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Ken Parker Bubbles model archtop

AXES OF INNOVATION

CREATIVE NEW GUITAR CONCEPTS FOR THE MODERN AGE

CREATIVE NEW GUITAR CONCEPTS **FOR THE MODERN AGE**

By Keith Baumann

Most of us don't think twice when we plug our beloved Strats or Teles into a digital tuner, run them through a DSP effects processor, or even connect directly to a laptop or tablet computer. But there is irony inherent in this scenario—kind of like a driver in a Model T Ford talking on an iPhone. The fact is that despite major advances in technology, the basic design of the acoustic and electric guitar has been surprisingly stagnant throughout the decades.

Over the past 70 years, guitar culture and instrument design have remained highly resistant to change, with players and manufacturers slow to adopt new concepts. Although computer technology has greatly impacted the way we make instruments and generated an explosion of digital outboard gear, players tend to stay stubbornly loyal to the classic guitar designs, choosing instruments that pay tribute to the legendary axes first introduced to us by industry giants like Martin, Gibson and Fender. Among such a conservative marketplace, innovation is an extremely risky proposition. One has to dig deep to uncover those with the true grit to push tradition and blaze entirely new trails into the guitar universe.

In seeking out trends in guitar innovation, we stayed focused mainly on the instrument itself, targeting concepts and technologies that occur within the guitar and not through outboard gear or external software. Each represents a notable departure from standard methodologies. Our research revealed several key categories where there is a significant amount of development as well as a noticeable interest from musicians. These include innovative bracing patterns, new body design concepts, unconventional construction materials, fan fret models (variable scale length), amplification/pickup technology and on-board DSP/MIDI capabilities.

Bracing

Simply put, bracing a guitar's top is a necessary evil on wooden instruments with hollow body chambers such as acoustic flattops and archtops. The braces' main function is to strengthen the soundboard so that it does not distort when placed under pressure by the strings. In order to vibrate freely and produce rich tone, a guitar's top needs to be thin enough to react efficiently to the playing, yet stiff enough to resist any warping. The compromise is a pattern of thin wooden struts glued to the underside of the top.

Most acoustic flattops utilize a variation of X-bracing, which places the struts in an "X" pattern across the soundboard (a technique that has been around since the 1840s). Archtop instruments generally use either a parallel bracing system consisting of two tone bars placed on the bass and treble side of the top, or an X-brace pattern similar to flattops.

Bracing is an absolutely critical factor in shaping a guitar's tone, and the battle of stability-versus-tone has been raging for years. Techniques such as scalloping or shaving braces and tap-tuning tops to maximize responsiveness are common practices. But despite all these subtle variations, most luthiers still rely on traditional bracing methodologies. There are, however, a select few who have strayed far from the pack and are attempting to test the laws of physics.

Mike Shellhammer was driven to find a better way to brace an acoustic guitar without causing significant dampening to the top's vibrations. After 15 years of development, he created the Suspended Bracing System (SBS), which utilizes two aluminum bars that are suspended from the soundboard, anchored only at their ends. This allows the entire top to vibrate freely while still providing the necessary stability. Shellhammer also felt that the traditional placement of the soundhole in an acoustic guitar was not optimal since it weakened the overall structure, requiring the need for stiffer bracing. His design relocated the opening off to the side, closer to the player's ear, which he felt had structural advantages and greatly enhanced the overall playing experience.

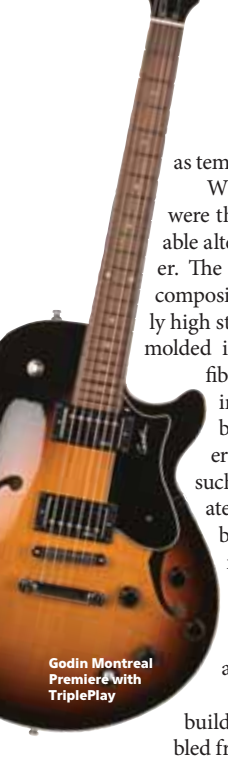
This radical new concept became the cornerstone of the Boulder Creek Guitar Company, which has been manufacturing a successful line of SBS-equipped guitars for six years. According to Jeff Strametz, CEO of Boulder Creek Guitars, "It was very difficult to sell the concept to guitar manufacturers since it was something so foreign and completely different." Strametz describes his guitars as exceptionally well-balanced, producing a tone reminiscent of instruments that sell for a significantly higher price tag.

