a true graphic arts professional.

For the record, a few typos, dates, and grammatical errors in the original "Electronic Perspectives" columns have been corrected. This publication represents the definitive versions. A few magazine pages and other images have been edited for historical accuracy. **Joseph Bastardo** made these quite difficult adjustments seamlessly!

Peter Donhauser, renowned authority who wrote *Elektrische Klangmaschinen: Die Pionierzeit in Deutschland und Österreich* and *Musikmaschinen: Die Geschichte der Elektromusik* revealed the mysteries of accessing German Archives and making contact with those Archivists. **Joel Chadabe,** author of *Electric Sound: The Past and Promise of Electronic Music* has provided invaluable insights perennially about the entire field. **Gayle Young,** author of *The Sackbut Blues: Hugh Le Caine, Pioneer in Electronic Music,* provided valuable guidance to Canadian Archives. **Daniel R. Wilson** brought new facts to light about Futurism and the Intonarumori. **Fred DiLeone** of Vintage Vibe Pianos and **Jon Borducci** of Tropical Fish Vintage Instruments commissioned new photographs of vintage Wurlitzer and Rhodes electric pianos (photo credits in text). **Mike Buffington** and **Andy Baron** provided brilliant photographs, and incredibly detailed information about Leon Theremin and his instruments. **Pril Smiley,** who was there, provided insight into the RCA Synthesizer and its group of composers. **Irwin Chusid** provided voluminous information on all things Raymond Scott and Sun Ra. **Rosalind Hall** was especially kind in providing insights into Australian Archives and the process of gaining permissions to print. **Christophe Duquesne, Lippold Haken,** and **Edmund Eagan** provided photographs of the Onde, Pyramid, Haken ContinuuMini, and Eagan Matrix Expander. **Naoyuki Omo** provided photos of his latter-day ondes Martenot, the Ondomo. Thanks to **Dave Brown** for the rare photo of the Raymond Scott Motown Electronium. Thanks to **Douglas Burnett Cross** for information about his uncle Burnett Cross. Special thanks to **IONE** and **Maggi Payne** and **Rick Smith** for providing photographs of Pauline Oliveros and Buchla instruments. Thank you, **Priscilla** and **Barton McLean,** for generously sharing artifacts from your long careers together. **Doug Jackson,** Hammond organist and aficionado, gave me invaluable hard copies of Hammond Company memorabilia that **Alan C. Young** had shared with him. Thanks to **Matt Traum** for assistance in garnering images of wind synthesis pioneers. Thanks to **Milan Guštar** for his comprehensive *Elektrofony I & II* books in Czech that detailed USA patent numbers for a variety of instruments. Major kudos to **Jean Laurendeau,** author of *Maurice Martenot, luthier de l'électronique,* who has helped not only this effort, but the entire field to gain a better understanding of the ondes Martenot due to his publications, performances, and pedagogy. Thank you **Douglas** and **Régine Heffer** for assistance locating French publications. **Frederik Adlers** graciously lent me Harold Rhodes' *Sit Down and Play* (www.fenderrhodes.com). **Ian Helliwell,** author of *Tape Leaders,* clarified information regarding British composers of electronic library music (tapeleaders.co.uk).

Introduction and Acknowledgments

I've been fortunate to know a number of the early pioneers and figures in the field, and have interacted significantly with some of them. They've kindly given me many photographs and graphics. My heartfelt thanks for this largesse to: **Milton Babbitt, Harald Bode, Edith Borroff, Donald F. Buchla, Wendy Carlos, Joel Chadabe, Emmett Chapman, Irwin Chusid, Suzanne Ciani, Burnett Cross, Hugh Davies, Wally De Backer, Peter Donhauser, John Eaton, Gerry O'Grady, Lejaren Hiller, Brian Kehew, Earle L. Kent, Gershon Kingsley, Hugh Le Caine, David A. Luce, Max V. Mathews, Benjamin F. Miessner, Abraham Moles, Robert A. Moog, Harold Rhodes, Curtis Roads, Clara Rockmore, Oskar Sala, Eric Siday, Pierre Schaeffer, Walter Sear, Jim Scott, Raymond Scott, Nyle Steiner, Robert J. White, Alan C. Young,** and **Gayle Young.** In several cases, I've been able to reciprocate by providing resources for their publications. Some of these people have passed on, and their artifacts are now located in formal archives and institutions. I've tried to indicate current provenance for such, even though I often have a copy that was given to me personally. I've possessed some of the photographs and graphics that appear in this book so long, I frankly can't recall who gave them to me. As someone who deeply respects intellectual property, I invite surviving family members, and such institutions or archives to contact me if I've not provided proper attribution in this book.

