

# A Visionary Composer wrestles her computers into submission



# Wendy Carlos



**T**he links between music and technology go back a long way. Eighteenth-century advances in metal-working gave violinists the brilliant tone of wire-wrapped strings. More recently, the changes brought about by electronics have opened up far broader creative vistas. And just as the violin needed a Paganini to show the world what it could do, just as the piano needed a Liszt to sweep away the cobwebs of harpsichord technique, electronic music technology needs visionaries. People like Wendy Carlos. 🖱️

By Jim Aikin

# Wendy Carlos

Carlos has been using computers in her studio since the early '80s. Her upcoming CD, *Tales of Heaven & Hell*, was recorded on a pair of Macintoshes using Mark of the Unicorn's Digital Performer MIDI sequencing/audio recording software. But her love affair with technology goes back much further. In 1968, synthesizers were found in only a few universities, where electronic music was an arcane specialty taught only to graduate students. Carlos changed all that, almost single-handedly: Her landmark album *Switched-On Bach*, recorded entirely on an analog modular synth built for her by Robert Moog, became the first classical disc in history to sell platinum (a million units). *SOB*, as she affectionately refers to it, was the recording that introduced the public to the sound of the synthesizer.

Few listeners had any grasp of the painstaking craft that went into *SOB*. Often, a single line of melody required many overdubs of individual notes with an instrument that tended to drift out of tune between takes. Today, Carlos brings the same meticulous care to projects that use far more advanced technology. One of her passions is alternate tuning systems, a field that has only become practical to explore with the advent of digital instruments. Her more recent albums, including *Digital Moonscapes* (1984) and *Beauty in the Beast* (1986) have explored the phantasmagorical world of electronic orchestration.

We spent more than an hour on the phone with Wendy, and she had far more to say about music and computers than we have room for in these pages. (For the full text, dial up [www.music-and-computers.com](http://www.music-and-computers.com).) What follows are the most provocative portions of the conversation.

## Tell us about your new CD.

A couple of years ago, some people I know asked me to do something for people in their twenties, because they felt that there's not very much intelligent music being done for Generation Xers, and could I do something that wasn't classical, wasn't Baroque, wasn't rock, wasn't jazz, but had elements of the kinds of things that the younger audience was listening to, and yet still be myself? And I'm afraid I disappointed them. The idea of making something that was based loosely on *Clockwork Orange* [a Stanley Kubrick film that Carlos scored] had also come around; it just didn't work with

something paced fast with an "up" beat, because *Clockwork Orange* is very slow music. It's a dark, somber affair, and a lot of the [new] album is that way. It's very melodramatic, dark, over-the-top, scary stuff. It fits very well with the title *Tales of Heaven and Hell*.

The project took a long time, mostly because of the way I insisted on doing it. Because of all of the complexities of the way it was put together, it couldn't really have been done prior to having DAWs [digital audio workstations] with built-in sequencing, the very thing that's epitomized by [Mark of the Unicorn] Digital Performer, which is what I use.

Unfortunately, on my old [Macintosh] FX, which is what I started the project on, with the big files that these things were turning into, the newest versions [of Performer] were unstable. I had to go back to an earlier version, which was moderately stable but wouldn't allow more than four minutes

they can do different tasks, and it's handier than even the best multitask single machine.

**What two tasks would you be using two computers for at the same time, typically?**

Sometimes I might be using [Coda] Finale, because it's still my notation program of choice, even though Performer does a pretty reasonable job of printing out music. I like to sketch out and get printed-out copies of what I'm doing, so that I can figure out where the piece is going. With alternative tunings and that, you get into such difficulties in trying to keep track. [Ed. Note: See "What Are Alternative Tunings?" below.]

I don't write simple music, and I cannot just do head arrangements, which is what most so-called electronic composers do. Many of them don't read or write music anyway, so they don't have a need to or don't have any choice in the matter. But notation is a very fine tool [even] if you don't write "eye music," as the Germans used to call it. If you use notation as the tool that it is, it's very handy. Even in multi-tonal alternative tuning music, where the notes don't necessarily correspond in sound with what you see on the paper, it's good to have something so you can put together the structure of the piece.

Also, it's sometimes very stable to run audio on one machine and MIDI on the other, or some parts of the audio on one and some parts on the other. The machines behave better, and you get more audio channels.

