What Dreams Sound Like: Forbidden Planet and a Physical History of the Electronic Musical Instrument

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The newest electronic music instrument—sounds like a human performance!
—From a Raymond Scott Clavivox advertisement

We’ll always be together… Together in electric dreams.
—“Together in Electric Dreams,” Phil Oakey and Giorgio Moroder

1. Introduction: Electronic Nervous Systems

The first all-electronic film score was composed and performed by Bebe and Louis Barron for Fred Wilcox’s 1955 film Forbidden Planet, an adaptation of Shakespeare’s The Tempest that many consider the first true big-budget science fiction film. While Forbidden Planet is widely regarded as one of the classics of early science fiction cinema for its complexities of plot and characterization (two qualities that had been largely absent from the genre) it is probably best remembered for the Barrons’ compellingly alien score. Critics cite the score as “the most important” science fiction soundtrack (Taylor 93), as well as a “cult masterpiece” (Lack 313), and “one of the most imaginative electronic music creations of all time… [that] wrote the book on what outer space sounded like” (McGowan 110). Despite the (what now can seem) rudimentary nature of the Barrons’ technological instrumentation and the tremendous advancements in both the production and recording of electronic music that have occurred since 1955, their soundtrack remains surprisingly complex and

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1 Here we must acknowledge the difference between the sound of space and the (lack of) sound in space.
remarkably coherent in its execution. And although it is frequently acknowledged as a milestone, remarkably little criticism has been dedicated specifically to the Barrons’ score and its impact on the history of science fiction cinema and electronic music.

As friends of and early collaborators with John Cage\(^2\), the Barrons were not strangers to the more experimental aspects of composition and performance, yet their work for *Forbidden Planet* was their first major commercial project. It was so unfamiliar and so unlike the then-popular notions of film music, that the Barrons’ work was acknowledged by the mysterious title “Electronic Tonalities by” rather than the more traditional “composed and performed by” in the film’s credits. Initially, this was done to avoid a lawsuit from the Musician’s Union\(^3\) (the Barrons were non-union, a fact that some film critics believe kept them from winning an Oscar for this score) who felt that their work could not be termed “music” as it combined the jobs of the “sound department, the special effects department, and the music department” (Barron 199). But it is exactly this resistance toward ready categorization that is at the heart of the method and manner of these electronic tonalities—and it is this that was responsible for the score’s success.

Of course, the Barrons were not the first to work with a completely electronic palette; just a year before *Forbidden Planet*’s release, Stockhausen’s entirely electronic work *Studie II* premiered. Moreover, by this point in time, mainstream film

\(^2\) However, Cage didn’t like their work during this period, calling it “disgustingly orchestral and musical” (Barron 199).

\(^3\) Their use of this term, one probably unfamiliar to most movie audiences of the period, also suggests the more experimental nature of the music as well as the composers’ attempt to separate their work from more traditional conceptions of film music—a desire apparent in their earlier, less “commercial” projects (such as their work with Cage, Anais Nin and Maya Deren).
audiences were beginning to grow accustomed to electronically generated (and recorded) sound. But these sounds were often draped in the “warmth” of more traditional acoustic timbres, such as the strings which envelop the Ondes Martenot, an early French electronic instrument, in Franz Waxman’s score for *Rebecca*. As Russell Lack points out, when isolated, electronic tones were most often used diegetically to represent that which was alien (such as Bernard Hermann’s famous theremin-sound-as-flying saucer in Robert Wise’s 1951 film *The Day the Earth Stood Still*) while acoustic tones accompanied that which was considered “human” (311).

But for *Forbidden Planet*, the Barrons constructed a purely electronic sonic landscape⁴ that flits and flutters between the diegetic and nondiegetic aspects of the film’s soundtrack. The resulting tonalities are at once both the sound of the film as well as the sound from the film, they are both musical and technical, ordered and aleatory. As a result, their score complicates the relationship between human and the other, whether it be mechanical or biological. And this indeterminacy is evident also in the electronic substance of the music itself. The soundscape centers on the liminal nature of the electronic musical instrument—as represented both by its technological and musical histories—and makes that space the focus of the score’s creative genesis and technical engineering.

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⁴ As opposed to most other experimental artists of the time—especially the *music concrete* movement with which the Barrons were involved. B. Barron remarked that in their work they “were concentrating on generating purely electronic sounds; we used only electronics to create the music… whereas they [music concrete composers] would use existing sounds which they would then process…” (Barron 195).
By using this film and its score as a focused case study, this chapter seeks to better understand the role electronic musical instruments play not only in the “spooky sounds” of science fictional spaces, but in the very ways in which these electronic sounds govern how an audience interacts with a film’s acoustic environment. In order to contextualize the work the Barrons are doing, it is necessary to examine the history of the electronic instrument and its use in film. By doing so, the emergence of the technical and theoretical concerns which reach a critical point as the Barrons are writing their score become readily apparent. For their work comes at the moment just before the invention of the commercial music synthesizer, just before the dream of a usable and affordable multitimbral electronic instrument begins to materialize. After situating the Barrons in the larger context of cultural and technological history, the chapter will then focus on *Forbidden Planet* and its tonalities, evaluating the ways they directly confront these issues of materiality in human interaction with technology.