Thanks to archives, museums and others for access to images: **David Gleason** and **Frank Berry** for access to magazines (worldradiohistory.com); **Uncle Sam** for U.S. patents available by patent number at (patft.uspto.gov/netahtml/PTO/srchnum.htm); **Terry Smythe, Michael Kukral, Keith Bigger,** and **Glenn Thomas** (The AMICA Bulletin); **Sue Verzella** and **Warren Ashworth** (Nineteenth Century Magazine, Victorian Society of America); **Arian Sheets** (Witten-Rawlins Label Collection, National Music Museum, The University of South Dakota); **Margaret Downie Banks** (Conn Archive, National Music Museum, The University of South Dakota); **Edith Borroff** (College Music Society Symposium); **Carolyn Grant** and **Jonathan Piper** (Museum of Making Music); **Caroline Haas** and **Anne Biber** (Technisches Museum Wien); **Lesley Ruthven, Jade Leonard,** and **Mick Grierson** (Daphne Oram Trust, Goldsmiths, University of London); **Andria Hoy** (Cleveland Orchestra Archives); **Robert Sherman** (The Nadia Reisenberg and Clara Rockmore Foundation); **Mike Buffington** and **Andy Baron** (RCATheremin.com); **Zoe Webb** (Redpath Chautaqua Collection, University of Iowa Libraries); **Vincent Pupillo Sr., Vincent Pupillo Jr., Drew Raison** and **Benjamin Luce** (EMEAPP: Electronic Music Education and Preservation Project); **Michelle Moog-Koussa** (Bob Moog Foundation); **Jean Laurendeau** (Document famille Martenot, Document Ginette Martenot-Lazard, Document ADDOM); **Michel Ferland** (ATMA Classique); **Valerie Jackson, Kurt Cripe, Daniel Fisher,** and **Chuck Surack** (Sweetwater Sound); **Peer Bode** and **Rebekkah Palov** (Institute for Electronic Arts, School of Art and Design, NYSCC at Alfred University, Alfred, NY); **Peter Weibel** (Harald Bode Archive, Zentrum für Kunst und Medien (ZKM), Karlsruhe, Germany); **Gerhard Steinke** (Gerhard Steinke Archive); **Wally De Backer** (Forgotten Futures); **Anna Krutsch** and **Irene Püttner** (Deutsches Museum, München, Archiv); **Marcel Ruhl** (Stiftung Deutsches Technikmuseum Berlin, Historisches Archiv); **Martina Müller** (Fraunhofer Heinrich Hertz Institute Berlin); **Matt Traum** (Patchman Music); **Annekatrin Förster** (August Förster GmbH); **Jeroen van der Schaaf** (Basta Music); **IONE** (The Pauline Oliveros Trust); **Heather Gaunt** (Grainger Museum Collection, University of Melbourne); **John Leimseider, Don Kennedy,** and **Claire Neily** (National Music Centre, Canada Science and Technology Museum); **Stan Warnow, Deborah Scott Studebaker, Carrie Makover,** and **Liz Adam** (Reckless Night Music LLC); **Rick Smith** (The Buchla Archives); **David Vallancourt** and **Mindy Farabee** (Columbia University Engineering); **John Bewley, Cory Jacob Davis, Scott W. Schwartz** (Sousa Archives and Center for American Music, University of Illinois at Urbana-Champaign); **Roanne Wilcox** (Caramoor Center for Music and the Arts); **Jody Kravitz** and **Robbie Rhodes** (Mechanical Music Digest); **Emmett Chapman, Dan Chapman** and **Yuki Chapman, Greg Howard, Jim Reilly,** and **Bob Culbertson** (Stick Enterprises www.stick.com); **Maximillian Zaunder** (Wienbibliothek im Rathaus).

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Thanks to: **Michael Lehmann Boddicker**; **Joel Chadabe**; **Irwin Chusid**; **Wally De Backer**; **Brian Kehew**; **Michelle Moog-Koussa**; **Laurie Spiegel**; and **Rick Wakeman** for "advance praise" quotes.

