

The Sounds

I love the orchestra. In fact, when I switched from physics to music as my major in college, the opportunity to work with and write for orchestra was no small motivation. When it appeared that the new field of electronic music could give a composer all of the resources of an orchestra and more in a room-sized studio, I jumped at it and enrolled in graduate school at the Columbia Princeton Electronic Music Center, then (1962) the only such facility in the United States. The crude means of the classic electronic studio of that time, with a splice or two for each note of taped music, could produce magical and dramatic musical effects and textures, but they were certainly no substitute for an orchestra.

When I met Bob Moog in the early 1960's and began to work with his synthesizers, then at least I could interpret music with real performance values, as I attempted to prove with my *Switched-On* recordings. Indeed for fuss-pots like me, electronic music had become real music at last! For a while I thought that we were getting close to achieving an "orchestra in a box."

However, it did not take long for me to learn that this common belief was really a misconception. By 1968, when I was finishing my second album (*The Well-Tempered Synthesizer*), I had already discovered that the "infinite possibilities" of the synthesizer were actually very narrow — to the point of boredom, if one were honest about it. It was all too easy to sound thick and turgid, even with only two or three tracks of this presumably wonderful new sound. Somehow the sounds of the older acoustic instruments were still much better. I began to understand that it was the utter simplicity of the synthesizer's sounds that was their downfall. Acoustic instruments evolved over the ages to satisfy the human desire for subtly complex sounds. The synthesizer, as it evolved over only a few decades, produced sounds that were neither subtle nor complex and became boring with repetition, once the novelty wore off.

Even the most refined of today's analog synthesizers generate timbres that are far removed from physical reality, with their pure sine, sawtooth and square waves, plus a bit of filtering and modulation—all very easy to describe in words or pictures or numbers. Just try to describe the wave-shapes from a (well-played) violin, horn or timpani!

Technology now exists that can digitally sample or record a few notes of rich acoustic sources and then play them back from a keyboard (at different speeds to produce other pitches) like the old Mellotron. While this does have its usefulness,

a few minutes spent with one of these machines will show you the limitations of the *Xerox copy* approach, if subtlety or flexibility is desired.

Even many of the wonderful new digital synthesizers made available over the past few years in a variety of forms, including a lot of bells and whistles and special convenience features, are still unable to control sounds much past the simple stage of the original modular Moog machines. The basic design of each presupposes this or that kind of sound variation to be "unimportant" or "inaudible," thus limiting the possibility of control.

Finally, what I consider to be the prime departure from the previous limitations was developed a few years ago by Hal Alles at Bell Labs. He wisely avoided making sweeping simplifications in his designs, which evolved to be open-ended enough, yet controllable, to permit subtle complexities in sounds akin to the best acoustic instruments. His series of prototypes eventually resulted in the *GDS* and *Synergy* digital synthesizers from Digital Keyboards. Their first task was to assemble a user-friendly software and control package for the Alles generator card.

The next step, which I undertook in 1982, was building a library of voices (nearly 500 by now, many were also made available on cartridges from Digital Keyboards) replicating as closely as possible the features of acoustic instruments. Album notes are not the place to describe the complexities of the several hundred details that must be

programmed for each note of each instrument with various dynamic levels and performing methods. It is intimidating, yet ultimately fascinating. I recommend the exercise to any of you with a love of sound, a synth, and some knowledge of acoustics and computers. Expect it to take a great many months, but I promise you'll learn a *lot!*

The results may not be perfect; mine are perhaps only something like 60-90% successful as replicas that sound just like those "real" instruments do (that's an apt term: "replicas"). But perform and record several dozen of these replicas together in an ensemble and you can produce what this recording demonstrates: the world's first digitally synthesized orchestra, thanks to the miracles of LSI technology ("Large Scale Integration" circuits, i.e., computer chips).