**For this album, you were using a combination of MIDI sequenced stuff and audio tracks, right?**

Exactly. It's what I think everybody's doing. I've now spent a lot of years so that I can really make mostly any sound I wish to make. There are still things I find more expedient to use Kurzweil sampling for, although I've never liked samplers in the past because of their lack of expression. Some of the newer, sample-based synthesizers are now becoming quite expressive, so you're not just getting that "dant-dant-dant-dant-dint-dant-durnt-durnt," you know. Now I have a lot of tools within the V.A.S.T. business [Kurzweil's synthesis architecture] that let me start plastically manipulating sounds and making them respond to what I'm doing with the controllers, the velocities, and all of that. I find that textural sounds which are going to be moved around and pitched differently, and layered rhythmically, those are best run off of things like Kurzweils.

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## What Are Alternative Tunings?

The conventional 12-note scale found on both the piano and synthesizers is called *equal-tempered*, because the octave is divided into 12 steps of equal size. This compromise tuning was developed to allow music to be played in any key. Many other types of tuning are used in other cultures, and were used in European music in earlier centuries. In many historical tunings, the 12 notes of the scale are not spaced equally. As a result, some chords sound relatively pure, while others sound very odd. Alternative tunings developed more recently sometimes provide more than 12 notes within the octave.

of music before the files would self-detonate. So I had to do the thing in little bitty chunks, and then try and link them together, and every time I tried to link them together, the new file would become unstable, and it would crash everything around it. It became the worst software nightmare I have ever experienced. Plus, it was a fairly complicated hardware thing.

**Any news about what label the CD will be released on?**

Well, by the time the recording was finished, some of the record companies I had initially talked to had sort of lost interest. They thought the project would never happen. A few other companies had become interested, so I'm kind of in the junction of not knowing who to go with right now. We've just begun talking with a few people.

**You said you started the recording on a Mac IIfx. Did you switch to a Power Mac?**

That's what I'm using now to finish the project. It's an 8500. I still use the FX inter-actively. I have always liked having two computers in a studio at one time because

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**Do you use a Kurzweil K2000, or a K2500?**

I've got two 2000s. I prefer having 32 MIDI channels, because I do a lot of multitimbral stuff, and one 2500 would definitely be not enough. They're both loaded machines, they have a lot of RAM in them, and they have a lot of sounds, which are mostly *musique concrète* things that I've built here myself. [Ed. Note: See "What Is Musique Concrète?" on page 58.] I'm getting back to using *concrète*, which is what sampling seems to allow once again, and then a lot of real synthesis. The world of the audio on hard disk is more *concrète*, because you're playing back textural things that are so long that you don't really want to put them in a sampler. What's the point of having something that runs for two minutes be on a note in the sampler?

I'd rather use the memory for great big, long, fat samples of single-event notes and

tempos. Digital Performer allows all kinds of time and tempo-warping, and pitch-warping. They're really powerful tools. If it only weren't so damn slow. . . . But the scalpel is very sharp, and it allows you to cut very precise layers and put together a piece of music that can be very plastic and very alive.

**You mentioned being able to pitch-warp and time-stretch in Digital Performer. I'm wondering whether the little glitches and artifacts that can be created by that process bother you, or if you have tricks for getting around them. How do you deal with that?**

You try them, and if they don't work, well, even if the idea was good, you don't use it. Sometimes also, I've found that I can take things that have glitches, bring them into [Digidesign] Sound Designer, and find little spots, and do little crossfades, and hide them. It's like having scratches on a photograph that you scan and put into [Adobe] Photoshop: You've removed the flaws artificially, tediously, by hand. It takes forever, but that's the way you do it, if it will work.

I tend to clean my things rather meticulously now. Everyone's talking about 20-bit audio, but I don't think many people have

## Carlos's landmark album *Switched-On Bach* became the first classical disc in history to sell a million units.

the like, and then the things that are probably only going to appear once or twice, put those in hard disk audio. Also, of course, you can bounce them back and forth. You can take sections of a long audio file, poke it into the sampler, play with it there, and then sample out what you've now played with it back into a hard disk file, and then that can run in sync with the new things you're adding.