Loving thanks to my wife **Muriel Louise Palmer Rhea**—to whom I've dedicated this publication—for understanding why I had to get this done—even if it may not make sense in strictly financial terms.

Thunderous applause to all, I literally wouldn't and *couldn't* have done it without you! Of course, errors or oversights caused by cracks due to my lack of understanding or diligence are on my head alone. Wabi-sabi. Cracks are how the light gets in (as per **Leonard Cohen**).

I'm a fan of **Carl Gustav Jung** (excepting the astrology)**,** and I suspect that *Electronic Perspectives* didn't happen accidentally. It took a lot of *synchronicity* and serendipity. Perhaps it *does* take a village. But the critical factor that determines the *excellence* of any enterprise is: exactly *who* are the people in the village? My grateful thanks to all the generous and talented people who populated my village in order to make this publication possible. Like Muriel and me, all of you will get your reward in, uh . . . Heaven.

Thank You!

This book is dedicated to my wife Muriel Louise Palmer Rhea.

Singer-songwriter, graphics and textiles artist, adult ice skating competitor and Coach.

She writes the songs that make my heart sing.

Synguru Graphic (opposite page) © Muriel Louise Palmer Rhea
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Colorized by Joseph Bastardo in 2017

Disc 1

Choralcelo
01 Regina Farrington: Choralcelo Demonstration Recording 2:40

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02 Porter Heaps: Hammond Demonstration Record 3:33
03 Korla Pandit: Temptation 2:37

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04 Daphne Oram: Bird of Parallax 4:16

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08 Suzanne P. Davis: Unknown Composition 2:37

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09 Maurice Martenot: Pastels Sonores 2 3:58
10 Jeanne Loriod: Sonorop Demo of Ondes Possibilities 2:05
11 Musical Demo 2:02
12 Special Effects 4:23

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13 Rob Schwimmer: Winter Skipping Pond 2:47

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14 Collins H. Driggs: When Day Is Done 3:13

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15 Sun Ra/Sonny Blount: Darn That Dream 5:04

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16 Jean-Jacques Perrey: Ondioline Presets 0:54
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Hellertion
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20 Bruno Helberger: Chopin Etude, Opus 10 No. 2 1:32

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21 Oskar Sala: Excerpt 0:26
22 Oskar Sala: Unknown Pop Song 0:48

Trautonium & Neo-Bechstein
23 Kristy Tscharikoff & Max Nahrath: The Swan 2:16

Trautonium, Neo-Bechstein & Hellertion
24 March Battalion 1:00

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25 Juan Blanco: Música Para Danza 5:32
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27 Else Marie Pade: Syv Cirkler 7:07

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Hanert Electrical Orchestra
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03 Lydia Kavina: Grainger Free Music No. 1 1:22

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04 Harald Bode: Melochord Demonstration Tape (1950) 3:22

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05 Harald Bode: Demonstration Tape (1960) 8:20

Bode Klangumwandler/Frequency Shifter
06 Harald Bode: Demonstration Tape (mid-1960s) 3:36

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07 Harald Bode: Demonstration Tape (1977) 4:42

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08 LM-1922 Demo LP: RCA Synthesizer (1955) 2:11
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10 John Eaton: Live Duet-for Bob Moog (Excerpt) 4:08

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14 Hugh Le Caine: Paulution 2:08

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15 Hugh Le Caine: Dripsody 2:02

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16 Raymond Scott: Electronium Excerpt 1 2:42
17 Raymond Scott: Electronium Excerpt 2 0:26

