

CONTENTS

About the Author.....	3	2000 and Beyond.....	38	Part 3: The Technical Stuff.....	82
Introduction.....	4	Amp Modeling.....	39	The Science of Sound.....	82
Part 1: The History of Guitar Gear.....	5	Guitar Apps.....	39	Vibrations.....	82
The 1930s.....	5	8- and 9-String Guitars.....	39	Amplitude and Types of Waves.....	82
The First Electric Guitars.....	5	Guitar-Based Video Games.....	40	Overtones (Harmonics).....	82
The First Amplifiers.....	6	Look, Ma, No Amp!.....	40	Modulation.....	83
Early 7-String Guitar.....	8	Fractal Audio Systems Axe-FX II.....	40	The Order of Effects.....	83
Early Talk Box.....	8	Looking Ahead.....	41	Understanding Guitar Amps.....	84
The 1940s.....	9	Part 2: A Close Look at the Electric Guitar.....	42	Tube Amps.....	84
“The Log” by Les Paul.....	9	Understanding the Electric Guitar.....	42	Solid-State Amps.....	84
The Myth of the First Electric Guitar.....	10	Strings.....	43	The Combo Amp.....	85
Leslie Rotating Speaker.....	10	Gauge.....	43	Amp Heads and Stacks.....	85
Flanging.....	11	Types of String Windings.....	44	Basic Amp Features.....	86
Leo Fender.....	11	Roundwound.....	44	Boutique Amps.....	87
The Transistor.....	12	Flatwound.....	44	Point-to-Point Wiring.....	87
The 1950s.....	13	Half Roundwound and		How to Chain Amps Together.....	87
Fender Broadcaster.....	13	Quarter Roundwound.....	44	Understanding Speaker Cabinets.....	88
Fender Precision Bass.....	13	Materials.....	45	Cabinets.....	88
Gibson Les Paul.....	14	Ball End.....	45	Speaker Cones.....	88
Tremolo and Vibrato.....	15	Coated Strings.....	46	Open Back or Closed Back?.....	89
The Origins of Fuzz.....	15	Pickups.....	47	Ohmage and Impedance.....	90
Tape Echo.....	16	Single-Coil Pickups.....	48	Tubes.....	90
Gibson Flying V.....	17	Humbucking Pickups.....	49	Inside a Vacuum Tube.....	91
The 1960s.....	18	Active Pickups.....	50	Preamp Tubes.....	91
Fuzz Boxes.....	18	Handwound Pickups.....	51	Power Amp Tubes.....	91
Ring Modulation.....	19	Electronics.....	52	Biasing.....	92
Marshall Amps.....	19	Fender Stratocaster Setup.....	53	Rectifiers and Rectifier Tubes.....	92
Marshall JTM 45: Beginning of the		Gibson Les Paul Setup.....	54	Signal Flow and Level.....	93
Marshall Stack.....	20	Series and Parallel Pickup Wiring.....	55	Flow.....	93
Compression.....	21	Coil Tapping and Splitting.....	56	Guitar Gear Levels.....	94
Fender in the 1960s.....	21	In and Out of Phase.....	57	More About Effects Loops.....	94
The Wah-Wah.....	22	Kill Switches.....	58	Noise.....	95
Innovations in the Late 1960s.....	23	Tone Woods.....	59	Noise Reduction.....	95
The 1970s.....	24	Plywood in Electric Guitars.....	60	Noise Is Everywhere.....	96
Mesa/Boogie.....	24	Wood Setup for		Scrubbing the Noise.....	96
Talk Box.....	25	Gibson SG Standard.....	61	Other Ways to Reduce Noise in Your Rig.....	98
Phase Shifter.....	25	Wood Setup for Paul Reed Smith		Physical and Virtual Effects.....	99
MXR Phase 90.....	26	Custom 24.....	62	Cabling.....	101
Other Phasers.....	26	Wood Setup for Fender Stratocaster.....	63	Cable Test.....	102
Morley.....	26	Wood Setup for		Part 4: Real Rigs and What They Can Do.....	103
Replacement Guitar Pickups: DiMarzio.....	27	Carvin Custom 7-String.....	64	Real Rigs.....	103
Roland.....	27	More About Guitar-Building Materials.....	64	Small Rig.....	103
Compressors and Limiters.....	27	The Truss Rod.....	65	Medium Rig.....	104
Ibanez.....	28	Fretboard Radius.....	66	The “Real” Rig.....	105
Innovations in the Late 1970s.....	28	How Radius Affects Playability		Setups for Different Musical Styles.....	106
The 1980s.....	29	and Performance.....	66	The Blues Sound.....	106
Paul Reed Smith.....	29	Compound or Conical		The Country Sound.....	107
Bradshaw Switching System.....	30	Fretboard Radius.....	67	The Jazz Sound.....	108
Rockman X-100.....	30	Scale Length.....	68	The 1970s Classic Rock Sound.....	109
Floyd Rose Tremolo System.....	30	Conventional Scale Lengths.....	69	The Funk Sound.....	110
MIDI.....	31	Frets.....	70	The Heavy Metal Sound.....	111
Tube Preamp.....	31	Fret Maintenance.....	70	The 1980s Hair Metal Sound.....	111
Tube Power Amp.....	31	Fret Type and Size.....	71	The Djent Sound.....	112
Eventide H3000.....	32	Number of Frets.....	71	Over the Top Madness.....	113
Customizing Marshalls.....	32	Neck Profile.....	72	Setups of Legendary Players.....	114
Double and Quad Guitars.....	33	Tuning Pegs (Machine Heads).....	73	The Eddie Van Halen Sound.....	114
SansAmp.....	33	The Nut.....	74	The Jimi Hendrix Sound.....	116
The 1990s.....	34	The Locking Nut.....	75	The Tom Morello Sound.....	118
Pro Tools.....	34	The Compensated Nut.....	76	The Michael Angelo Batio Sound.....	120
Matchless.....	34	The Bridge.....	76	The Joe Satriani Sound.....	122
Digitech Whammy Pedal.....	35	The Whammy Bar.....	78	The Randy Rhoads Sound.....	124
Parker Fly.....	35	How to Live in Peace with		The Charlie Christian Sound.....	126
Grunge Pedal.....	36	Your Double-Locking Trem.....	80	Conclusion.....	128
Sovtek.....	37	Locking Down a Trem (Blocking).....	81	Additional Reading.....	128
Innovations in the Late 1990s.....	37				