One way to better understand these concerns is by interrogating what the film’s central character Dr. Morbius (Walter Pidgeon) calls “physical instrumentalities.” Morbius dreams of (literally) a world without the materiality of *techné*, a world of telekinesis and telepathy, empowered by the alien technology he has “discovered” beneath the surface of the planet. Unknowingly dreaming parts of himself into being, Morbius continually denies the necessity of physicality and tactile action, despite the fact that the other characters in the film insist (in word and action).

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5 For, as Joachim Braun puts it, “technology has always been inseparable from the development of music” (9).
that such a world is impossible—nothing can be truly disembodied, separated from its innate physical-ness. “Underscoring” this issue, the Barrons’ music exists in a space between the physical and the immaterial, the tangible waking moment and the dream. Bebe Barron remarked that she and her husband “were delighted to hear people tell us that the Tonalities in Forbidden Planet remind them of what their dreams sound like” (Taylor 94). But the music, as well as the narrative it supports, creates a conversation between these dreams and waking life, causing the listener/viewer to question what it means to be physical, to be embodied, to be a constructed as human.

2. Beginnings: (Im)Material Communications

Elisha Gray was a few hours late. On February 14, 1876, he and his patent for the telephone arrived at the United States Patent Office just after Alexander Graham Bell. Despite the years of litigation that followed—and the fact that Gray’s design represented a working prototype whereas Bell’s would not have functioned as described—Gray’s role in the development of the telephone is all but forgotten. However, a fortunate consequence of his telephone research granted him a significant, if somewhat less well-known, place in technological history. In the course of his work on the telegraph that lead to his near-invention of the telephone, Gray stumbled across the method of generating, controlling, and amplifying sound from an electric oscillator. Elisha Gray may not be remembered for almost inventing the telephone, but he is known for using this electric oscillator to create the first
electronic musical instrument⁶: a two octave monophonic keyboard instrument he called the Musical Telegraph.

Gray never put the Musical Telegraph to much use (beyond that of yet another technological marvel for his many public demonstrations). It does, however, represent one of the first of many happy accidents to come from electronic communication research at the end of the 19th century. But what makes Gray’s little keyboard so notable is that its origin (as well as its name) suggests one of the more compelling aspects of the forthcoming evolution and use of the electronic musical instrument. From its very beginnings, the development of the electronic musical instrument was more connected with the growing technology of representation and communication than it was with any musical community. In part, it grew out of the nineteenth-century dream of a total representational medium—the unified expression of image, sound and text that Friedrich Kittler articulates in his book *Gramophone, Film, Typewriter*. The development of the instrument that began in Gray’s lab would place it, both historically and conceptually, in between the emerging sound and image recording technologies. As each of these technologies were refined, the electronic musical instrument would establish a mediating quality between the theoretical and technical concerns of these two dominant modes of representation, especially as they converge to become modern cinema.

Shortly after Bell and Gray’s near-collision on the patent office steps, another inventor in the midst of telegraphic experimentation made a (tremendously)

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⁶ This, as with many such “firsts,” is contested by some, but there seems to be something of a consensus regarding the first-like significance of Gray’s invention.
significant step in the technology of sound reproduction. In 1878, Edison patented the phonograph, about which *Scientific American* wrote in its December 1877 issue:

> It is already possible by ingenious optical contrivances to throw stereoscopic photographs of people on screens in full view of an audience. Add the talking phonograph to counterfeit their voices, and it would be difficult to carry the illusion of real presence much further.

As film continued to develop in tandem with sound recording technology\(^7\), the inevitability of the eventual conjoinment of these representational media seemed absolute. But creating this illusion of visual and aural “presence” involved more than just technological advancement. Cinema and sound were bound up in the complex exchange between the material and the imagined, the technology of representation and the desires of the audience. Kittler points out that earliest films were rooted in the ability to render these visual tricks\(^8\)—he writes that “the making of films is in principle nothing but cutting and splicing: the chopping up of continuous motion, or

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\(^7\) The same year of Edison’s design for the gramophone Emile Reynaud finished his Praxinoscope, a device similar to the earlier Zoetrope that utilized a spinning drum and mirrors to create the illusion of visual movement. Thus when, a year later, Eadweard Muybridge famously captured the movement of a galloping horse photographically and displayed it in his newly developed Zoopraxiscope, the basic technologies were in place for the development of modern cinema. Reynaud continued to develop his Praxinoscope and eventually was able to project moving images onto a screen. But despite the fact that he would go on to hold the first public exhibition of moving pictures, it was Edison’s (with W.K.L. Dickson) continued research that led to the first significant method for producing and projecting moving pictures, the Kinetoscope. In 1893, the first Edison film was put in the Library of Congress and when, in 1895, the Kinetophone was introduced to the public, a single viewer could watch a film while simultaneously (although there was often a ten second lag) listening to a sound recording. But despite the relative success of Edison’s kinetoscope, it was the work of the Lumiere brothers who were hired to produce films that were cheaper than Edison’s that made significant steps in the development of modern cinema.

