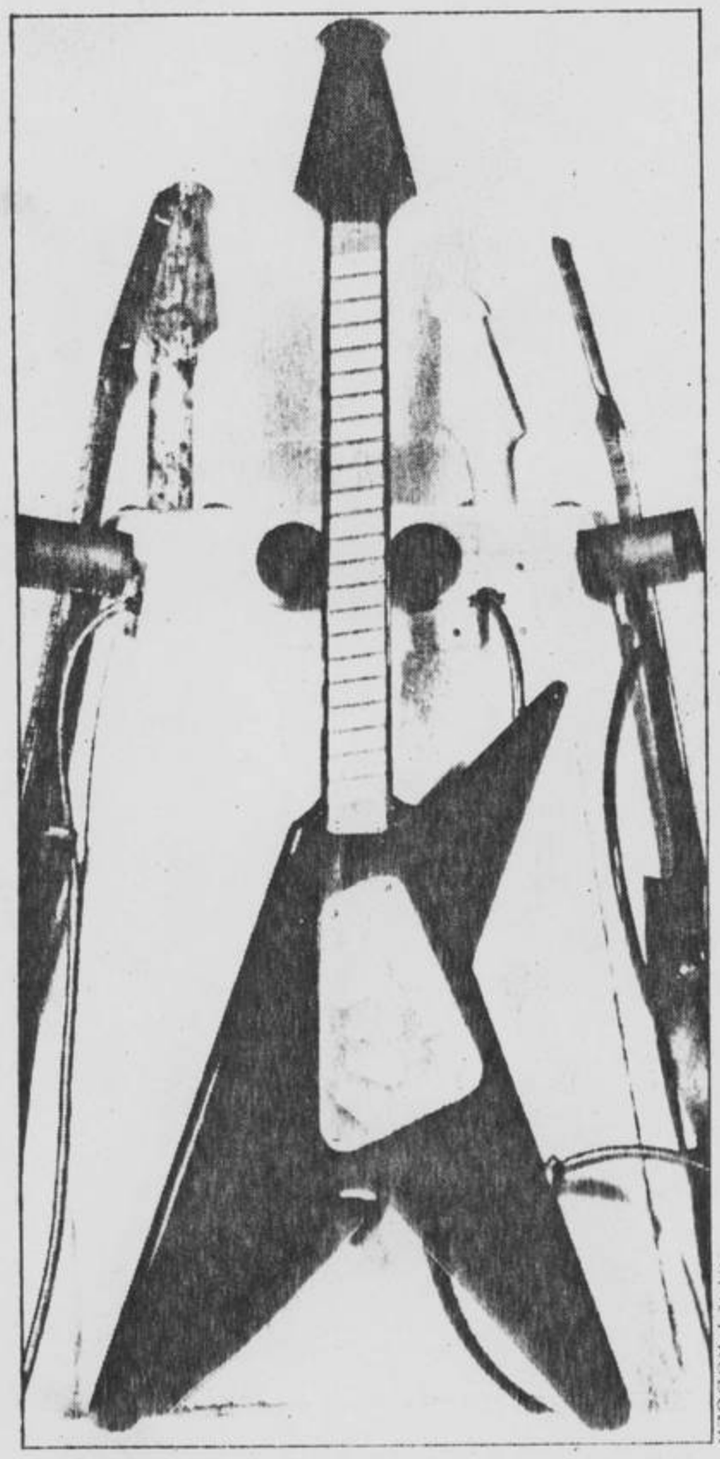
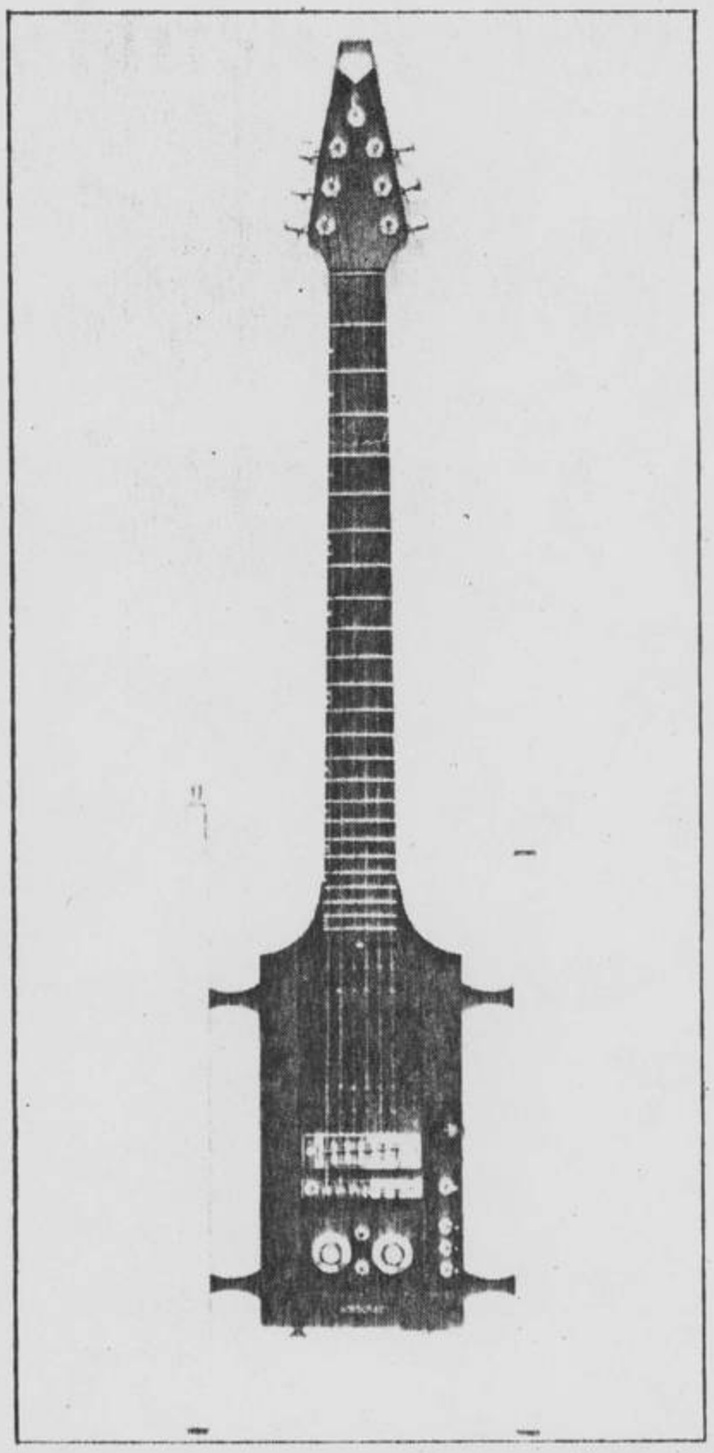
Special Equipment Issue

