International Institute of Bassists Interview of Chris Willcox

1. What led to your first optical pickup design? (background information)

At first it was the usual suspects: tone and sustain. I had a small custom guitar shop in Santa Barbara, California, and I was experimenting with electric guitar designs. My observation was that magnetic pickups were the dominant voice in electric guitars and basses, and I was looking for a way to place more emphasis on the role of the instrument, the string, and the player. A more transparent pickup system seemed to be the most viable solution, and infrared optics fit the bill nicely.

2. How exactly does your optical pickup system work?

Simply put, there is an infrared emitter for each string on the instrument. It shines a beam of IR light across the string, casting a shadow of the string onto an array of photodetectors. When the string vibrates, the size and shape of the shadow changes, and this modulates a standing current in the detectors. From there, the signal goes into an onboard preamp and through the tone controls. The signal, by the way, is analog all the way to the instrument output. The underlying principle is a transducer that reads string vibration directly, but without influencing it in any way.

3. Can you explain the advantages of LightWave System’s optical pickups as compared to the conventional magnetic pickups that are installed by most other luthiers in their basses?

The characteristics that set optical pickups apart from magnetic and piezo pickups include a richer and more accurate string sound; longer, more natural sustain; a versatile and very musical tonal palette; extended bandwidth with wider dynamic range; chords that are very clear and well articulated; and extremely low noise, even at high volumes. All together, this creates a more intimate interaction between player and string.

4. Why was the first LightWave optical pickup initially developed for bass and not a different instrument such as the electric guitar?

Initially, the extended frequency response of optical pickups presented a great way to access the tight and focused bass response that magnetic pickups can not fully realize. The larger diameter of bass strings and the wider string spacing were a practical consideration in the early development phases. Wire guitar strings were a challenge that was solved later. We are now introducing our six-string ElectroAcoustic Guitar, in addition to the Saber Bass lines. Many more string instruments in the bass, guitar, and bowed families are planned for future development.

5. Do you believe that an instrument’s pickups impact its overall sound as much or more than its woods, the way the neck is joined to the body, or its scale length?

Well, I believe that everything matters in the design and execution of string instruments, and not least of all, consideration for the player’s style and nuance. Optical pickups provide a new and significantly different alternative in tone and playing experience to their more conventional counterparts. Designing and producing guitars, as with most musical instruments, is a multi-disciplinary activity involving art, science, technology, aesthetics, ergonomics, and a touch of voodoo.

6. If someone, who had never heard a bass with an optical pickup, asked you to describe the sound produced by a LightWave Systems bass, how would you explain it?
Definitely, the Saber Bass will enable the player to create a highly detailed bass soundscape, composed of rich complex harmonics, vocal mids, and sparkling highs, built on a foundation of strong, bold, and focused low end response. Players will immediately recognize the perfectly balanced sound, clean string to string separation, precise note articulation, wide dynamic range, and excellent sustain. A powerful and versatile onboard EQ section gives the player easy access to the enhanced tonal palette, and superb touch sensitivity creates an intimate connection with the string and the instrument.

7. Could you outline the basic differences between your Saber VL, Saber SL, and Saber SL Hybrid series basses?

The Saber SL is the standard model, with a solid alder or ash body, opaque color finishes, and a rosewood fingerboard on a three piece laminated hard maple neck. The Saber VL shares the same electronics package, but with a chambered Swamp Ash body, solid 1/4” AAA Flame Maple Top, matching Flame Maple headstock veneer, and a special composite basswood fingerboard. The SL Hybrid is the same as an SL, but with the addition of a magnetic pickup. The Hybrid also has a pan control that provides all optical output, all magnetic, or any blend of the two.

8. Are there common features found on all the LightWave basses?

The basic electronics package and suite of controls is fairly similar across the Model lines: Master Volume, Bass Boost / Cut, Mids Boost / Cut, Mids Sweep, and our patented iceTone feature are found on all the basses, except the Hybrids. The Hybrid has the optical / mag pan control instead of the iceTone, and a treble cut is also added. The design and specification of the Saber Basses are similar, with differences primarily in wood and finish choices.

9. When did you decide to start manufacturing your own line of basses to complement your already existing optical pickups? (what contributed to that decision?)

LightWave branded instruments were always an integral part of our business plan. The initial sales of LightWave kits to boutique builders and manufacturers provided a great way for us to experience installing optical pickups on a wide variety of instruments, and contributed a wealth of knowledge that lead to many design improvements. Providing finished instruments also gave us the opportunity to optimize the integrated design, as well as having more control over quality, sales, marketing, and distribution.

10. Was there a particular design concept behind the distinctive body shape of your basses?

The concept that I envisioned was to create a shape that was both traditional and modern, recognizable, aesthetically pleasing, lightweight, and comfortable to play.

11. Why did you decide to produce hybrid basses that incorporate magnetic pickups? (what kind of magnetic pickups do you use?)

I resisted the idea at first, because adding a magnetic pickup does add an influencing factor to the string's vibration, even if the mag's output is turned off. Because of the interaction between the string and the magnetic field, the magnetic pickup directly affects tone and sustain. However, a significant number of players requested the combination, and in the end, I was won over by the fact that the optical and magnetic pickups together produce some unique sounds that are not available any other way. The current Hybrid features a humbucking pickup of our specification, but there will likely be other magnetic pickup choices available on future Hybrids.
12. How should a bassist go about choosing between the different models? (would you recommend one of the models over the others depending on the particular musical context?)