\(^8\) As cinema technology fell into the hands of magicians and tricksters—especially *actual* magicians such as George Meliès—its association with this notion of the physical illusion and the “counterfeit” was inescapable.
history, before the lens” (117). The power of film was in its ability to manipulate the physical, the tangible artifacts of perception in time: “to translate technology into the desires of the audience” (119). But yet the other component in Scientific American’s “illusion of real presence” is the phonograph, a device that “permitted for the first time the recording of vibrations that human ears could not count, human eyes could not see, and writing hands could not catch up with” (118). There was an immaterial component to the nature of sound recording that seem to distance it from (and finally join it to) the very material and physical nature of visual representation—as parts of a seeming whole.

Though much has been written on cinema and its complex relationship with its own imaginary realities, for the purposes of this project it is enough to note that as film was evolving toward developing its own voice, there was a parallel progression in the development of the electronic musical instrument. This was a development that not only shared many of cinema and phonography’s technological achievements, but also their difficult relationship with issues of materiality and the “humanness” of representational technology. Like phonography, the electronic instrument’s earliest ties were also with the telegraph and the nascent invisible modes of communication—what became Lee DeForest’s “empire of the air”—a desire to disembody communication via its various technological media. Jonathan Sterne writes that in its “acoustics, physiology, and otology, sound [in the early 19th c.] became a waveform whose source was essentially irrelevant; hearing became a mechanical function that could be isolated and abstracted from the other senses and the human body itself”
(23). The very nature of sound and its component theories were being removed from the physical experience of communication.

So as one begins to work through the history of the electronic instrument and its use in film, one is immediately made aware of these seemingly contradictory impulses: the inevitable invisibility of the sound source, alongside the need to make visible (and recognizable) the means by which this source is controlled and manipulated. For in physical construction of these early instruments (and most which follow, up to the present), there was a desire to hide these mechanisms for sound production behind the familiar interface of piano keys and wooden enclosures. Yet the sound they produced was an odd amalgam of both: a recognizable (if somewhat unearthly) timbre whose potential was to be beyond the physical limitations of traditional instruments, akin to those “vibrations that human ears could not count.” And this condition is best represented by what is considered to be the first significant electronic instrument: the Telharmonium.

3. Telharmoniums and Tonalities

Just two years after the Lumiére Brothers famously shot their first frames of film at the gates of their factory, lawyer and inventor Thaddeus Cahill was filing his patent (#580.035) on the Telharmonium or Dynamophone. A massive 200-ton instrument, the Telharmonium was constructed of a series of modified dynamos that produced alternating currents over various audio frequencies. The tones produced by this sixty-foot long complex of gears and wires were controlled by multiple
polyphonic keyboards and were initially amplified by a series of giant acoustic horns. The idea was that, eventually, the Telharmonium would be connected to a telephone network and function as something of a real-time proto-Muzak\(^9\), piping music out of telephones and into restaurants, stores, and theaters—a more apt realization of Gray’s “Musical Telegraph.”

Figure 5: The Telharmonium

As he began to refine his invention, Cahill founded the “New England Electric Music Company” and a version of his instrument was built into an entire floor of a building (“Telharmonic Hall”) in midtown Manhattan and hooked up to the phone lines. However, due to its tremendous cost ($200,000 US) and the fact that its musical messagings tended to interfere with the (predominantly non-musical)

\(^9\) During this same period, General George Owen Squier was beginning his work that would later result in the Muzak corporation and the invention of piped-in mood music.
telephone network, Cahill’s behemoth failed to catch on and, by WWI, had all but disappeared. Yet his concept of a multi-timbral and highly flexible electronic musical instrument (the first to employ additive synthesis) controlled by a traditional musical keyboard had established, if unsuccessfully for the moment, a vision that would not again be fully realized until the invention of the synthesizer half a century later.

In spite of its overwhelming size and weight, there is an airy and almost immaterial quality to an instrument whose sounds can be packaged and sent along wires and over distances greater than that of its most robust acoustic contemporaries. But more than this, the complex physicality of the Telharmonium surfaces within its ability to play microtonal scales that were beyond the capacity of more traditional instruments. In his essay “Outline of a New Aesthetic of Music” composer Ferruccio Busoni advocated “absolute music: true creations, free from all material limitations. Such hindrances were the unalterable properties of traditional musical instruments” (Bijsterveld 124). And Cahill’s instrument was able to produce these tones, these complex scales that Busoni’s compositions demanded. Unfortunately, the two men were never able to solidify a working relationship and time (and money) ran out for Cahill. However, this need to transcend “unalterable properties” and “material limitations” would continue to be a vital component of the electronic instrument. Moreover, the ties forged between Cahill and the experimental music community would make possible the cultural environment that would not only encourage the next major advance in the development of the electronic instrument, but would later enable the Barrons space to do their own electronic work.
4. *Theremins and the Orchestra of the Air*

In 1907, a year after the Telharmonium’s first public demonstration, Cahill began a brief collaboration with inventor and “Father of the Radio” Lee De Forest who, in January of that same year, had received a patent for what would become his most famous and influential invention, the audion triode vacuum tube. De Forest suggested that his vacuum tube powered radio transmitters would provide a better mode of broadcast for the Dynamophone, but Cahill remained unconvinced\(^\text{10}\). Had De Forest been more persuasive, he and his vacuum tube certainly would have made Cahill’s instrument much more practical (both in size and amplification, as well as in transmission), but while the Telharmonium faded into obscurity, De Forest’s audion tube made possible the next major step in the production, amplification and broadcast transmission of sound.