Luthier Lukas Brunner is another innovator who felt dissatisfied with the traditional X-brace design. Brunner noticed how gluing on braces actually divides a top into several different sections that each vibrate unevenly. His solution was to create the "Flying Top" bracing system. Traditional braces are replaced by an extra layer of spruce that is glued onto the center of the top to create additional strength. Brunner then adds a set of wood braces that are supported on the sides, contacting the top in only one spot. These floating braces, along with his use of a tapered top design, leave the soundboard free to vibrate and result in increased balance, clarity and volume.

Materials

When it comes to materials, tonewoods such as spruce, maple, mahogany, walnut and rosewood have all become widely accepted industry standards due to their ability to produce warm, complex tones. Although there are numerous additional hardwood species now being utilized, the industry remains focused primarily on wood as its primary choice for construction. The tonal advantages of wooden construction are obvious—just ask anyone who has ever picked on a vintage Martin guitar or strummed a Lloyd Loar L-5. So, why look for alternative materials? To begin with, environmental concerns such as unsustainable harvesting have made some of these woods more difficult, or at least significantly more expensive, to acquire. Furthermore, laws like the Lacey Act have actually made some species illegal to import. Availability issues aside, wood, among its many benefits, also has some distinct disadvantages. As good a sound transmitter as it is, wood is actually quite inconsistent, with variations in structure and density throughout any given slab. In fact, some will tell you that the most consistent thing about any wood is its inconsistency. To top it off, wood is highly susceptible to climate changes such

Traugott 7-string fanned fret

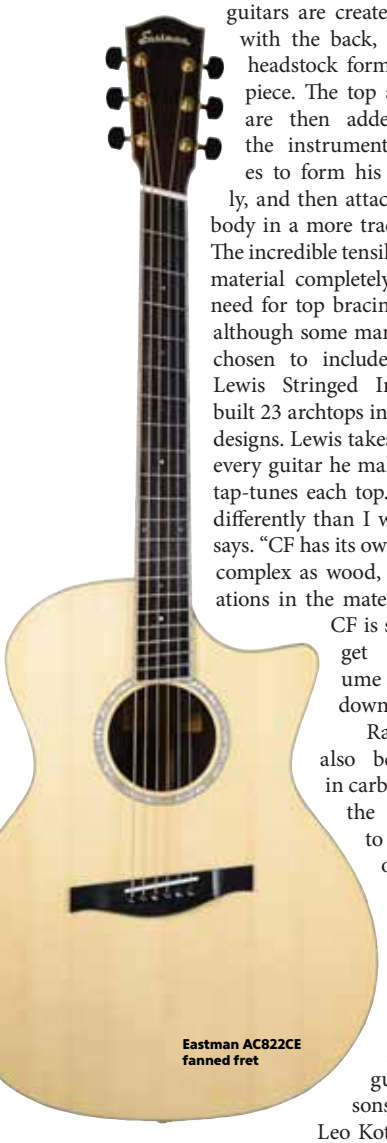


Godin Montreal Premiere with TriplePlay

as temperature and humidity.

With these drawbacks in mind, there were those who felt there must be a suitable alternative to wood as a tone producer. The answer was carbon fiber (CF), a composite material capable of an extremely high strength-to-weight ratio that can be molded into virtually any shape. Carbon fiber was already being used in racing cars and sailing boat hulls before its unique resonance properties were discovered by musicians such as Martin Lewis, who immediately recognized its potential and began constructing stringed instruments with it. Lewis is now among numerous builders working with carbon fiber, but his company is the only one that currently offers an acoustic archtop guitar model.