All sounds on this recording were digitally synthesized and fine-tuned by ear. No digital sampling techniques were employed. No microphones were used at any stage, thus eliminating one of the weakest links in audio. It was not necessary to disguise sounds with a lot of echo and phasing to hide their inadequacies. With digital delay and time processing, it was possible to achieve a balance between natural room-sound ambience and three dimensional stereo placement, resulting in an uncanny sense of "scrim free" orchestral transparency on the digitally mastered recording.

But why do all this? Do we now have the "orchestra in a box?" Not really, considering the

time and effort required to produce an orchestral recording in this manner. Rather we should consider the reality of replication as only a measure of the quality of the synthesis, not as the ultimate goal. The goal ought to be providing the base on which to build new sounds with orchestral qualities that have not been heard before but are equally satisfying to the ear. This album represents my attempt to provide that base; look for the next steps using the experimental hybrid and imaginary sounds which have grown out of this work.

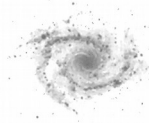
So the LSI Philharmonic is born. This recording celebrates itself within the bounds of the initial library of orchestral replicas I created. I present it to you as my encomium to the orchestra. After all, imitation is a high form of flattery. (But in most ways I still prefer the original.)

The Music

There's a significant reason why we find such a small audience for serious contemporary music. As Tom Wolfe pointed out in *From Bauhaus to Our House*, since about World War I, architects (and fine artists too) have become more afraid of appearing "bourgeois" than wanting to give delight to their audience. In so doing they have moved in smaller and smaller concentric circles until all stand on the same square inch of safely non-bourgeois style. I believe this applies as much to modern music as to the other arts. Is it any wonder that the audience at large has fled to the

decidedly more human pop culture? My hunch is that they don't hate music that is *m-o-d-e-r-n*, only music that is *b-o-r-i-n-g*.

Considering that, the music composed for this album is no less important to me than the sounds it is performed with. Written for orchestra (or orchestra replica), it is inspired by several astronomical subjects.



Cosmological Impressions

Cosmological Impressions is a suite of three movements. The first, **Genesis**, portrays a wide-angle view of the universe. Sounds grow out of the void and crystallize into a high fifth in bassoons and cellos. This builds slowly and deliberately with increasing complexity into a "dawn of life" theme over swirling impressionistic arpeggios. Trumpet and then pipe organ join in crescendo at the broad climax, followed by a reposeful ending.

Eden, the second movement, is a peaceful combination of diatonic tune over simple harmonic *chaconne*. Three main themes and three sub-themes are woven into a continuous contrapuntal fabric in moderate $\frac{3}{4}$ meter to depict the candid elegance of the legendary garden of Adam and Eve.

The distances between galaxies are incomprehensibly vast, unbearably lonely. In the third movement, **I.C.** ("Intergalactic Communications"), we try a radio signal: "Hello, we exist!" Wanting to be imaginative about it, we'd probably avoid $\frac{3}{4}$ and choose something quite subtle, like the sophisticated $\frac{3}{8}$ used here. An allegro theme is repeated over and over, first by bassoon, then clarinet. Above it floats the melancholy adagio counter-theme in violins and horns, as the message continues over light-years and parsecs, until eternity meets infinity...



Moonscapes

Moonscapes is a nine movement suite, a larger work rather in the spirit of Holst's *The Planets*. The subject matter here is the major moons of the solar system for which we have at last, thanks to NASA, real images of real worlds, each with its own personality. (Appropriately, these are images reconstructed by computer from digital information.) Working outwards from the sun, we encounter:

Luna, for Earth's moon, the most familiar one in the solar system, is the longest movement. From traditional associations with "love" and "lunacy," it takes the form of a concerto for schizophrenic

soloist. Two main themes, one dramatic, the other romantic, alternate between soloist and orchestra. The solo begins as a violin, becomes a violoncello, and then nervously retreats to become a trumpet, a clarinet and a bass clarinet, before returning as a violin just in time for a variation on the romantic theme. All five personalities alternate freely through the cheery coda. Briefly a sixth personality, which combines a violin timbre with the percussive envelope of a piano, can be heard. This is the *only* sound on the record that cannot be made with a traditional orchestra.)