But like Edison before him, De Forest wasn’t content lingering too long over the technological applications and development of his inventions, as his more than 300 patents would suggest. Shortly after his failed collaboration with Cahill, De Forest discovered a method of combining two inaudible high-frequency sound waves to produce an audible low-frequency wave, called heterodyning or beat frequency oscillation. In 1915, utilizing his vacuum tubes in a heterodyning oscillator system along with a method to control timbre and pitch, De Forest created the first vacuum tube...\(^{10}\) De Forest too was interested in methods of transmitting music, specifically live opera performances, into homes and public places.
tube instrument. A small monophonic keyboard instrument reminiscent of Grey’s Musical Telegraph, the Audion Piano (De Forest affectionately termed it the “Squak-a-Phone”), appeared mostly alongside De Forest’s radio exhibitions and promotions. Although a polyphonic version was purportedly in the works, the instrument never really caught on—yet it carried within it the electronic principle that would serve as the basis for the first popularized electronic instrument (as well as the first one used in film scores): the Thereminovox or simply, the Theremin.

After noticing that the natural capacitance of the human body would cause frequency variation in De Forest’s heterodyning effect, Russian cellist and electrical engineer Leon (Lev) Termin envisioned a novel way to reconceptualize the most basic aspect of the musical interface: touch. In 1917, he designed the prototype of the theremin (or thereminvox), an instrument that allowed the musician to modulate an electronic tone (fixed in timbre to resemble a violin) by moving her hands in proximity to two antennae (one for pitch, one for volume). As if conducting some

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11 The theremin was not the only instrument of this period to exploit the method of heterodyning oscillators, nor is it the only popular one. In fact, despite its significant contribution to film and popular understanding of electronic music, the theremin was something of a commercial failure in comparison to one of the instruments it inspired. In 1928 French telegraphist Maurice Martenot, also a cellist, conceived and constructed the Ondes Martenot. Much like the theremin, Martenot’s instrument was intended to be integrated into the traditional orchestra and it is still featured in orchestras across the world. Some argue that the reason for the Ondes Martenot’s success was that it, unlike the theremin, the Ondes Martenot featured a traditional keyboard layout and used a separate finger control for glissando and vibrato as well as keys to adjust the timbre. As Martenot was developing the Ondes, German electrical engineer Friedrich Trautwein was also using the heterodyning method to create a three octave subtractive synthesis device known as the Trautonium. Visually similar to the modular synthesizers of some four decades later, Trautwein’s instrument featured a fingerboard on which the musician would make contact between a wire stretched over a metal strip, thus closing the circuit at a given point and creating a tone that would then be filtered and amplified. Through the 1930s a number of composers wrote for the Trautonium, but it wasn’t until the instrument was “adopted” by composer and performer Öskar Sala, who had worked with the instrument from its earliest stages, that it would achieve its most popular articulation in Sala’s score for Hitchcock’s The Birds in 1960.
ethereal orchestra (it was also known as an Aetherophone), the thereminist is the only musician whose performative movements are completely removed from the instrument itself.\(^2\)

The theremin was visually engaging in its performance, yet one tends to watch the performer and not the instrument, as the two never come in contact with one another. More than any other instrument in the early history of electronic music, the theremin best represented the fragile materiality of the human interface with musical technologies. It pulled into sharp relief the separation between the performer and the instrument, the sound source and the musical result. And both for the instrument itself as well its most accomplished practitioners, one can witness the technical and theoretical concerns that would be so central to the Barrons’ work with *Forbidden Planet* two decades later.

The Theremin represents one of the first electronic instruments that offered a new way of interfacing with new mode of sound production. For all of its immateriality—one never actually touches the instrument—it is actually one of the more “bodily” instruments, necessitating an almost complete internalization of the sound source. When playing the theremin, the musician seemed to sculpt air into sound. Photos of Clara Rockmore, one of the first truly accomplished thereminists\(^3\) and close friend of Termin, standing in front of a podium-style theremin with a far-

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\(^2\) Despite its apparent simplicity, the Theremin is notoriously difficult to play as there are no visual or tactile reference points.