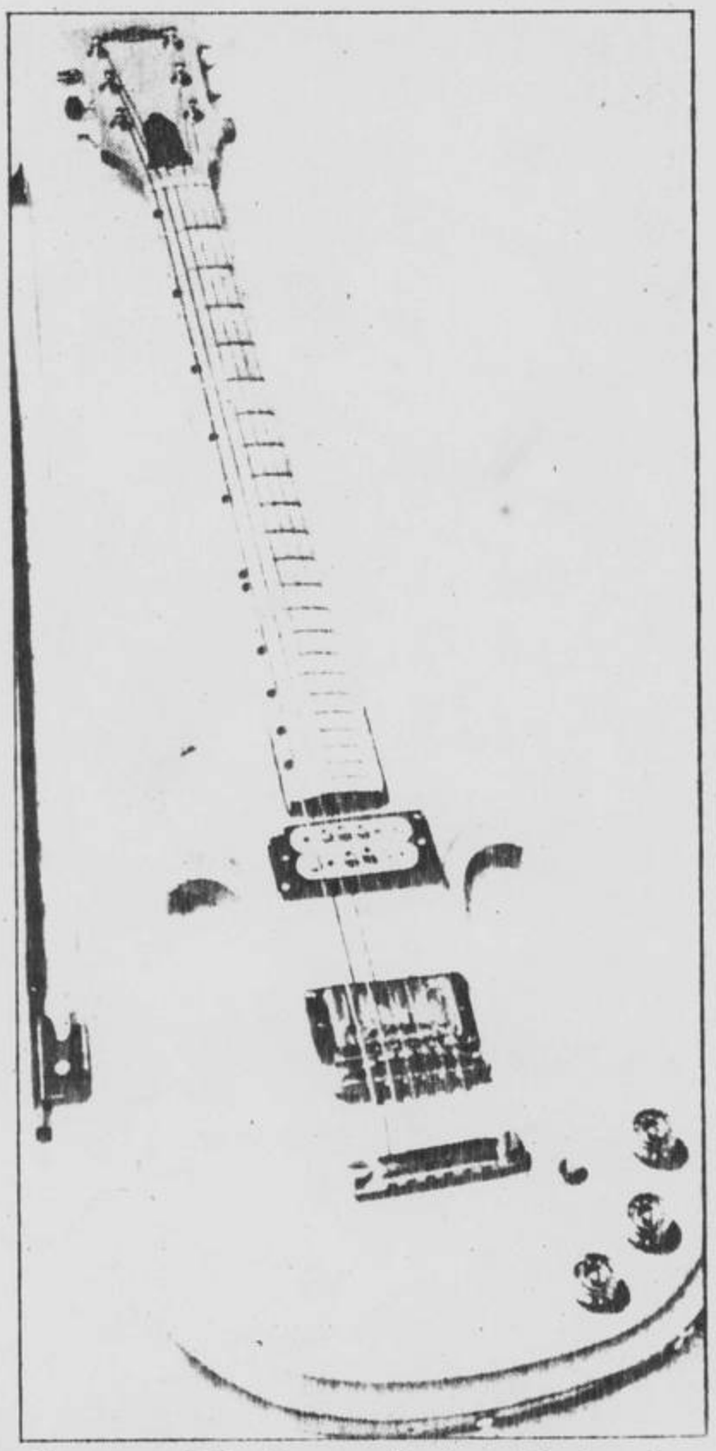
Guitars of Tomorrow?