Unlike traditional instrument building in which a guitar is assembled from individual pieces, carbon fiber guitars are created from a mold, with the back, sides, neck and headstock formed as one solid piece. The top and fingerboard are then added to complete the instrument. Lewis chooses to form his necks separately, and then attaches them to the body in a more traditional fashion. The incredible tensile strength of the material completely eliminates the need for top bracing or truss rods, although some manufacturers have chosen to include them. Martin Lewis Stringed Instruments has built 23 archtops in 17- and 14-inch designs. Lewis takes great care with every guitar he makes and actually tap-tunes each top. "I tap-tune CF differently than I would wood," he says. "CF has its own sound—not as complex as wood, which has variations in the material throughout. CF is so even that you get consistent volume and tone up and down the neck."



Eastman AC822CE fanned fret

RainSong Guitars also believes strongly in carbon fiber and was the first company to offer a full line of CF guitars. President and CEO Ashvin Coomar says he feels that the consistency and repeatability of his guitars are reasons why artists like Leo Kottke play carbon fiber instruments. In addition, CF guitars are impervious to climate conditions. "As soon as you incorporate wood, you add a weak link that is susceptible to climate and stress," Coomar says. RainSong also notes that not all CF guitars are the same, as there are several different weaves and manufacturing methods that can shape the sound in various ways. "We do not try and replicate the tone of wood, but bring out the unique sound of the material," Coomar says of his carbon fiber guitars. RainSong and Lewis are not alone in the carbon fiber revolution: Companies such as Blackbird Guitars, Composite Acoustics and Emerald Guitars all produce CF instruments.

Andy Reiss plays a Martin Lewis carbon fiber archtop

Fanned Frets (Variable Scale Length)

Any musician who has broken a string, or struggled to get their instrument to play perfectly in tune up and down the fretboard, has been the victim of a little-known fact about guitars: The standard fixed scale layout used on nearly every guitar is inherently flawed. It's a compro-

Wilcox Atlantis ElectroAcoustic with Lightwave Systems Optical Pickups

mise at best. Guitars with a single scale length use only string gauge to control pitch and tension. This leads to intonation problems and varied amounts of tension across each string, which has a direct impact on playability and tone. The solution is fairly obvious and has actually been in use for hundreds of years on pianos and harps, which use a variable-length scale layout where the lower-pitched strings get progressively longer than the high-pitched ones. If you apply this theory to a guitar or bass, you get what is known as a "fanned fret" instrument, which replaces the common straight frets on the neck with ones that are aligned in a non-parallel pattern and actually fan out to create a longer scale length for the lower strings.

Ralph Novak of Novax Guitars is regarded as the pioneer of fanned fret instruments. He held the first patent in 1989. "I came to this through my repair work, where I learned how all tone begins with the string, so controlling the harmonic structure of each string individually makes perfect sense," Novak says. Adding individual scale length to the equation of string gauge and pitch opens up an entirely new world of possibilities that include perfect intonation, improved balance with a richer bass response, and optimal string tension. Novak adds, "Many builders are looking to simply recapture the past, but these instruments are a completely different paradigm."