\(^3\) Theremin builder and synthesizer pioneer Bob Moog believed that “there are few people who have the talent to be able to even get a melody out of it. There’s only been *one* really great theremin player… and that’s Clara Rockmore” (Moog 133).
away look framed by her two arms akimbo seem more like something from Man Ray’s studio than a concert photo. Yet behind her on the wall is a large speaker that allowed her the split second required to slightly adjust her pitch. Like singing, playing the theremin well requires almost perfect pitch-recognition—a demanding ability to produce one’s own internal musical reference points. In addition to this new way of conceptualizing performance, the theremin also provided a wide range of listeners their first exposure to the sound of musical circuitry. Its timbre was eerily human, yet it required no pause or breath. It was a sound that dovetailed nicely with the visual nature of the performance; the continuous glissando of the vacuum tubes is shaped and restrained into notes hovering somewhere between a voice and a violin with few overtones, finally becoming plaintive, melancholic, and full of space. Yet there were few people capable of drawing from the instrument its full sonic and musical potential, a fact which made clear the sometimes awkward liminal space between diegetic and nondiegetic roles of the new electronic sound palette. More often than not it was used simply for its ability to sound “strange.”
A trained violinist and Russian émigré who met Termin in New York in 1930, Rockmore played and treated the theremin like the traditional concert instrument she had set aside, and she had no patience for the instrument’s growing novelty factor. Later in her career, she remarked on having been asked to play the theremin for a popular film score and refused, noting that instrument shouldn’t be used to make “spooky noises.” Despite her intentions, it was for these very spooky noises that the theremin came to be known. In part because of the nature of the gestural controls and the instrument’s innate difficulty, it became something of an effects generator for the many film scores and soundtracks in the coming years—most famously Alexander Courage’s original soundtrack for the *Star Trek* television series.
But long before *Star Trek*, the theremin was first featured in the 1931 Russian film *Alone (Odna)* directed by Grigori Kozintsev. Originally a silent film, *Alone* garnered a soundtrack by Shostakovich shortly before its release as film sound was made available in Russia. The score was to be the only time Shostakovich wrote for the instrument, yet the tremulous notes followed by the smooth and eerie glissandos in the score’s “Storm Breaks” suggest the manner in which the instrument would come to be remembered. But despite its dramatic cinematography, tremendous score and emotional intensity, the film’s politics weren’t in keeping the tenants of the first Five Year Plan, so it got shelved a few years later and was eventually lost in the siege of Leningrad in 1941 (it was later pieced together from various prints). Like the first film to feature his instrument, so too did Termin come into conflict with the Soviet authorities. After the first concert performance of the instrument in 1924 which garnered a good deal of praise from the powers-that-be (Lenin commissioned 600 of them), Termin successfully toured with his instrument. However, after moving to New York, Termin was accused by Stalin’s regime of anti-Soviet propaganda and sent to a Siberian labor camp.

But where Termin and *Odna* were to disappear for a time in the machinations of Stalinism, the instrument itself was just beginning to be noticed. Prominently featuring the theremin, Miklos Rozsa’s score for *Spellbound* (1945) would win an Oscar for best score with a performance by Dr. Samuel Hoffman, the most highly regarded thereminist after Rockmore. But despite concert works composed for it by Charles Ives and Aaron Copeland as well as the staunch evangelism of people like
Rockmore, the “spooky sounds” of the theremin in *The Day the Earth Stood Still* (1951) and *It Came from Outerspace* (1953) were to define the popular conception of the theremin. But as an electronic artifact, the theremin’s importance (as well as its resilience) comes from its dual nature. The theremin displayed the remarkable versatility of the electronic instrument as it not only made available the tremendous potential of electronic sounds and effects for a new type of film soundscape, but it did so while still retaining the formal and graceful air of a concert instrument. In addition it also clearly portrayed the tremendous potential for reconfiguring the very way one can interface with this new breed of instrument. However, the next step would not be not a mere reconsideration of the way new technologies affected how humans played these instruments, but an examination of how these instruments might play themselves.

5. Raymond Scott: The Cockpit of Dreams

In the late 30s and early 40s, as the theremin was the “spooky” sound of choice for many popular radio dramas, the young leader of the CBS radio house band was Raymond Scott. His jazz-influenced scores were featured regularly on *Your Hit Parade* and, most famously, adopted by Warner Brothers’ “Merrie Melodies” and “Loony Toons” cartoons. A Julliard graduate and aspiring engineer, Scott and his quintet performed for (and in) films of this period featuring Ethel Merman, Shirley Temple and Eddie Cantor; however, he is probably best known for his composition “Powerhouse,” featured in cartoons starting in 1943 and continuing to the present.
“Powerhouse” very quickly came to symbolize the sound of mechanical automation and production with its metronomic urgency and jittery arrangement.

Despite his tremendous success with his quintet, Scott seemed to prefer working in the studio with his electronic instruments rather than the musicians who could never quite keep up with his exacting standards. He saw it as the “the human element of the individual musician [that] began to intrude” (Scott 28). His drummer once remarked that “[a]ll he ever had was machines—only we had names” and jazz singer Anita O’Day opined that Scott “reduced [musicians] to something like wind-up toys” (Chusid 10-11). So when, in 1946, Scott founded Manhattan Research, Inc. (whose brochures advertised “Designers and Manufacturers of Electronic Music and Musique Concrete Devices and Systems”), he focused his efforts on creating the machines that could meet his tremendously exacting requirements, all independent of the human element. In 1948 Scott began developing an immense in-studio sound effects machine called the “Karloff” that featured over 200 hundred sound and rhythm sources that could be combined and filtered. He then built what was to be his most financially successful instrument: the Clavivox. Originally intended to be something of a theremin one could play with a keyboard, the instrument eventually became much more complex as Scott conceptualized new ways to shape the sound.

Despite the success of these experiments, Scott imagined a much more dramatic long-term goal for his engineering work. In 1949, he remarked:

Perhaps within the next hundred years, science will perfect a process of thought transference from composer to listener. The composer will sit alone
on the concert stage and merely THINK his idealized conception of his music. Instead of recordings of actual music sound, recordings will carry the brainwaves of the composer directly to the mind of the listener (Scott 29).