Phobos and Deimos are the two tiny moons of Mars. They move the fastest and are probably the least attractive moons in the system. Here they are given musical voice as a rondo/scherzo with two gnomelike themes tied together with three contrasting sub-themes. The first theme, for Phobos, is a sort of shouting match between horns and trombones. The second, for Deimos, is a dour dance. The harmonies explore stacked major thirds and stacked fifths.

Ganymede, the largest moon in the solar system (it's even bigger than Mercury), is one of Jupiter's satellites. Its size and eclectic, attractive surface features suggested buoyant, happy and generous music, which brought to mind a jazz waltz. Three main and two secondary themes contrapuntally weave in and out over a ten-bar chord progression, occasionally shortened to create asymmetrical interest in both harmony and rhythm.

Solos in horn, flute, alto sax and bassoon highlight the entrance of each new theme.

Europa, another of Jupiter's moons, projects a slow impressionistic mood. Two angular themes float over an accompaniment that undulates in varying *ostinati*. The ending is hopeful: beneath the cracked-ice surface there may be life waiting to be thawed from its frozen prison as in Arthur C. Clarke's novel, *2010*. (This is the only movement to employ audio processing: subtle phasing was added to the string tracks.)

Io is a tempestuous scherzo, a *perpetuum mobile*, in keeping with Jupiter's red-orange volcanic moon. The surface is constantly changing, yet it appears the same, and the music bubbles along as a passacaglia with eleven varied repetitions. The relentless theme and harmony are built in fourths and major seconds.

Callisto, the last of Jupiter's moons in the Suite, is a heavily cratered, desolate body. The music has a simple ABA form, with a sad, lyrical theme for each A, and a $\frac{3}{4}$ *ostinato* in B, over which non synchronous orchestral textures wax and wane. Harmonies are bitonal and quartal; the meter is frequently surprisingly complex despite the gentle nature of the melancholy mood.

Rhea, the second largest moon of Saturn, is the briefest movement. It features clusters and tritonality, but at a more spirited tempo than usual for cluster-music, and a simple theme over the cluster harmonies. (The "electronic" sound quality

is totally an artifact of the clusters used; the effect would sound nearly the same with acoustic instruments.) The meter is a compound $\frac{3}{4}$ + $\frac{3}{8}$, but the music flows gracefully and lightly over such intricacies with an uncomplicated sound, not unlike the attractive appearance of this moon.

Titan, Saturn's largest moon (also larger than Mercury), has been thought likely to contain life. But Voyager's photos revealed that the thick rust-colored, hydrocarbon-rich atmosphere that makes life possible totally obscures the surface. The music reflects this enigma. It is dark and brooding, with predominant use of the low instruments, a tuba solo, soft bass drum and tam-tam. The adagio in $\frac{3}{4}$ with constantly shifting downbeat sits on an unvarying pedal harmony of E-flat minor over A minor.

Iapetus, the third largest of Saturn's moons, has an appearance unique in the solar system: One side is nearly charcoal black while the other is bright and reflective, although the surface itself is not particularly complex. This most contrasting movement of the Suite is composed with just two main themes, each of which takes on several moods and styles. The ending, with its extended coda, also explores quiet aleatoric impressionism, a fat tutti/recapitulation, and an unusual solo percussion toccata, which brings the suite to an energetic conclusion.



In Hindsight

Digital Moonscapes was the second major project in my present studio (the score to **TRON** provided its shakedown), and the first to make exclusive use of digital synthesis. When I wrote the notes above the finish to the sensational success of an outer planetary *Grand Tour* by the Voyager space probes was still in question. It wasn't certain that NASA would be financially able to complete the "bonus" fly-by intercepts of Uranus and Neptune. We threw away one chance to take the very close look at Saturn's largest moon, Titan. The revised path chosen for Voyager One made any further solar system intercepts by it out of the question. I thought Titan looked pretty unpromising, socked in by an opaque ochre atmosphere. A closer look would be wasteful, so I was angry to hear that's what had been decided upon by specialists more optimistic than I was. At the time anyone unlucky to be around here for several weeks heard me muttering: "Idiot!" out of genuine frustration.