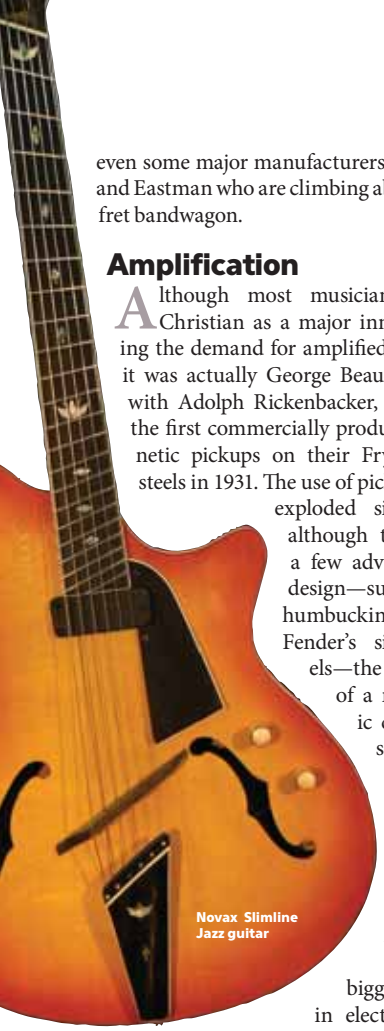
Jeff Traugott of Jeff Traugott Guitars is another practitioner of the fanned fret school who first embraced the concept when a client requested that he build an eight-string guitar. Fanned fret technology is especially well-suited for seven- or eight-string guitars, which encompass a much broader tonal range than traditional six-string designs. Crediting Novak as a major influence, Traugott focuses mainly on acoustic instruments—he was among the first to build a fanned fret acoustic.

"Fanned frets are all about maximizing scale length to the pitch," Traugott says. "It changes the quality of the sound and creates an entirely different instrument." Both builders agree that there has been a lot of resistance to fanned fret guitars in the market. They look radically different than a standard guitar, which makes it seem like they would be difficult to adapt to. This is apparently not true at all: Most players who have tried fanned fret guitars find the transition to be quite easy, with minimal adjustments and huge benefits. Fanned fret technology has grown slowly but steadily in the market since Novak's patent reverted to the public domain in 2006. There are numerous luthiers and

even some major manufacturers such as Lowden and Eastman who are climbing aboard the fanned fret bandwagon.

Amplification

Although most musicians cite Charlie Christian as a major innovator in creating the demand for amplified electric guitars, it was actually George Beauchamp, working with Adolph Rickenbacker, who introduced the first commercially produced electromagnetic pickups on their Frypan model lap steels in 1931. The use of pickups has literally exploded since then, and although there have been a few advances in overall design—such as Gibson's humbucking pickups and Fender's single-coil models—the basic technology of a metal or ceramic core wrapped in several thousand turns of fine copper wire has remained virtually unchanged since the mid-1950s.



Novax Slimline Jazz guitar

One of the biggest advances in electric guitar pickup technology in the last 60 years comes from a company known best for its acoustic amplification products. Originating from a desire to utilize new technology to overcome the limitations of the old, Fishman's new Fluence pickup replaces the traditional wound coil with a multilayer printed circuit board. According to Fishman CEO Larry Fishman, eliminating the wire-wrapping process addresses the problem of quality variations and noise that are unavoidable with the older technology. The result is a pickup that is predictable, repeatable, stable and extremely quiet. Fishman also notes that Fluence pickups are specifically designed to produce the classic sounds that we all know and love. "Fluence has all the benefits with none of the baggage," he says. "Technology brings things to the table, so why not take advantage of it?"

Taking a more radical approach, Lightwave Systems Optical Pickups redefine the entire paradigm of a pickup by using infrared light to detect string vibration instead of an electromagnetic field. According to Chris Wilcox, president of Lightwave Systems/Wilcox Guitars, the pickup actually sees a string's vibration but does not interfere with it in any way. The result is a neutral, accurate and clear tone, with improved sustain and no inherent noise. Ron Hoag actually began to develop this technology in 1968, but Wilcox Guitars is the first company to offer a line of instruments that feature optical pickups. "As a luthier, I was always looking for tone and sustain," Wilcox says. "I found that there were many inherent flaws in traditional magnetic pickups, which actually dampen sustain."