Scott Rhythm Modulator
18 Raymond Scott: The Rhythm Modulator Demo 1:42

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Con Brio ADS200
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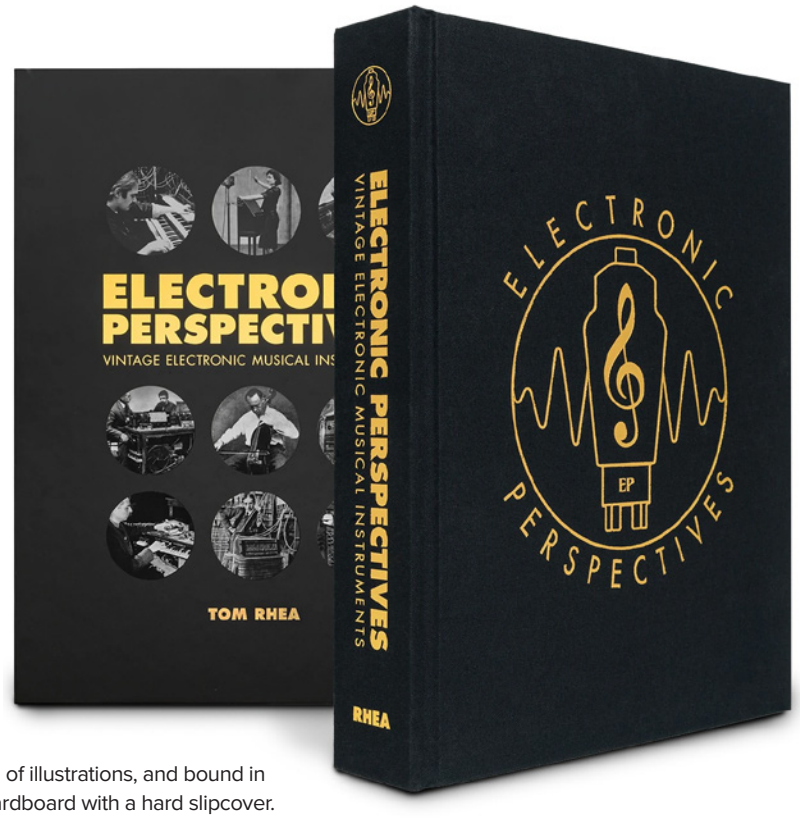
Electronic Perspectives: Vintage Electronic Musical Instruments

Hardback Book

Tom Rhea's colourful, comprehensive and insightful history of electrical and electronic music machines includes CDs with audio examples.

PAUL D LEHRMAN



When I was a kid, among my greatest joys was getting one of those Christmas toy catalogues in the mail. While my sister wanted the dolls and games and my friends all wanted the baseball gloves and football helmets, I salivated over techie stuff: transistor radios, electric trains and cars, building and highway construction sets, and walkie-talkies. Opening *Electronic Perspectives: Vintage Electronic Musical Instruments* is a lot like poring over one of those catalogues, only looking backwards. It's a huge and beautifully put-together compendium of electrical and electronic musical toys, going back well over a century.

Overview

Tom Rhea was the right guy to write this book. He is one of the sages of the electronic music era, having penned a column called *Electronic Perspectives* for the late, lamented *Contemporary Keyboard* (later just *Keyboard*) magazine from 1977 to 1981. His PhD thesis, back in the days before the Minimoog (for which he wrote the owner's manual), was on the evolution of electronic instruments. He had a 30-year career teaching college courses in synthesis and synthesizers.

The book reflects the enormous knowledge Rhea has accumulated: it's over 400 pages, and weighs upwards of seven pounds. All 51 of his columns are here, reproduced with their original layout and typefaces, accompanied by over 300 pages of illustrations, and bound in stiff cardboard with a hard slipcover. Attached to the back cover are two CDs containing some 53 musical examples totalling 1.5GB, some of which have never been heard before, and there are extensive notes about each track. It is, in one oversized volume, the history of electronic music, in words, pictures and recordings, from the pre-vacuum-tube era to the dawn of digital audio workstations.

What might be most remarkable about the columns, besides how well they hold up today, is that Rhea did all of the research for them the old-fashioned way, long before there was an Internet. As musician and author Brian Kehew, who helped on the project, says in his foreword, Rhea used "card catalogues, engineering and music indices, telephone books, letters written, books in library stacks, old newspapers and magazines, [*and*] flights to interview pioneers using his cassette tape recorder", as well as the *New York Times* on microfilm. Much of the information in his columns would still, even in the age of Google, not be easy to find. Stylistically, though, the columns don't feel at all dated — Rhea's conversational voice remains as pleasant to read as it is informative.

But while the columns form the basic framework of the book, they are enormously augmented by the work of graphic artist

Electronic Perspectives

$99

PROS

- A comprehensive history.
- Covers both familiar and less familiar instruments.
- Includes two CDs with audio examples.
- Gorgeous graphics.

CONS

- None.