By Tom Mulhern



NANCY RODGER





L-R: The Music Room stringless synthesizer interface, the Sardonyx Imperial with stainless steel outriggers, and the Bowtar, designed for bowing.

INSIGHT CAN BE A VERY powerful tool. Edison had it, and from his light bulb, phonograph, and a hundred other inventions, he made millions. The likes of Leo Fender, Robert Moog, Les Paul, and others have reshaped music through their inventive spirit and stick-to-it-iveness. However, history has shown that few people—especially would-be tycoons—possess that uncanny ability to peer successfully into the future or to project the outcome of a project, and thereby avert potentially ruinous or at least regrettable decisions.

"I could have" and "I should have" are phrases most commonly attributed to those who lacked the proper insight for a situation. Example: "I could have been a millionaire if I had bought IBM stock when it was. . . ." What, then, motivates some to go out on a limb, say, to present new inventions to the marketplace, sometimes risking ridicule or even financial ruin? Perhaps it's the burning desire to prove a point, or to become famous, or maybe it's because they believe that they've got something that can't miss. To some, failure on any level is inconceivable.

The guitar's evolution has been tumultuous, and for every major success there have been countless failures, near misses, and good ideas poorly executed. There is, unfortunately, very little one can rely upon to ensure that one idea will succeed while another fails. Yet there are new developments in the guitar field almost daily. Here is a sample of but a few of the guitar concepts that may or may not be instrumental in the course of future music. Like the fiber optic guitar and other high-tech instruments profiled in the May '82 issue of *Guitar Player*, these are the culmination of inventiveness, hard work, and gut feelings by determined, dedicated individuals. One or more of these may set the guitar world on its ear, or simply fade away as a mere curio. One never really knows.