PART 1: THE HISTORY OF GUITAR GEAR

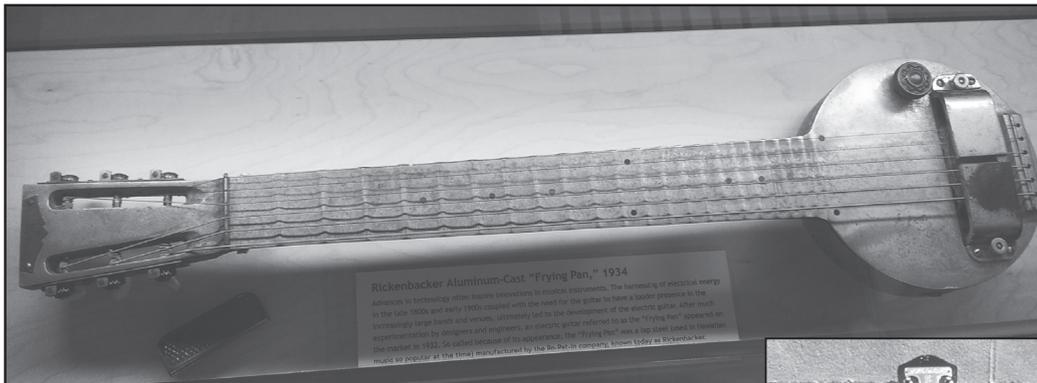
THE 1930s

Despite the stock market crash of 1929, which plunged America into the Great Depression, the 1930s were a time of significant technological innovation on multiple fronts. Along with the invention of frozen food, color film, the chocolate chip cookie, and a host of other conveniences, the electric guitar was born in 1931.