Fortunately, the second Voyager, the one with the slightly better optical system, was not to be thrown away, and it came to complete our first observations of the two outermost giant planets, Uranus and Neptune, and many of their moons, as well. It was a creative challenge at NASA to find ways to get the most from *the little probe that could*. By the end of the 80's only the outermost planet, Pluto, with its relatively large moon, Charon, remained to be explored, and that's the way things stand at the start of the next millennium. I've read about plans for a dedicated Pluto flyby probe to be launched in a decade, but it will take many years to reach its target. The rich legacy of Voyager won't be overshadowed for some years to come. I ordered the multi-CD-ROM's of essentially all of the "raw" Voyager images, when they became available in late 1993. Browsing through them feels like closure of a kind, while newer probes revisiting Mars and Jupiter (Saturn is due again soon) update our knowledge of these fascinating worlds and their moons.

Should the **Digital Moonscapes** suite now be expanded as new images are obtained, and will it ever be performed by a live orchestra? Let's take the second thought first. An acoustic performance has *already* happened, in 1985, only a couple of years after the album was released. A good friend, the innovative, versatile conductor, Kent Nagano, asked if he might perform many of the movements from **Digital Moonscapes** during a live concert

by the Berkeley Symphony Orchestra, right across the bay from San Francisco. It was a mixed, emotional event for us, a lot of lovely memories, wonderful people, a happy party thanks to our friends at Dolby Labs. But it was also flawed by insufficient time and funds to prepare and rehearse properly. The performance suffered, although it was full of spirit by the good musicians, and I came away as a composer oddly grateful for the positive side of having an LSI Philharmonic resource available to me. I'd still love to hear all the selections mounted properly by an acoustic orchestra.

Kent did manage to conduct the Boston Symphony the very next week, in two of the movements, **Europa** and **Io**, this time with far less compromise. I wish I'd been able to obtain a tape of the affair, as I remember it was nicely spirited, even if a part of the more musically conservative summer "Pops" concert season (thank you, Kent!). I know it was broadcast later that summer from friends who were charmed to find it on their car radio while out for a drive one Sunday in Maryland. Given another live orchestra opportunity, I'd jump at the chance to compose some additional movements, to include the extra outer Solar System moons we have visited since the original score was completed. We now have wonderfully provocative images of two complex moons, Miranda and Triton, that could easily inspire additional movements for **Digital Moonscapes**.

But as events in my own life seem to steer a course of their own, I'm usually surprised by what projects turn out to be next in line. There are so many good ones that have just fallen from the sky, so it seems, that I've not really had the time to get back to projects which cried out for a sequel. Doing a wholly LSI composing / orchestrating / performing / conducting / producing / mixing job is a pretty complex job, a wearing of many hats. The focused dedication over many months must wait in queue, along with all the other demands on my creative time. Is all of this ramble leading up to "a definite maybe?" Well, it's as honest as I can be. It would have been a real kick to have been able to include more movements with this remastering, but that just wasn't possible, not up to my usual standards. Still, I do try to live by the expression: "Hope Springeth Eternal."

It came as a surprise to hear this music after a lapse of many years, when it no longer was vividly in my memory, individual trees to me, instead of a forest. I was happy to discover how many of the movements are carried by continuously woven melody, some decent themes there. It's not stuffy or overly cerebral music, and would work well on many live orchestral programs, just as intended. Sad to say, some of the writing, **Luna** in particular, outstrips the available technology of 1983/4, and is somewhat too intricate to work perfectly here. But only the denser ensembles are rendered with less clarity than might be possible with a very good

live orchestra (well performed and recorded). On repeated listenings your ear becomes more able to hear the subtleties of this adaptation of orchestral timbre, its strengths and weaknesses. One item: the upper strings, are frequently more "steely" and synthy than ideal, but this was the best I could do with the tools then available.