Kozm Guitars H1-4

Design

When it comes to true innovation in guitar design, there are a surprising number of talented builders who are breaking the mold and defying

tradition. Few would deny that Ken Parker is at the top of that list. Parker forever altered our perception of the solidbody electric when he introduced the Parker Fly guitar in 1992, but in recent years he has focused his attention on the acoustic archtop. Parker's love affair with the archtop began in 1973 when he first heard his guitar teacher's Gibson L12. "After playing a variety of other archtops, I felt most of them did not sound as good," Parker said. "They were heavy and bulky and not practical when amplified." Parker believes that an archtop must be light and flexible in order to be responsive and produce a full bass response. Parker also points out that since guitarists are not using a bow, their instruments should not be designed like a cello. His guitar designs feature several key innovations. He uses a unique system for attaching his necks to the body with a mounting post that suspends the fingerboard over the top, freeing the top to vibrate more and eliminating the need for a heel. The post is also adjustable so that the guitar's action can be easily altered without requiring the need for an adjustable bridge, allowing Parker to design a lightweight custom hollow bridge and maximizing sound transfer to the top. Another variance from the norm is Parker's sound port design, placed at the upper bout nearest to the player's chin. "If you want a guitar to feed back, just put the f-holes in the traditional spot," he quips.

Another interesting trend in guitar design makes full use of CAD/CAM capabilities and CNC-driven machinery to design and build guitars. Although computer-controlled machines are common practice in modern guitar manufacturing, most builders use the technology to automate repetitive tasks and do not take advantage of its creative potential. Jeff Kosmoski of Kozm Guitars takes digital technology to a whole new level by building ergonomic three-dimensional guitars designed and fabricated with the aid of computers and a computer-controlled router.

Kosmoski feels that most guitars remain rooted in 1950s two-dimensional technology and do not take advantage of today's modern tools. With a background in mechanical engineering and product design, Kosmoski creates a highly unique acoustic guitar that is carved from two pieces of hollowed-out tonewood. The front and back are then assembled to form the body without the need for separate side panels, allowing for the creation of soft curves along the instrument's edges. "My guitars look different and sound different, but they do sound like wooden acoustic instruments," Kosmoski says.

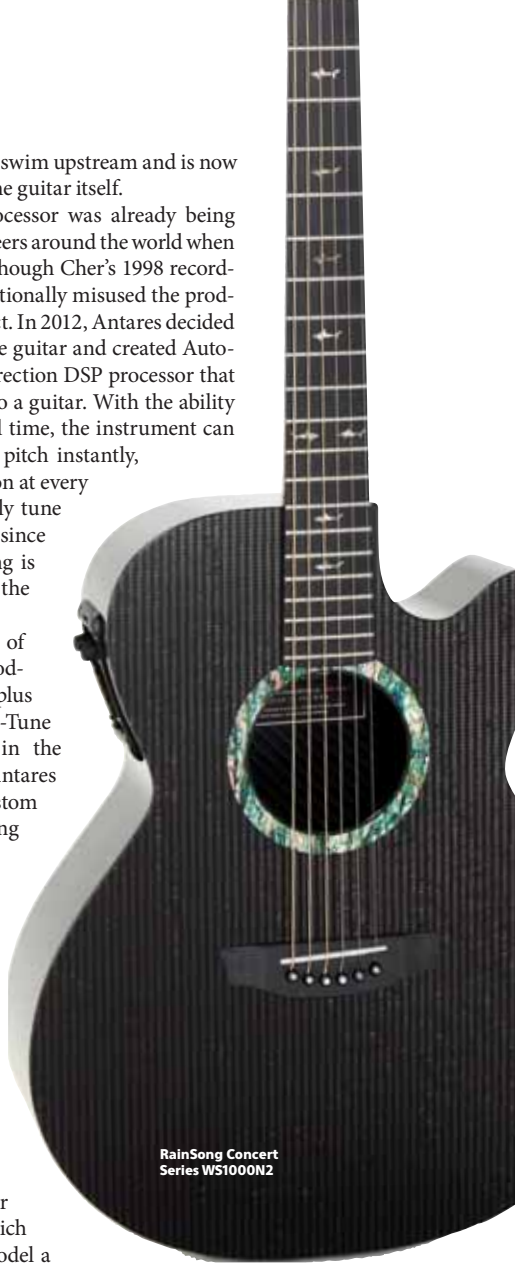
MIDI/DSP

Digital signal processing (DSP) technology has become widely accepted throughout the music industry and can be found in many guitar pedals and amplifiers. Commonly used for effects processing and amp modeling, DSP has mainly stayed within the domain of outboard gear. Recently, the technology has begun to swim upstream and is now being integrated right into the guitar itself.