That would definitely be a personal decision, and we would encourage a player to try as many models as possible to make a well informed choice. We feel that the LightWave instruments offer a new and different experience for any playing style in any genre of music. One thing worth mentioning, though, is that our fretless bass sound has often been described as a “holy grail” solution to achieving an upright acoustic bass tonality with an electric bass. Any player who already plays fretless or who has considered it should definitely check out a LightWave Saber fretless.

13. Which model has proven to be your most successful instrument in terms of sales, and why do you feel that particular bass has become the most popular? (VL vs. SL vs. SL Hybrid, 4-string vs. 5-string, fretted vs. fretless)

The Saber SL is most popular because it offers a very affordable entry to a completely new and exciting technology. Four and five string sales are about equal; fretless is popular because of the upright tone, but the fretted outsells it due to the significantly greater number of fretted players. The Hybrid is our newest model, so it is too early to estimate its popularity relative to the other models.

14. Were any of the LightWave models designed with a specific performance application or target audience in mind for which those basses might be most appropriately suited?

No, we think of LightWave instruments as being suited to any style of music.

15. Are your basses manufactured more towards being an alternative to basses equipped with magnetic pickups or do you think optical pickups will one day completely replace traditional pickups?

We have always positioned our technology as a significantly differentiated alternative to the conventional and traditional instruments currently available. Over the long haul we believe that optical pickup technology will achieve the status of a new industry standard, but not necessarily to the exclusion of the others.

16. What do you say to bassists who have used conventional pickup technology for their entire careers and seem to be somewhat hesitant to check out your optical pickups?

You will never know unless you try it! No amount of talk, advertising, product reviews, or word of mouth can take the place of a direct playing experience. Get out to one of our dealers and check it out, you owe it to yourself as an informed player to make a decision based on your own playing experience and opinion.

17. Since your optical system utilizes infrared light technology to sense string vibration and doesn’t rely on the magnetic properties of stainless steel or nickel-plated strings like standard pickups, can a bassist employ strings made of other materials such as nylon?

Yes, absolutely. We encourage LightWave players to experiment with string types and compositions, and many have related some very interesting experiences back to us. We intend to offer some unique LightWave branded strings, in the future, taking advantage of the fact that optical pickups can sense any string material, and that you can hear the difference.

18. Why do optical pickups seem to more faithfully reproduce a low B-string than traditional pickups?
The answer to that is a “fundamental” technical difference between magnetic pickups and optical pickups. Magnetic pickups are a velocity sensing transducer, which inherently limits their response to low frequency string vibration, and is also one of the same factors that causes magnetic pickup sustain to break up and fall off before the string actually stops vibrating. Optical pickups are amplitude sensing. They can sense vibrations as low as one per year. (We roll off the low-frequency response to prevent speaker damage). This characteristic makes the low B of a bass sound like you never heard it before: tight, focused, massive but well defined, present, and accounted for!

19. What does the iceTone blend control and warm/cool toggle switch offer in terms of enhanced tonal capabilities?

Our unique and patented iceTone blend gives you precise control to add a sweet, glassy, and brilliant treble response, with no added noise. Turned up fully, it also adds a percussive dimension to the string sound for slapping, popping and other funk playing styles. The warm / cool switch is a quick way to effect a tone change on the fly that is similar to switching between a warm and fundamental neck tone and a tighter, brighter, leaner bridge tone.

20. Have you ever considered installing a thumb rest on your basses below the lowest string to replicate the feel of a bass with standard pickups?

We have considered it, and we designed an easy to install thumb rest that can be added to any Saber Bass. Players who miss the feel of anchoring their thumb on a magnetic pickup can install one; they will soon be available on our website and through our dealers.

21. How long does the battery in your basses last when fully charged and how long does it take to recharge? (can you play the bass while the battery is charging?)

A fully charged battery yields about 16 hours of play time. The rapid charge system will recharge a fully depleted battery pack in a little over an hour. If need be, you can play and charge at the same time.

22. Is it currently possible for someone to retrofit their bass with your pickup system?

Due to the major structural differences between optical pickups and conventional pickups, it is not a simple task to retrofit an existing instrument with our pickup system. In fact, since we began offering completed instruments, we no longer sell a user installable pickup kit. We still get inquiries about kits, and we hate to disappoint people, but we have restructured LightWave to produce well designed and well built complete and standardized instruments. Maintaining our focus on this mission enables us to offer our high quality instruments as an easy and affordable way to own that killer tone!

23. Can bassists purchase LightWave basses directly from you or do they need to locate an authorized dealer?

We sell our instruments through our dealer network. We are in an expansion mode for our US dealer network, and also just beginning to distribute internationally. Players can check our website for a growing list of authorized dealers.

24. Considering that LightWave Systems now produces several lines of basses and even a guitar series, do you have any plans to expand your pickup technology to work with other stringed instruments? (such as an acoustic upright bass, violin, viola, cello, etc.)

Yes, we have a long list of future instruments, as well as ancillary gear and strings that will take advantage of the unique features and characteristics presented by our optical
pickups. We will be adding a number of guitar models, including solidbody electrics, nylon string electroacoustic, and likely some jazz hollowbodies; an acoustic guitar with an optical pickup; solidbody upright bass and a pickup system for acoustic upright bass; violin, viola, and cello; the list goes on. If it has strings we are thinking about it! We are also very excited about our HexFX Edition. This is an option that has additional deck controls and will bring a separate output signal from each string out to a 13-pin DIN connector that is mounted in tandem with the 1/4” output jack. This will enable playing through and controlling MIDI converters, hex DSP processing devices, and string fanout boxes. To sum it up, we aim to make LightWave Systems the dominant force in an entirely new segment of the guitar industry.