I'm having a great deal of fun reaping the benefits of this hybrid, mature technology. Well, I guess "mature" is . . . it's not stable mature, but it's at least conceptually mature. This is a very, very decent way to make music, having all these kinds of tools linked together so you can do all of the personal, expressive stuff that we can do now with an elaborate MIDI setup, and with responsive synths get that to play back in a way that is every bit as alive and natural as a live ensemble would be, using sounds that go everywhere from the wildest "electronic-y"-sounding things, through things that are actually acoustically replicate-sounding, or *concrète* things that are somewhere in the cracks, or hybrids of three of the above put together, and then layer that in with the live performance parts which are better handled with a multitrack audio metaphor in the DAW. And it's all synchronizable; you can change your mind, you can vary the

really squeezed very much out of 16 yet. It seems to me that 20-bit would be nice for the masters, and for people who record live orchestra and ensembles who are unpredictable in their dynamic range. For those cases, it'd be nice to have extra bits, but as long as the final result is going to be 16 bits, I don't care what they say. This is a case of knowing where the bodies are buried. I try to do the job rather deliberately.

**So you're getting the most you can out of 16 bits.**

I'm squeezing it in a lot of ways. I don't really want to point to every dead body and where I put some perfume around the corpse so you wouldn't smell it, or how I made a hologram of another corpse so that you have the illusion it's there. It's possible to use the tools like a surgeon to do plastic surgery on your music. I feel like I almost massage every molecule at the end.

**Would that involve noise reduction, EQ, compression, or all the above?**

All of the above! I don't use automatic compression very much. I'll usually go and tweak regions by hand, because sometimes a limiter will just take off all of the peaks. I'll go and find the ones I don't think would mind coming down a dB or two, then I can enlarge that entire spot so I can give a real "oomph" to an attack. Then

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with several stepped regions selected, I'll do a very small decibel change on each to form a ramp. It becomes a very gentle, little easing in so that I can give the maximum sound output at that moment for some sounds without sacrificing anything else in the neighborhood. So there are no artifacts, nothing that's doing the things that invariably happen when you use any automatic machine. I'm in favor of throwing away most automatic processes, and taking on the tools in my hands raw, and using them very carefully, one at a time.

***Is the creative process itself any different because you're using computers than it would be if you were using a pen and paper and then hiring an orchestra to play it? Do computers really create a different creative space, or do they simply allow you to do the same things in a different way?***

I don't really know how composition works. You feel like themes and the like

work, so the bridges are bad? Or are the bridges good, but the material sort of dull, so you've got a polished job on mediocre material? Or do you have some great things here, but you ought to pull it apart into shorter pieces because it's not making it as a large structure? Or is it exactly the opposite problem?

Questions like that have never changed in all the years I've been writing music, and from reading biographies and interviews, and talking with other composers, and other people in other creative arts, [there's] no difference. I don't think computers change it at all, it's just for the disturbing [difference] that, because they're more brittle, you're more likely to find that that stream of consciousness will be interrupted, making you sometimes wonder why you don't just take the whole shebang, open the window, and drop it down to the sidewalk below.

***Did you ever want to do that to your old modular Moog?***

Yes. Oh, God, that was a nightmare, too. In some ways it was a worse nightmare, because you didn't have the wide variety of sounds. It's such a large family now. I don't feel the sting of my old teachers telling me that if you're interested in composing for

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are filtering through your mind. You're aware of being an editor, you're aware of saying, "No, not that. That's not good enough." You're aware of throwing things out that you've spent days, weeks, even months doing, because something better just pops into your head. You're aware of the time you've spent, you're aware of every little bit in the music at the end, that it all went through you, but the process itself is somehow still almost magical. That's just the act of being creative. It's not music composition *per se*.

In the case of the tools of computerdom, the canvas and the colors are different, but the steps of making great music are still the same steps. Form is still the biggest bugaboo in any piece of music longer than a minute or two. Anyone who hasn't attacked anything [larger than] a song doesn't know what I'm talking about. But the minute you try and get into a longer, abstract piece of music, even if it's program or film music, you're facing formal questions: How do the structures relate to one another? Does this lead to the other logically? Do themes come in and never repeat that almost seem like they're gratuitous, and therefore like you threw in too many ideas instead of working them through? Or did you work them through enough, but the things that tie them together don't quite

timbre, stay with the orchestra; if you're interested in composing new, odd things, you can stay with electronics, but it will not give you the range of timbre that you can get with an orchestra. That's no longer true. So, for that reason, no, I'm not unhappy using this medium, and I don't feel necessarily that I would rather use a pencil and paper for an orchestra. But with some of the themes and ideas that come along, it would be nice to have a live orchestra waiting to add its contribution to the electronic elements.