* * * *

Music Room

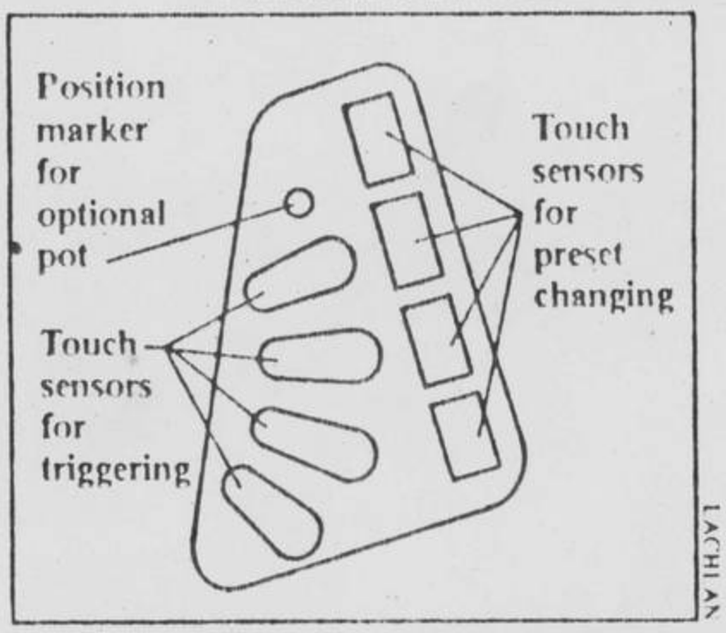
BALANCING CHECKBOOKS, billing customers, and solving complex problems are the classic examples of computers in action. Not very exciting to a guitarist. Suppose, though, that a touch-sensitive, stringless guitar were interfaced to a computer. The computer revolution of the past decade continues, and more and more "friendly" applications are coming about (digital watches, video games, programmable synthesizers, etc.), bridging the gap between the brainy computer and the average Joe.

Mating the guitar, the computer, and the

synthesizer wasn't the primary objective of electronic music composers Paul DeMarinis and David Behrman when they developed the Music Room—a system of five guitar-like interfaces for controlling synthesizers, which is on display at San Francisco's Exploratorium [3601 Lyon St., San Francisco, CA 94123]. They wanted to develop a system whereby non-musicians, as well as highly skilled performers, could immediately play music in an interactive situation. It just happened that the guitar-type controller worked extremely well for their purposes.

Each "guitar" has touch-sensitive panels instead of strings: 31 on the neck and eight on the body. The trigger circuitry operates on the principle of body capacitance—by touching any of the pads, you provide the missing part of the circuit. Every few milliseconds (thousandths of a second), the touch panels are scanned by brief pulses of current from the interface circuitry. The detection of a time delay in the return of this current enables the computer to know whether or not a particular panel is touched. Custom circuit boards are mounted directly within the necks and bodies.

DeMarinis says that while practically any physical shape might be adapted to contain the sensors, the solidbody electric guitar design was ideal from a standpoint of human engineering: It is easily held, accessible to both hands, and enticing (how many times have you walked by a guitar and given in to the urge to play it?). From his extensive experience performing computer music, DeMarinis was convinced that the interface between the performer and the computer was the aspect requiring the most attention in order to make the system conducive to the actual playing of music. He had guitar bodies built by the Exploratorium's Kevin Osbourn, and set about the task of adding a computer and synthesizers.



On the body of the Music Room instrument are eight touch pads. The four oblong ones control "picking" attacks, such as single, double, or triple strokes; the four rectangular ones are for changing programs (the small round one is actually a pilot hole for placement of an optional control pot). By changing the instructions to the computer, it is possible to reassign any of the functions.

The final product is a console upon which the guitar controllers rest. Inside, is the scanning computer (an Apple II+ with 48k of memory and a 5¼" mini-floppy disk drive), four Casio MT-30 synthesizers, and a Korg Rhythm 55 percussion synthesizer. All of the sound-generating devices are under the direct digital control of the Apple, custom-designed circuit cards that plug directly into the Apple's peripheral slots.

Paul explains the concept behind the Music Room: "The musical theory at work is designed to be intuitively graspable by untrained performers, and—like a video game—to be immediately playable and yet allow the player to develop his or her own special virtuosity. Each instrument performs a distinct musical role. One controls rhythm, and tempo, playing percussion sounds in a broad range of combinations. Another plays bass lines and selects the predominant harmony; two are harmony instruments able to alter voicing, timbres, and harmonic figures. The fifth is a melody instrument. Interestingly enough, the fact that the positions of the touch-sensitive panels on the neck have no pitch relationship to their up/down position causes no confusion to the musician. The software, written by Micromotion Forth [a computer program] carefully avoids collisions—wrong notes—by coordinating the musical effects of the performers' actions. Ongoing interactions among the various software modules have been kept to a minimum in order to keep the musical roles clear to the individual performers. This is necessary due to the inherently large number of possibilities available, as well as the brief time visitors to the Exploratorium have to familiarize themselves with the system."