On the other hand, now I do have an extensive collection of fine orchestral timbres and can perform these in fairly natural and elastic ways, not very far removed from any possible sound one might wish for. Yet the newest sounds based on samples are not always as cohesive as these complex additive and FM/PM versions. Many of the original LSI Philharmonic timbres just work better from note to note, soft through loud, in a charmingly natural manner that's nearly impossible to pull off with sample-based voices. It's an interesting lesson, and proves both that you can get good results from many alternative choices of creative expression. But each one of them will also have its strengths and weaknesses, no matter how much loving attention to detail you may bring to them. Certainly shows the folly of dogma of any kind—we must be open to all means of expression or we do cut ourselves off at the root.

A completely different topic is that the whole look and feel for this ESD album is changed from that of the 1983 CBS/Sony version. We had little choice: the original artwork is still under CBS copyright, so we're unable to use it legally as things

stand. Working things out with a very large corporation is rather like trying the same thing with the government, similar red tape and inexplicable delays where the buck never stops. No matter for this project, I'm not going to cry about it. To be honest, we never cared for the original graphics, it was such a departure from the concept we'd originally requested, a dull, rather contrived replacement at that. During these several years I've never heard anyone compliment it.

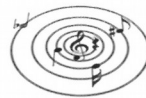
When we explained the sudden urgency to design a new cover to other musicians and industry friends, to a person they requested we return to the original concept: of myself in outer space surrounded by the orbiting satellites with their elliptical paths circuiting around my head. ESD suggested Earth's own lunar terrain might make an appropriate setting for the scenario, and that good idea stuck. We've searched back to find a good vintage image of me in the studio, one taken in 1984, near the time of the first release, to work into our scenario concept.

After a few weeks using PhotoShop and other tools, I've cobbled together some of these ideas and elements, finessed and drawn many portions, and come up with the new images on this release. We're pretty happy as it's the sort of thing we first wanted but were unable to bring about, never mind convince the CBS people that it was reasonable. There's no doubt that an artist could have done a lovely job back then as we requested, and a painting would have lent a nice abstraction

to the cover's mood. Even so, there was certainly no way to generate the hyper-real image that you see on this new ESD remastering, not back in the early 80's. Candidly, I'm quite tickled at the opportunity to put things right this time around, and hope you'll agree that the new artwork fits the music and album concept far better than the originals ever did.

The sound on this new release is better than on any prior version, as once again we've made an ultra **Hi-D** digital transfer from the original master tapes, then carefully optimized and tweaked the sound so that every residual glitch was tamed with no audible side effects (this was my first digital album, and was in much better shape than those recorded earlier). A/B comparisons of several saved versions were made days later, and the best was chosen double-blind. The enhanced sound here is restored to and absolutely faithful to those original master mixes. There is also the usual Enhanced-CD bonus material for you to peruse at your leisure. We hope you'll enjoy the extra TLC behind this specially remastered edition.

— Wendy Carlos, NYC 1984 & 2000



Credits

For the LSI technology and original images, this album is affectionately dedicated to NASA. Sounds designed, performed, engineered and produced by Wendy Carlos, using GDS/Synergy synthesizers. Important assistance from Stoney Stockell, Tom Piggott and Gus Skinas. Original photography in the studio by Vernon Smith. Originally released in 1984 as CBS **MK 39340**.

Restored, remastered and graphics/layout by Wendy Carlos. Audio (DAW), graphics and additional Macintosh™ computer equipment by John Romkey. "Hi-D" digital audio equipment by Mark of the Unicorn. Verance MusiCode™ support by Gabe Lawrence and Joe Winograd. Enhanced-CD formatting by Drew Miller. ***Special thanks to*** Larry Fast, John Klett, Jerry Ptaszynski, Jim Cooper, Mike Burg and Rob Simonds / ESD.

This is a "hypertext-enhanced" CD containing additional information about this work, as well as a snapshot as of June 1, 2000 of the "living page" www.wendycarlos.com. From your web browser choose "Open file" and select [index.html](#)

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