***I remember a few years ago, in an interview, you were talking about how you had started with an original Macintosh. Was it a Plus?***

No, it was the 128. We got one right at the beginning of the first year they were available, 1984. So we saw the first interface, when in order to copy a floppy, it used some of the screen RAM, and so the screen filled up with black and white dots. And then that machine got added onto. It became the 512, and the 512KE, and then a Plus, and then it was turned into a Prodigy Prime. And then I updated to a IIx, then to a IIcx, and now to the 8500.

In fact, every one of these synths, since the Moog, is a computer also. We're working

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with multiprocessor environments. A good MIDI interface box like a [Mark of the Unicorn] MIDI Time Piece, that's a computer. And then Jim Cooper's various little [JL Cooper] devices, those are each computers. Each of those has its own little computer, and sometimes they will go down. Sometimes the little simple passive [MIDI] merging box that you're using for putting together a lot of controllers, that'll go down, and the notes that you're trying to input suddenly are either blocking up, or being polluted in some way. It's hard to find where the problem is, because there are so many places it can happen.

**We could talk about malfunctions all day.**

Oh yeah! At least you could make it plain, especially for people who think that this is a quick, cheap ticket to success and fame and fortune, which it's none of, honestly. It's almost exactly the opposite, especially at this stage, where it's highly competitive. Too many people have gotten into the field. They should be discouraged, really, because there's nothing to be gained except if you're on a hobbyist level, and you enjoy it for your own pleasure, and you don't mind these problems, that's fine, but the truth is that it's a very onerous, difficult way to make music. At least what I describe as being music.

**Sometimes technology is oversold to consumers as, "Now, you can make professional-sounding music, even if you've never had a lesson!"**

Oh, dear. There was a magazine, I think it was called *Compute*, which was dealing with, I think, Apple II's and the like. Somebody was quoted as saying that there were going to be so many more Beethovens now, thanks to the new technology. It's wanton lies! That is not true. Art comes from creative people doing a job well. Some part of it is a gift, in which case you can take no bows for it; other parts it's just pure sweat work, in which case you can take a bow for it. In any event, human beings are not decided on their value in life by whether or not they can put together a good string of notes. Some of us do it well, some of us don't. And you can still enjoy the act of music and do it for your own recreation, without being in any way a great composer. Why should you take on that onus, anyway? And why shouldn't there be people who can do it a little better than others?

What you *should* say is that the technology allows even people who've never

trained in music to learn to do music on their own, and by their time, and sweat, and natural talents, they will achieve or not achieve varying degrees of success.

**And technology certainly makes it easier for people like Brian Eno, who perhaps had no conventional music training, to achieve some wonderful things that would not have been available to us otherwise.**

The only thing is, don't be surprised that some of his material sounds like it's lacking performance value, because he doesn't know how to put in that aspect unless he hires performers. A great deal of electro-acoustic music seems to come from a mindset that champions getting rid of the performer, whereas in truth, the technology is slowly coming around to giving us the control that a great performer needs to put the notes and the sounds and the events together in a fluid, graceful, elegant manner, and that is not what a composer does. The composer says what to do, but not how to get from point to point to point.

**That creates more of a burden on the electronic artist, because it's not enough to be a great composer; you also have to become a great performer.**

## What is *Musique Concrète* ?

With the advent of magnetic tape in the late 1940s, it became practical for composers to use natural acoustic sounds as an element in their scores. This technique was pioneered in Paris by Pierre Schaeffer and Pierre Henry, hence the use of the French term *musique concrète* (literally, "concrete music"). Early *musique concrète* pieces were created by cutting and splicing dozens or hundreds of short pieces of tape. Today, the same results can be achieved far more easily in a computer.

**Not in real time, but you now have to wear those two hats.**

And you should, if you're going to do an electro-acoustic thing, become a great orchestrator and instrument-builder as well, too. Otherwise you'll have to just write to the companies and buy their pre-packaged sounds — which is fine, except then you're using canned art, in the same way that people who design brochures and little business publishing notes might use clip art, because they don't know how to draw.