SUMMARY

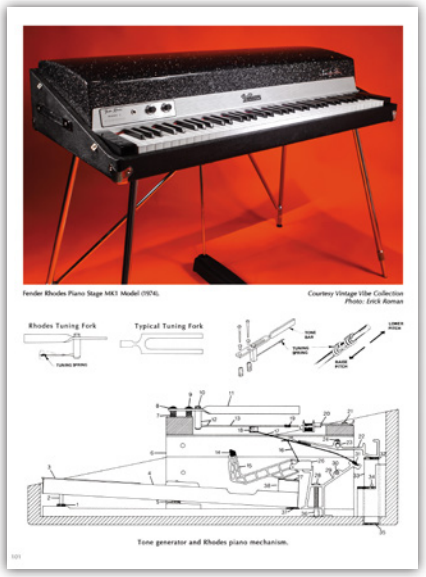
A wonderfully compelling and thorough history of electrical and electronic musical instruments from the pre-valve era to the dawn of computer music.

Joseph Bastardo, whose contributions include restorations of vintage ads, product brochures, concert programs, photos, patent documents, newspaper and magazine articles, and many other materials. As you can see from the sample spreads included in this review, they are simply gorgeous.

Some of the instruments the book covers will be familiar to today's readers: the Theremin, the Wurlitzer and Rhodes electric pianos, the Hammond organ, and Robert Moog's analogue synthesizers. Some others will be less well-known: the RCA Mark II synthesizer, for example, which, with its 1700 valves, took (and still takes) up an entire room on 125th Street in New York City, and to which Rhea devotes six columns; the Ondes Martenot, invented in the 1920s but which still has active players in France and Canada; the Ondioline, conceived by Frenchman Georges Jenny in 1939 and used to great effect by Al Kooper on his seminal 1968 album *Super Session*; and Don Buchla's keyboardless modular synths. There are also a lot of instruments and systems in the pages and on the discs that will probably be brand-new to most readers, such as the Hellertion, the Electronic Sackbut, the Pianorad, the Clavivox, the Multi-Track Tape Recorder (not what you think it is!) and the Cellulophone. And there are instruments made by well-known inventors and companies that never got popular, such as: Hammond's Solovox (presented here on disc by the legendary Sun Ra) and Novachord; Theremin's Terpsitone and electric cello; Telefunken's Trautonium; and an early electric piano from the German piano maker Bechstein.

Structure & Highlights

The book starts out with three essays about Thaddeus Cahill's 1900 invention of the Telharmonium, an electro-mechanical monster of an instrument that used dynamos (electrical generators) to produce powerful audio signals that were transmitted to subscribers in New York City in real time over telephone wires. It was, arguably, the first electric instrument to enter the public eye. It also pre-dated other subscription music services by about 100 years! The size of 10 railroad freight cars, it occupied an entire building in midtown Manhattan, and required two musicians to play it. Although its means of tone production was revolutionary, its repertoire was hardly so: in order to attract subscribers, Telharmonium programs consisted mostly of light classics



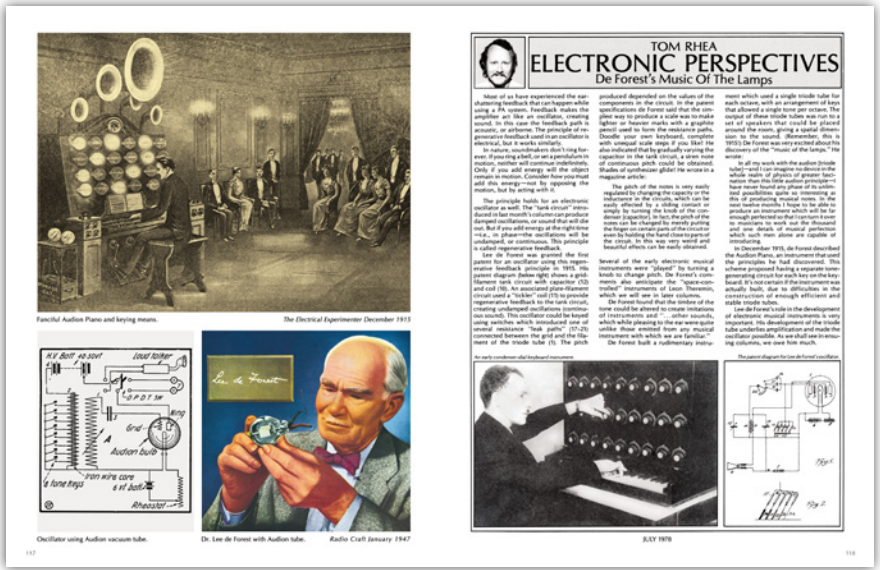
and popular tunes of the day. But despite huge investments in the instrument, and a formidable marketing campaign, it was a colossal failure. According to some who heard it, the instrument's sound was impressive (Mark Twain pronounced himself a fan) but, alas, no recordings of it have survived.