Antares' Auto-Tune processor was already being used on recordings by engineers around the world when it came into the public eye though Cher's 1998 recording of "Believe," which intentionally misused the product to generate a vocal artifact. In 2012, Antares decided to apply its technology to the guitar and created Auto-Tune for Guitar, a pitch-correction DSP processor that can be mounted directly into a guitar. With the ability to process every note in real time, the instrument can correct any inaccuracies in pitch instantly, resulting in perfect intonation at every fret. It can also automatically tune itself at the push of a button since the actual pitch of the string is completely independent of the processed note it outputs.

Antares offers a variety of altered tunings, pickup modeling and guitar modeling, plus instant transposition. Auto-Tune for Guitar first appeared in the Peavey AT-200 guitar, but Antares also offers a Luthier Custom Installation Kit for installing the system into any instrument. Antares Product Managers Henry Bridger and Marco Alpert agree that this technology is in its infancy and will expand down the road.

Line 6 is a well-known name in the world of DSP processing and an industry leader in the field of amp modeling. In 2003, the company introduced the Variax guitar featuring on-board DSP, which allows the instrument to model a variety of electric guitars and even other acoustic instruments like a sitar or banjo. The Variax is also capable of pitch-shifting alternate tunings with user customization accessible via connection to a computer.


RainSong Concert Series WS1000N2

Roland is another name that needs no introduction in the world of guitar innovation. The company released its first guitar synth in 1977 and has been a major player in the technology market ever since. Roland is well known for its COSM modeling technology, which first appeared in its VG-8 guitar system. Recently Roland teamed up with Fender to produce the Roland G5 VG Stratocaster featuring on-board COSM. The G5 is capable of modeling a variety of acoustic and electric tones as well as providing alternate tunings.

MIDI guitar controllers have been around for more than 25 years, but the technology has been somewhat quirky at best. Use of external MIDI pickups or even synth-equipped guitars offered only a hex-signal output that required a special cable and outboard translation into MIDI. Solutions were expensive and plagued with latency issues, and frequently carried an extremely steep learning curve. Sensing players' frustration and determined to offer a better solution, Fishman

Fishman Fluence single-coil pickup

Ken Parker YoYo archtop

developed the TriplePlay wireless MIDI controller. "We wanted to simplify the equation," says Larry Fishman. "In creating TriplePlay, Fishman took advantage of emerging DSP technology to create a self-contained unit that required no cables or breakout boxes with all processing done directly on the guitar." TriplePlay easily mounts onto any solidbody electric or archtop guitar in minutes and connects to your computer or tablet through a wireless USB dongle. It provides guitarists with extremely low latency and accurate MIDI tracking at an affordable price point.

Initially released as a standalone product, TriplePlay technology is now being offered in Fender's Stratocaster HSS guitars as well as Godin's Session Custom and Montreal Premiere guitars. "We have always built guitars that are technologically advanced, and our seamless integration of TriplePlay has been extremely well received because the instruments look and feel just like standard guitars," says Mario Biferali, sales and marketing manager at Godin.

It's encouraging to discover that innovation is alive and well in an industry that's deeply rooted in tradition and extremely cautious about change. It's also apparent that a significant portion of new innovations will arise from independent visionaries who are willing to take a chance. If you wonder, "Why reinvent the wheel when the wheel was pretty well designed to begin with?," consider that the road we are traveling on is changing all the time. **DB**