DeMarinis says that the type of completely electronic guitar synthesizer used in the Music Room exhibit doesn't have to be limited to the programming that he employed in this particular instance. For example, by redefining the roles of the "frets" through a rewriting of the computer software, it is possible for a guitarist to create any combination of adjacent notes. Instead of moving up the neck chromatically (e.g., *E*, *F*, *F*#, etc.), a guitarist could write a program that would designate each adjacent fret as, say, a perfect fifth higher than the previous one, or two octaves higher, or employ any combination of intervals up and down the neck. (Inquiries pertaining to prices, configurations, or availability of the Music Room guitar synthesis system can be directed to Paul DeMarinis, in care of the Exploratorium.)

Given the current computer technology, it is conceivable that a guitarist could control an incredibly large pseudo-orchestra of synthesizers from one instrument. And although the absence of strings may at first prove unsettling to some guitarists switching to the type of guitar incorporated in the Music Room exhibit, the flexibility and expandability afforded by the computer should allay some of their trepidation. To the young computer enthusiast, who spends hours writing exotic programs—when he's not plunking on the guitar—this approach may offer a particularly exciting challenge.

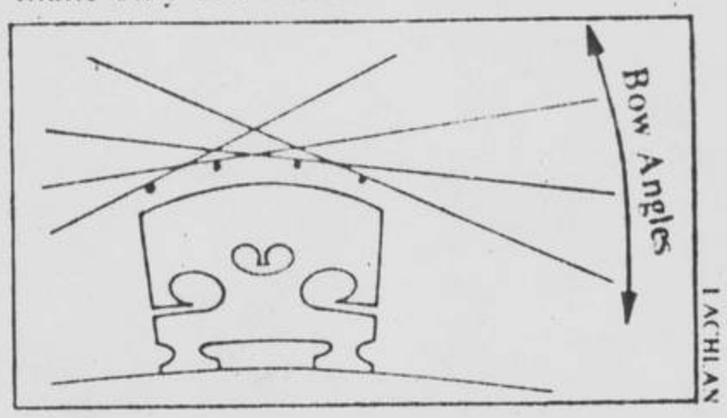
The Bowtar

Guitars are played by picking or plucking—or so you might think. Sure, some guitarists work in passages that require only a bit of feedback to excite the strings, and others use so much sustain or distortion that you never hear the pick anyway. But by and large each note is a product of that initial attack. From time to time, some 6-stringers (most notably Jimmy Page) have borrowed the bowing technique from violin in order to introduce an expanded vocabulary of note production. After several years of experimentation, a 23-year-old jazz guitarist named Frank Falgares, of Bloomfield, New Jersey, has developed a working form of an electric guitar designed especially to accommodate bowing: the Bowtar.

In the late '60s and '70s one of Jimmy Page's more dramatic effects with Led Zeppelin was his use of a violin bow with his Les Paul. (An example of his bowing can be heard in "How Many More Times" from *Led Zeppelin*, Atlantic, SD 19126.) By adding echo and a distortion edge, he produced ethereal sounds that gave his instrument a completely different personality; onstage his use of a bow was a strong visual tool, as well.

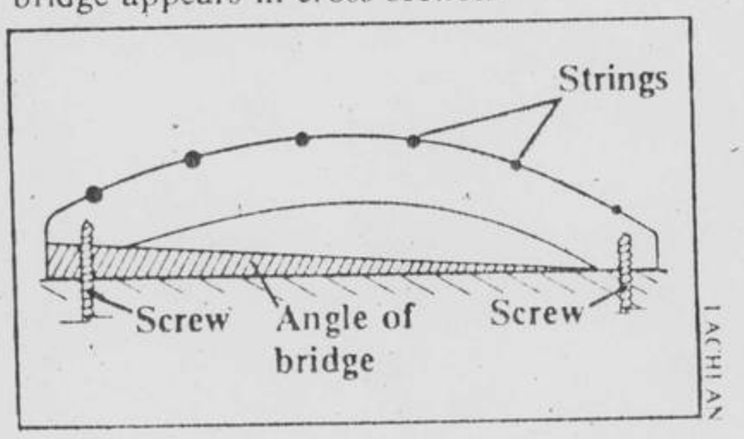
As many guitarists who tried emulating Page's bowing excursions found, there were some severe drawbacks to running a bow over a standard guitar. First, all six strings are at approximately the same height. Therefore, for any accuracy of note selection, the guitarist must bow only the low *E*, the high *E*, or all six strings at once. Naturally, this greatly limits the musical options. Frank recalls rock guitarists using bows to get various effects, and he says, "They'd beat their bows on the guitars, but there wasn't much to be heard. It was really limited." He adds, "I've always liked violin, though—I'm a real Jascha Heifetz freak—so one thing led to another, and I decided to use a bow on the guitar."