**Can you remember the first time you encountered alternative tunings?**

I was playing with my parents' piano back when I was an adolescent. First I thought, "Well, I'll go to the music store and get a tuning thing, because I bet I could tune a piano," and then I discovered, "Oh, my God! This is hard!" And I went and got the books from the library, and really then

was worried, because it's even harder than you think it is. I started playing around with just, and with meantone, and with some extended oddball scales. It was slow and tedious to do on a piano. For three or four days I'd leave it in one tuning, then the next week I'd try some other tuning.

**What scales did you use on the new album?**

For music that forms a moderately conventional-sounding Western harmonic progression, I still prefer using some version of meantone, or the Werkmeister scales. Also, I had never done a piece in 15-note [equal-tempered] tuning, and I thought I would try that.

There are also some random tunings that I've invented just to try and find, by ear, intervals the way the Indonesian musicians might find them, where that pitch for that timbre is kind of in a little niche that's the most provocative next step I could have.

**Since a lot of the readers of *Music & Computers* may never have even considered alternate tunings, how would you explain their attraction or benefit?**

It's a little bit like you've only eaten at a fast food restaurant all of your life, and you're suddenly being told that the whole world of *haute cuisine* exists, and that [in] many countries — Northern Italy, France, certainly, and Asian countries — there are these whole values of food that you've never sampled. They're different, and they're much more subtle than what you've had to do to your tongue and taste buds in having to live on a diet of fast food, where the subtleties are all removed by the temperature of cooking.

Like your first piece of sushi, it's strange. But at the same time, these things are based on very real acoustic values, and they're better than anything you've experienced in the past, so given time, if you listen closely enough, you will become aware that something subtle is occurring that you never have experienced before. Some of it can be extremely hard to hear. Others will be smoother and nicer-sounding, and you'll say, "Oh, yeah, I can hear it right away."

But because of the tunings, the musician or composer will have stopped doing certain types of modulations and the like, so it'll almost have a new style of music that you'll hear, which came about because of the tuning, in the same way that Western music tends to be pretty busy about moving from note, to note, to note, all the time. None of the notes really sound that great, so we've evolved a kind of music that's based on trying to hide the



Wendy Carlos's Web site contains detailed information on her unusual instruments, such as this Circon, which she invented to play exotic melodies on *The Shining*. The pointer arm shows which note you're playing, with the exact center marked by a gray dot, so microtonal passages become possible. A spring-loaded lever on the side can control volume and brightness.

inadequacies of our scale. So you'll be able to investigate kinds of music which don't need to do that sort of stuff. That's fascinating, too.

***Is there any software that you use currently for setting up tunings?***

The [Opcode] Galaxy editors have a pretty good one for the [Yamaha] TX802/DX7II machines. That's probably the best computer tuning software I've seen. I've used spreadsheets. I find spreadsheets very handy, because you can put in ratios and have them propagate all the way down, so that you can find the numbers in Yamaha tuning units and in cents [hundredths of a semitone]. You can make all those things happen on a spreadsheet, but in the end you still have to sit down with the synthesizer and type it all in, and that's extremely tedious. Galaxy's editor will help you as long as you're using instruments that are based on the Yamaha or similar modules.

***Do you have any upcoming projects, or anything that has been of passionate interest to you lately that you wanted to mention?***

I'm going to do a *Tales of Heaven and Hell Part II*. I don't know what I'll call it, but I want to tap the vein of this extremely dramatic, picture-painting-style music — tone poems. I have a lot of ideas that I've already started on, but we're going to try to get the first one out as soon as we can, and then I will get the next one out, probably much more rapidly now that the new machine seems to be working.

I don't know where I'm going to go from there, but I think there'll always be an interest in alternative tunings in my music for the rest of my career, now that it's become so easy to do. I still will do some music in equal temperament, and some in variations of it, like meantone, but there will also be music. . . . You know, it's like, "What way do you want to eat tonight? Do you want Turkish food, do you want Japanese, do you want Thai, do you want French, do you want Ethiopian . . .?" There are so many ways to go, and we have the stuff to do it now. It would take a rather cowardly, un-curious person not to want to fool with it. ◀