Much like Morbius in *Forbidden Planet* a few years later, Scott envisioned a world “without instrumentality,” a technology that could bypass not only the trappings of physical media, but the most basic musical interface of the human ear. In an effort to realize the compositional aspect of a “thought transference” music, Scott spent twenty years working on the Electronium, an “instantaneous composition-performance machine” which was a pitch and rhythm sequencer\(^\text{14}\) that controlled a bank of oscillators, a modified Hammond organ, an Ondes-Martenot and a few Clavivoxes. Earlier in his career he built the Videola, a modified piano that allowed one to watch a film while playing along and being recorded, making real-time composition more feasible. The Electronium attempted to facilitate the same process, albeit in the absence of actual human contact, as it had only switches and settings rather than a keyboard or “traditional” musical interface. But unlike the theremin that demanded a great deal of innate musical talent, the Electronium sought to internalize these process and remove the potential for human error. It would not only compose and perform music based on user-defined parameters, but it would do so on its “own terms,” without human interference\(^\text{15}\).

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\(^{14}\) Scott was the first to build a working musical pitch sequencer—he built his UJT-Relay sequencer in 1960.

\(^{15}\) This is not to say that Scott wanted to do away with compositional music; rather, it was more of an attempt to automate composition as work—creating a what he called a “jingle factory” that would automatically produce the type of music he had spent much of his life writing and recording.
Despite decades of work, Scott was never quite satisfied with the Electronium. But his forward-looking machine produced, among other things, his three-volume work of synthesized lullabies called *Soothing Sounds for Baby* in 1960 that anticipated the work of minimalist composers Philip Glass and Steve Reich (cf. *CMJ* and *Vox* reviews). Unlike Termin or Cahill, Scott didn’t really leave a tangible instrument behind with which he could be associated. The Clavivox was a bit too derivative and the Electronium was too ambitious. But Scott seemed to typify a period in electronic music that featured musicians who worked in studio-labs with equipment that as yet didn’t have a recognizable physical interface. It was a period when, as Hans-Joachim Braun puts it, “composers often turned into sound-researchers” (9). Musician-engineers such as Scott and the Barrons were, like Termin before them, not only experimenting with the ways in which humans make sound, but how they interface with the instruments that produce it. But Scott, *et al.* were also experimenting with the very spaces in which music was made—the ideal result being a music that is made in no space at all, a music that is thought into being and “channeled directly” into the mind of the audience. But more realistically, as Cage

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16 Mark Mothersbaugh, composer and member of the influential electronic band Devo, now owns Scott’s Electronium and plans on returning it to working order (Scott cannibalized it for parts over the years and never restored it). Even though Scott’s work was very public in its nature—he helped make audible the “sound of the future” for organizations as diverse as Motown, General Motors, Twinkies, and even the headache medicine Bufferin (featuring a young Jim Henson, who worked with Scott on a number of projects)—Scott was very protective (some would say paranoid) of his engineering work. The majority of his electronic instrument research remained within the confines of his extensive Long Island workshop. It wasn’t until much later, thanks to people like Mothersbaugh and Moog, that the tremendous scope of his work in electronic instrument development and production was realized.
puts it, this was music made in a studio to “appear” elsewhere in that same form, with no information loss—this wasn’t (and as yet couldn’t be) performed music.

In July of 1959, an article about Raymond Scott appeared in the magazine *Popular Electronics* and, just two months later, another one showed up in *Popular Mechanics*. Like many other pieces on Scott from this period, the articles focused mostly on the developmental and self-sustaining aspects of Scott’s electronics work: the fact that Scott’s house was a “32-room electronic labyrinth” filled with “a couple hundred thousand dollars” worth of electronic sound generating and recording equipment “which he developed for his own needs” (Blom 45). The so-called “wall of sound”—a phrase used to describe the walls of his studio that were covered with an intimidatingly-ordered set of relay switches, tone generators and tape mechanisms—was imminently photographable, so these articles were accompanied by a series of
shots of the machinery, as well as a few of Scott and his family in the midst of all of these knobs and dials and reels.

In an effort to make these rooms and switches into something that is a recognizably musical, these photographs seem to highlight the fact that Scott’s studio is a domestic as well as scientific/experimental space. Readers of *Popular Electronics/Mechanics* might not have needed for this attractively sterile environment of ordered tools and circuits to be “warmed up,” but the photos of Scott recording his wife singing into the microphone and his young daughter watching intently as he “explains the intricacy of the equipment” do just that (*ibid*). Like classic images of the American family around the radio, these photos make cozy and human this silver and vast expanse of relays and switches. But unlike that warmly wooden object that gave presence to De Forest’s invisible radio “empire,” there is something intangible about Scott’s wall of sound. It is a hermetic and individualized system that has no center, no glowing face plate or large golden and plastic knobs that any child could use. His daughter stands with her hands behind her back, safely distanced from the rows of switches; his wife looks at Scott and not the panel. One can’t help but feel that this system, for all of its immensity and space, is finally somehow inaccessible. It is as if there is an a-physical “thought transference” at work here, although it is the transference of Scott’s thoughts alone. It is one more way for Scott to attempt to bypass the physical nature of musical ‘instrumentality’ in order to allow “the listener to see into the mind of the composer” (Scott 29).