Strings on more traditional bowed instruments—the violin, viola, cello, and string bass—are arranged in an arc. The innermost strings are higher off the face of the instrument than the outer strings. The result is access to each string individually, without disturbing the others. Here is a cross-sectional view of how the strings pass over a violin bridge. The lines denote the angle at which a bow must traverse them in order to make only one sound at a time:



GUITARS OF TOMORROW?

Falgares realized the shortcomings of the single-plane string arrangement on guitars, and he developed an instrument which includes a special nut, fingerboard, and bridge designed to accommodate the arched format necessary for bowing. Here's how the bridge appears in cross section:



LACHIAN

Obviously, this conforms to the necessary design for bowing, although unlike a violin, which has only four strings, this allows very little space between the strings (roughly the same amount as a guitar—about 3/8"). However, besides simply arching the bridge, it was necessary for Falgares to include an exaggerated waist in the instrument (much like that of a violin) in order to provide the bow proper access: As the bow is positioned to play the outermost strings, its travel across them is at a fairly steep angle. On a standard guitar, the bow runs into the instrument's face when trying to properly attack the *E* strings, and quite often, the inaccessibility created by a lack of body contour will make *any* single-string bowing impossible.

The maple body of Falgares' electric Bowtar is shaped much like a traditional bowed string instrument in that it has rounded shoulders, two deep cutaways producing a waist, and large hips. Three years ago, Renaldo Orlandini of Pastore Music [507 32nd St., Union City, NJ 07087] built the current Bowtar prototype solidbody (shown in the photograph on page 58). Frank's original one was built several years ago by his cousin, Louis Ippoleto, who used an ebony fingerboard and a mahogany body.

Maple was selected for the neck and fingerboard, which has dot inlays nearest the player, rather than in the center. In order to accommodate arched formation of the strings, the fingerboard's radius is cut so that the contour is similar to that of a cello. As far as electronics go, a pair of specially made humbuckers, one volume and two tone controls, plus a pickup selector switch provide all the flexibility needed.

Originally, Falgares tried two regular humbucking pickups on his early models—with disappointing results. Even when he adjusted the polepieces so that the two center ones were much higher than the other four, he found that the tone and volume of the *D* and *G* strings were still unsatisfactory. According to Falgares, the standard pickup didn't work because the arrangement of its magnets is such that there isn't enough magnetic force acting upon the vibrations produced by the *D* and *G* strings, which are the farthest from the pickup.

A bow affords practically infinite sustain, because as long as you excite the string with the bow, a note will be produced. You can fade notes in and out, create glassy timbres, and glide between notes without punctuating them with picking attacks. Frank occasionally plays gigs using the Bowtar, and finds it particularly useful in solo work. He emphasizes that for all intents and purposes it is still a guitar—chords can be held, and it can be played with a pick or fingerstyle. "Playing this instrument does take a lot of technique," Falgares admits, "but if you already know guitar, you know the left hand. What you have to learn, then, is the bowing technique. Lessons with a cello teacher can really help there. You can bow with either an overhand or underhand technique—whatever you learn." Some of the materials from which Frank has been developing his technique range from Kreutzer violin etudes to Bach two-part inventions.

Now that the Bowtar is in its final design stage, Frank feels that it is now ready for other guitarists to try. The transition from a standard guitar certainly requires a fair amount of dedication, but he says that if sufficient interest is shown in the instrument he hopes to start a school from which he can offer instruction on the Bowtar. (Frank Falgares can be reached at Box 1292, Bloomfield, NJ 07003.)

Because he believes that many guitarists have sacrificed tonal versatility for increased sustain through distortion, the Bowtar's inventor feels that his instrument is a way to gain back the original tone of the guitar. "Sometimes there is so much distortion that it's difficult to tell what kind of guitar is producing the sound," he says. "The bow lets you get much more sustain without having to deal with incredible volume levels or feedback, and it lets you hear what the guitar should *really* sound like."