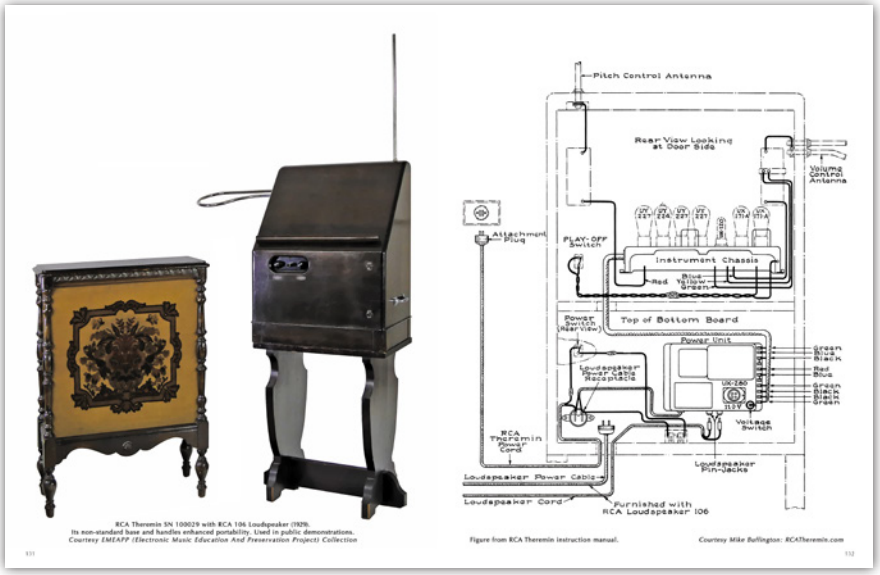
Rhea organises the book in the chronological order in which his columns were published, and these don't necessarily reflect the chronology of history. Yet this serves him well when he follows the Telharmonium columns with two on the Hammond Organ, introduced in 1933, which was in a technical sense a direct descendant of the Telharmonium: the dynamos were replaced by small metal wheels spinning alongside miniature electromagnets, whose output was amplified by now-ubiquitous vacuum tubes. Unlike its predecessor, of course, this invention was a great success.

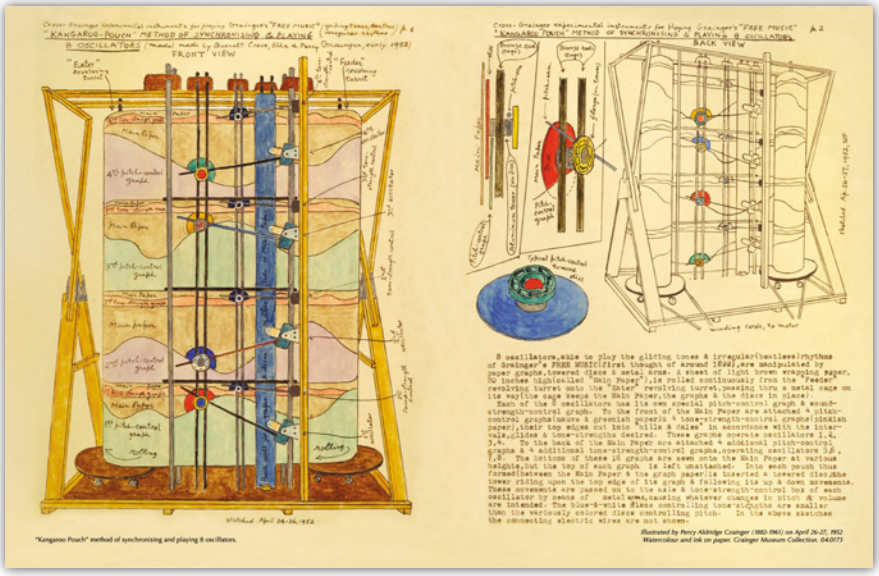
Later in the book he goes back earlier in time to what he calls the first 'electronic' instrument — that is, one that used nothing but circuitry to produce sound, with no moving parts: the Singing Arc of 1899. An English physicist named William Duddell discovered that if you attached a shunt circuit to a high-voltage DC carbon-arc lamp, you could make it oscillate in the audible range. The frequency of the oscillation depended on the components in the shunt circuit (resistor, inductor, capacitor) and thus you could design a keyboard that would play different pitches by varying the values of the components. There was no need for a speaker—the arc itself produced plenty of sound! (The same principle is used today in the plasma tweeters found in some high-end speakers.)