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17 Akin to those popular germ-free spaces of the time such as NASA mission control and the *Jetsons*’ living room.
Finally, this wall of circuitry was, in fact, Scott’s musical instrument of choice. His experiments in consumer instruments were in some ways just attempts to miniaturize this larger vision of the laboratory-as-instrument. He wanted to build an instrument powerful enough to move beyond the material limitations of traditional music production and composition, one that gave its user complete control\textsuperscript{18} over the music-making process, while abdicating much of the physical aspects of that process.

As his vision of a telekinetic music would suggest, Scott was also interested in a musical instrument that would not only allow control over the structure of its sound, but that could then be directly translated into a listener’s consciousness without any signal loss—like the tones of a Telharmonium traveling over the phone lines. But Scott wasn’t just interested in the idea of musical “thought transference;” he was focused on an instrument that could make music that would affect everyone who

\textsuperscript{18}Authorial control was something very important to Scott. He wrote in 1949: “I’ve begun my own recording company… the music is composed and arranged by myself. The musicians are trained and rehearsed by myself. The whole process of recording is supervised by myself, and I’m selling the sides by myself. Actually, I’d like to be able to sell the sides individually—only to people I feel will appreciate them” (Scott 29).
heard it. An early brochure referred to Scott’s company Manhattan Research, Inc. as “more than a think factory—a dream center” (Blom 2). He needed to be some way to make the sterile immateriality of his faceless studio into something with greater reach, with more power to affect others. In his Electronium Scott imagined the seed of an instrument that could truly result in the artistic “collaboration between man and machine”—something more than just the familiar warmth of domesticated and “humanized” technology (Rhea 88).

This idealized instrument will “not look like a Steinway, of course, but to have that sense of elegance and beauty. And I want it to have the feeling of driving, a steering machine, a cockpit of dreams” (Wood 92). There is an insistence here on the best qualities of humanized technology: elegance and beauty, a comfortableness that isn’t cheap and isn’t derivative: it won’t “look like a Steinway.” In Scott’s vision of an instrument that could provide a material link be the human and machine, there is the necessary addition of the kinetic element. In order to make possible this truly immaterial form of musical communication—this telepathic exchange of compositional forms—one must also move beyond the inertness of traditional instruments and create an elegant and, finally, a very physical space of interaction between the instrument and its operator.

6. Forbidden Planet: A World Without Instrumentality

As with Scott’s “Wall of Sound,” the Barrons were working within the electronic studio as musical instrument concept. However, they were not as interested
in absolute control over their sound devices as Scott was. In scoring *Forbidden Planet*, Bebe Barron says that they “just tossed convention aside, forgot about all that, and just did what we wanted to do. And it worked” (ibid 198). Yet they “wanted to do” seems a bit coy in light of the fact that the process by which they created these tonalities relied upon an near-absence of authorial “control.” Bebe Barron later remarked that:

> In scoring *Forbidden Planet*—as in all of our work—we created individual cybernetic circuits…rather than using standard sound generators… Most remarkable is that the sounds which emanate from these electronic nervous systems seem to convey strong emotional meanings to listeners (Taylor 94).

These cybernetic circuits, based on communicative models of what the Barrons termed “lower life-forms,” are something more than a revision of traditional scoring methods. Each musical theme in the film was the product of a circuit, or series of circuits the Barrons’ built in order to represent a specific human emotion. The circuits were sound-producing mechanisms based on Norbert Weiner’s cybernetic theories and provided the Barrons with a structure for emulating a human behavior in a non-human substrate. One of the reasons for this method was that they “didn’t want the control [of the circuits] and in fact had rejected the control” (Barron 199).

Just as the film narrative (which, as mentioned above, is a loose reworking of *The Tempest*) refigures the unruly Caliban as the gently mechanistic Robby the Robot, the Barrons replace the organic human orchestra and music with the sharp and
bubbling voices of networked circuits\textsuperscript{19} and tonalities that sounded “like a character rather than a musical theme” (ibid). Of the circuit’s “character arc,” Barron wrote that “it was like watching a primitive life form come into existence and then fade away” (ibid 195). In the process of diverting the action of “control” away from the themselves as composers and performers, they likewise eschewed notions of film music as having been “live” at one point—ideas glorified by the pit orchestras and wild piano players of early cinema as well as behind-the-scenes footage of John Williams in a glorious London recording studio—and, as John Cage remarked, “built up layer by layer on recording tape, not to give a performance or to write music, but to appear on a record” (Lack 310).

As Russell Lack points out, “the basic tools for understanding the musical experience [of an electronic film score] are themselves obscured by the blurred distinction between electronic sound and electronic music” (318). But in the case of the score for \textit{Forbidden Planet}, the Barrons attempted to make the machines speak for both the human and the alien. Initially, the textures of the electronic tonalities are notable for their strangeness, their otherworldly timbres that suggested more the ‘sounds’ of a future that seemed to be rapidly approaching (if one were to believe the contemporary world’s fairs and future fictions). But these sounds \textit{were} ultimately linked to a very real progress—the technology of not only electronic sound production, but consumption as well. The \textit{Forbidden Planet} soundtrack comes at a

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\textsuperscript{19} Their studio was one of the earliest electroacoustic studios in New York and their complex of “living” circuits and tape and disc machines were used by composers such as Cage, Lou Harrison, Edgar Varese, Morton Feldman, and David Tudor.
crucial time in the history of electronic music and the difficulties and concerns which accompany this development are internalized in not only the music, but the film’s narrative.