Frank called on luthier Phil Petillo [1206 Herbert Ave., Ocean, NJ 07712] to design a humbucker that would compensate for this inequity. Petillo built a humbucking pickup with one polepiece screw under each of the strings, except the *D* and *G*. For those, he provided one polepiece that's located between them. Petillo also designed a set of flatwound strings for the Bowtar, consisting of a magnesium/nickel alloy.

Petillo is currently building an acoustic Bowtar for Frank, and among its features are a carved German silver spruce top and carved curly maple back; the sides are also curly maple, and the ebony fingerboard with 27 Petillo triangular frets rests on a 15-piece laminated maple neck. The original design calls for six strings, but Falgares said it could have seven strings, and therefore allow for tuning down to *B* below the cello's low *C*. The nut and tailpiece are ebony, and the ivory wood bridge will house a transducer.

Very low profile frets are employed on the electric Bowtar, and according to Falgares, they give an almost fretless action, while maintaining the delineation of half-steps.

There are techniques for sitting and standing while using the Bowtar, and different bows can be used to create a variety of sounds: "If I'm playing mostly cello-like lines, I'll use a cello bow," he says. "For higher lines, I use a violin bow. I mostly use a viola bow, though, because the viola is right in the middle range between cello and violin, and it gives me a lot of flexibility." The bridge is adjustable to make it more accessible to the bow when the Bowtar player is in the standing position. Two screws allow for adjustment of the bridge's angle in relation to the top.

Frank, who has been playing guitar for 19 years, studied jazz guitar with Daniel Bennett, and is currently studying bowing technique from Tim Ryan, who occasionally performs with the Marshall Tucker Band. Until recently, he had been bowing with an underhand grip (the photo of Frank playing the Bowtar shows this). "A lot of technique, particularly staccato [a number of single notes produced while bowing only in one direction], relies on gravity interacting with your bowing," he explains. "So I went to an overhand, cello-style approach, which gives me more control. I now hold the Bowtar in more of an upright position, but it gives the best results."

The creation of the Bowtar is viewed by Frank as a natural step in the evolution of the electric guitar. "For the past 30 years," he states, "the guitar has slowly headed in that direction. Look at the pattern: First pickups were added to guitars, then amps became more powerful, and finally the pickups became hotter. The goal was more sustain, and a voice with long, sustained notes—like those produced by a violin—was created. This added sustain allowed for such things as finger vibrato, which was unheard-of on early electric guitars because the notes died too quickly. So, instead of getting the sustain electronically, I decided to do it with a bow." Phrasing and dynamics are much more controllable with a bow, says Falgares, because your actions are directly responsible for the way a note comes out of the amp: Volume and texture are the result of your attack."

Sardonyx Imperial

Luthier/repairman Jeff Levin started working on guitars 20 years ago as a 15-year-old student at Brooklyn Technical High School. As a guitarist, he found repairing to be right up his alley. He built and repaired his way through school, and eventually wound up restoring guitars for Matt Umanov in New York City. For the past four years he has been on his own, fixing guitars and building his own unusual lightweight solidbodies under the Sardonyx name.

A Sardonyx is a striking instrument: It has two long outriggers attached to its sleek, jet-black body (often mistaken for a molded metal or plastic one because of its beveled and squared angles, it is indeed wood), it has a glossy black fingerboard, and it weighs only about seven pounds. Closer inspection reveals other attributes. At the bottom of each outrigger is an anti-skid rubber foot, which prevents the guitar from sliding if it is

GUITARS OF TOMORROW?

leaned up against an amp or a wall—even on linoleum floors. Since the outriggers protrude from the sides of the instrument, they provide a wide stance and balance that makes it difficult for the guitar to fall over. At the top of the headstock is a stainless steel bracket, that can be used as a means for hanging the guitar or to protect its finish when leaned against walls, cabinets, etc.

These stainless steel outriggers do more than act as a stand for the guitar. Since the body is so small, Jeff added them for counterbalancing, to offset the effects of neck-heaviness. They were originally attached by means of metal struts which had to be specially brazed onto the outriggers, and which attached to a bracket on the instrument's back. Today Sardonyx' main instrument, the Imperial features the same outriggers attached to specially machined plastic supports, which are finished to match the body.