Following a column on Harald Bode's Vocoder and Klangumwandler (frequency shifter), and audio demonstrations of both on the discs, are four pages on Bell Labs' 1939 Voder keyboard-controlled speech synthesizer, which they nicknamed Pedro ("About a year's practice enables an operator to make Pedro talk glibly," states an article from *Popular Science* magazine), and four more pages on the Sonovox, the first talkbox (which could also be used as an artificial larynx) from 1942.

This book also covers instruments that Rhea didn't get a chance to write about in his columns. For example, he devotes six pages to the Choralcelo, a variation on a piano that used electromagnets to vibrate the strings so they could sustain tones, not unlike today's EBow for guitars. Along with two pages of colour photographs, he »







» reproduces an article from 1916 that calls it "the most wonderful musical instrument ever thought out by the human mind". A sampling of it is the first track on disc 1, and it is indeed lovely, a cross between a piano and a seven-octave flute choir.

The illustrations and the recordings on the discs expand greatly on the columns. Rhea's essay on Leon Theremin's various non-keyboard instruments is followed by no fewer than 25 pages of illustrations (including a high-school photo of Robert Moog playing his home-built Theremin), and then a column on the Ondes Martenot, which used very similar electronics but presented a completely different user interface, is accompanied by 18 pages of pictures. On the discs are three Theremin tracks (including a multitrack performance by Theremin cousin and student Lydia Kavina of a piece by Percy Grainger), four Ondes Martenot tracks, and a demo of a 21st Century polyphonic descendant of the Ondes Martenot, the Haken Continuum Fingerboard.

The RCA Mark II, introduced in 1956, was the first digitally controlled synthesizer to get widespread recognition, if not use — only one was made and only a small handful of composers knew how to work it. Rhea gave it no fewer than six columns, in which he took the opportunity to explain sampling theory, binary numbers, how various electronic instruments approach the issue of portamento differently, and what is often lacking in the performance of electronic music. The corporate motivation behind the Mark II was not to create a new platform for experimental music, which is where it ended up, but to replace conventional musicians and studios with a single machine for playing and recording music. The tracks on disc 2 hardly support this notion: they are laughably wimpy and sterile!

Many, many more instruments and their inventors are profiled. The brilliant and secretive Raymond Scott and his Rhythm Modulator, probably the world's first sequencer, and his automatic composing machine the Electronium (which was to be adopted by Motown Records head Berry Gordy, who also had visions of replacing humans), gets five pages and three CD tracks. Oskar Sala and the Mixtur-Trautonium, used to great effect in Alfred Hitchcock's horror film *The Birds*, is represented by four tracks. There are three columns about instruments that used light and photocells to produce music, and a total of 41 pages devoted to the evolution of the electric piano. And, of course, there are 24 pages about Robert Moog and his many innovations, from his first prototype to the Polymoog.

The final text entry is Rhea's farewell column from June 1981, which for the first time talks about the role of computers in making music. "In my opinion," he wrote hopefully, "the artistic — and commercial — success of the instruments produced in the next 10 years will depend more on the willingness of their designers to research and read existing literature on psychoacoustics and ergonomics (human engineering) than on startling technological breakthroughs." But then came MIDI, and the musical instrument paradigm changed completely: the physical characteristics of an instrument no longer needed to bear any relationship to what it sounded like. Ergonomics, for a while, took a back seat to making sure we had the latest sounds, but as the recent explosion in alternative controllers shows, they're getting attention once again.

A Book Worth Owning?

Electronic Perspectives: Vintage Electronic Musical Instruments ranks as one of the most valuable resources ever about the history of electronic music. Its combination of friendly text, beautiful pictures and unique recordings make it both useful as a reference and highly enjoyable to peruse. It's not cheap, but it will live in your library for a very long time, and although it covers scores of obsolete technologies, it will never itself become so.

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