The First Electric Guitars

Jazz guitarists, such as Eddie Durham, Charlie Christian, Les Paul, and George Barnes, as well as Hawaiian slide players, needed to be louder to cut through the band. Many had tinkered with various methods of attaching microphones to banjos, violins, acoustic guitars, and other instruments, but it seems the “Frying Pan Guitar,” invented by George Beauchamp, claims the distinction of being the first truly electric guitar. Beauchamp had also helped to develop the Dobro Resonator Guitar and co-founded the National String Instrument Corporation, through which he was acquainted with Rickenbacker, who would soon be manufacturing the first mass-produced electric guitars. The Hawaiian lap steel guitar pictured below (officially the model A-22 manufactured by Rickenbacker Electro Instruments) was the first electric guitar and earned its nickname due to its obvious resemblance to a frying pan.

Photo by Doryfour



“The Frying Pan.” Note the two large magnets that acted as pickups on this aluminum-bodied guitar.

The ripples of this important invention would be felt around the world, particularly in country music, which is now difficult to imagine without the inclusion of electric slide guitar in its many forms, be it the lap steel, pedal steel, or bottleneck slide. Close on the heels of the A-22 came the Electro Spanish Guitar, also by Rickenbacker, pictured to the right.

The Electro Spanish Guitar.



Photo Courtesy of Eben Cole/Cole Music Company

Guitar-Based Video Games

In 2005, electronic entertainment company RedOctane released the *Guitar Hero* video game, and suddenly there was vast renewed interest in guitars and guitar-driven music. *Guitar Hero* was followed by the *Rock Band* video game by Harmonix, and perhaps even inspired Ubisoft's 2012 game *GuitarSmith*, which allowed the user to plug in a real electric guitar and play! These fun inventions provided a much needed shot in the arm for recession-weary music merchandisers everywhere!

Look, Ma, No Amp!

In the post-2000 era, there was a growing movement away from amp dependence. Many players, such as Misha Mansoor of Periphery, didn't use amps at all any more and simply plugged a studio-grade modeling processor straight into the P.A. system or the monitors of a home recording studio. This eliminated the need for amps, pedals, speakers, and microphones.

The device of choice of tech-savvy tone geeks appeared to be all-in-one units that could serve as a live direct box, an interface to a computer environment, a multi-effects processor, and an amp modeler. Many such devices exist, including the Fractal Audio Systems Axe-FX released in 2006, Digidesign 11 Rack in 2009, and Digtch iPB-10 released in 2010. The iPB-10 acts as a docking and control station for the Apple iPad. All of these units are powerful tools for the modern guitarist and provide a vast array of features and capabilities, which may sometimes not be easily accessible without considerable effort on the part of the user. That said, the younger the user, the easier the job, usually—due to the increasing familiarity with computer-based technologies by younger users.

Fractal Audio Systems Axe-FX II

So where has nearly 100 years of electric guitar tone evolution finally led us to in the 2010s? The Fractal Audio Systems Axe-FX II, now in its 3rd generation, has risen to the top as, arguably, the best all-in-one guitar rig available. It's a two-space rack unit that can be connected to any computer via a USB cable, so editing can be done on a full-sized screen or on the unit's front panel LED display. Two kinds of software are used with the Axe-FX II: Firmware, which is the software onboard the unit, and Axe Edit, which must be downloaded to a computer and is used to program the unit and organize the patches. The software evolves very quickly, and updated versions of both are released frequently. The downloading and installation of these updates adds more features and better tone quality to the unit. This is the result of a fast-moving R&D (research and development) team and constant feedback from active online user forums, where players swap patches, ask each other questions, report bugs, and request new features from Fractal. Historically, a new physical unit was released when the CPU power of the old version could no longer handle the demands of the new software.

Photo courtesy of Fractal Audio Systems



Fractal Audio Systems Axe-FX II.