The Imperial is actually the culmination of several models of Sardonyx guitars designed over the past five years. Earlier, the 800 series, including six guitars and one bass, was built. Jeff has sold 800 series solidbodies to several well-known rock guitarists, including the late John Lennon, Howard Leese (of Heart), Ian Hunter, and Wes Beach (of the Plasmatics), among others. One basic body design was common to the 800s, although there was great variation in their electronics: Some were passive, others were active, and either one or two humbucking pickups were employed. Various tone and output routing (stereo, mono, switched A or B) options were presented on the 800 series as well.

Levin decided that he wanted to concentrate his efforts on a single configuration, and although he still makes 800 series models on special order, his main pursuit is the Impe-

NEW BASS TECHNOLOGY
See Page 90

rial. This guitar embodies all the physical design features of the earlier ones, with a few improvements. For example, Jeff retained the adjustable balance arm, an extendable piece that slides in and out of the upper outrigger. The guitar strap is connected to it, and it is adjusted to properly balance the instrument to suit the player's needs. It is friction-loaded so that it doesn't slide on its own accord, and once set, it will stay at its fixed point until it is readjusted.

The entire instrument is made of mahogany (or in some cases other light woods), with a black semi-gloss lacquer finish, and the neck passes through the entire length of the body. In order to maintain strength at the neck/headstock juncture, Jeff designed the guitar so that the truss rod is adjusted where the neck meets the body. He feels that this way is preferable to having a cavity at the headstock, not only for its added strength, but for its aesthetics (a clean, unbroken surface) and accessibility (no cover to remove).

The 25"-scale fingerboard is phenolic (a hard synthetic material), and there are 24 frets. Among the guitar's hardware are a tune-o-matic bridge, a specially designed tailpiece (which has access slots for the strings' ball ends, facilitating quick replacement), and Schaller M-6 Mini tuning machines. Depending on a customer's preference, Jeff uses brass, aluminum, or stainless steel for the nut.

Although the Imperial's passive electronics have been somewhat simplified, they offer a great deal of flexibility. Two humbucking pickups with coil-splitting capabilities are employed in conjunction with four switches, designated for pickup selection, series/parallel connection, in- or out-of phase routing, and single- or dual-coil configurations. There is also a master volume control located near the strings, close to the bridge pickup, to enable quick access while picking.

The remaining two knobs—tone and volume—work in a different way from standard designs: The tone control and volume control have corresponding switches for selecting which pickup they will govern. For example, the volume control's switch allows the guitarist to select the bridge pickup, the neck pickup, or both for volume control. If, say, the bridge pickup is selected, then the control will only affect the volume of that one. The way Levin has wired the controls sidesteps a problem common to many passive systems: interaction. On most guitars, the setting of the volume control will affect the overall tone (the higher the volume, the brighter the tone), and one pickup's volume or tone control may affect the other pickup's.

Levin mentions that he will accommodate special orders for active electronics or unusual wiring schemes (he can be reached at Sardonyx, 997 Metropolitan Ave., Brooklyn, NY 11211). He says that some guitarists have been put off by his guitar's futuristic look, but he stands behind the design: "Everyone looks at it and expects it to feel real weird," he says. "And a lot of people are stymied by the looks. It's the kind of instrument that people *really* dig, or they *really* don't. But it doesn't feel weird. It feels very good."

ADDENDA
%%%%%%%%%%%%%%%%%%%%%%

A number of inventors patented stringless imitation guitars and some of these go back quite a while.

For instance the Baldwin Co., maker of pianos and electronic organs, had at least one such patent assigned to it quite while ago.

. If we wanted to be facetious, we could say that the Bowtar discussed in this article is really an electric viola da gamba, and why don't they say so? Surely anyone brave enough to invent a modern bowed instrument of this type should be without any fear of offending the purists and antiquarians and Back To Yesterday people!

The Musical Establishment suffers from HISTORICAL PARALYSIS. If it weren't for this new activity in the guitar-inventing field, we would run the risk of dying of boredom. The non-progress and moribund stasis of the piano is surely proof of that. The piano is so stuck in its rigid design that the harpsichord has overtaken and passed it.

IVOR DARREG