The setting of the film is the twenty-second century on the distant planet Altair IV where, some twenty years earlier, Dr. Morbius (Walter Pidgeon) and his fellow scientists landed as part of an expedition/colonization force. Never heard from again, Morbius’ group was considered lost and now Commander J.J. Adams (Leslie Nielsen) and his crew are arriving at the end of a one-year trip from earth to rescue or “relieve” the colony. Morbius is reluctant to let the ship land because, as we later learn, the rest of his group was killed by some deadly “force” to which he, and his daughter Alta (Anne Francis) are “immune.” After recognizing that all may not be as it seems, Commander Adams initiates an investigation. While he and his crew are stationed on the planet, the “unnatural” (and invisible) monster that Morbius warned of attacks the ship, driving Adams and another crew member, Doc (Warren Stevens), to Morbius for answers.

In this scene, which takes place in Morbius’ study, Morbius takes it upon himself to “clarify” the situation for his visitors. In a somewhat stilted and didactic tone, he sits his audience down and begins to outline the magnificent rise and fall of the Krel, the “mighty and noble race of beings” who were the previous inhabitants of Altair IV and who were “ethically, as well as technologically a million years ahead of

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20 Altair literally means a “star of the first magnitude” and in a sense it is a star among planets, but it is also homophonically related to all-terre or all-earth, suggesting that, despite the planet’s removal both culturally and physically from earth, it retains a connection to it.
humankind.” But at the height of the Krel’s utopian society, he explains, just as they were on the brink of some “supreme achievement that was to crown their entire history, this all-but-divine race perished in a single night.” Morbius informs his guests that in the two-thousand centuries since this collapse, nothing of this alien culture “remains above ground, no record of their physical nature has survived, except perhaps in the form of this characteristic arch…”—an arch that leads to a vast underground complex that holds the “brain” of the planet.

But before leading the two men into the Krel’s subterranean computer complex to continue his tour, Morbius moves around his desk in a moment of uncharacteristic silence and places a small pill-shaped metal object into the top of a cylindrical metal and glass device. As he pushes the pill down into the cylinder, the device lights up and a minor-key variant of the Barrons’ music begins to play. Sine waves shaped into piano-like timbres fill out the lower register as metallic tones blip and whistle on the high-end, in the midst of which Morbius shuffles his papers and gives everyone a second to listen until he remarks, rather abruptly: “that recording was made by Krel musicians a half a million years ago… now, if you will follow me I will show you some of their other remaining artifacts.” Following this singular moment, Morbius leads the observers down into the planet’s deep and complex control center from which comes the power to control the “force” that destroyed the early colonists as well as the Krel themselves.

What makes this musical scene remarkable is that it occupies and represents a very potent liminal visual space in the film. It is a space between human knowledge
(Morbius’ study) and that of the Krel. This liminality is initially represented by Morbius himself, whose brain (as we will soon learn) has been artificially “expanded” to accommodate a very basic understanding of the Krel’s advancements. He is more than human, less than Krel. Also, the mise-en-scene here echoes this border space: to his back is the image of the stars, the old home that came before (and above), and on his right hand is the tunnel which leads to the new-old that is below, the key to humanity’s own “supreme achievement.” Morbius is now in a brown outfit, as opposed to the more menacing black he wore when he stepped out of the shadows early in the film; the tempered tones of his clothing reflects his own subtle shift. He sits on the edge of the desk and speaks as much to the audience in the theater as he does the men in his study. Everything in the scene is tempered with the potential for change from one state to another, with the charged possibility of shifts and leaps.

These visual cues, as significant as they are, seem more to support what is the more fundamental aspect of this scene: the aural environment. Up until this point in the film, the Barrons’ soundtrack has been oscillating between the diegetic and nondiegetic aspects of the film’s soundscape. That is, in some scenes, the music underpins the emotional framework of a scene (as in the echo of swelling strings as Commander Adams kisses Alta in the garden). Such scoring, although unique in its bare “electronicness,” nonetheless taps into traditional expectation of what a film score should do. As Elizabeth Hinkle-Turner points out, the Barrons modeled some of their cybernetic circuits to emulate various emotional and social “themes” expected from filmic characters and environments: serenity, anger, love, etc (Hinkle). Bebe
Barron remarked that they ended up with “musical themes” that, while “certainly” not
the typical “sweet love music with strings,” still “seemed to have a sort of universal
appeal; they sounded “right” to people” (Barron 199). There was a balance here
between a futuristic and alien aesthetic and a very human familiarity. Moreover, the
recognizably nondiegetic music intertwines with the more commonly diegetic
electronic sounds: the siren-ish humming of the setting ship when the crew arrives on
Altair IV, for example, recalls the theremin’s use in Hermann’s scores. Both voice a
sound that doesn’t yet exist: the sound of the spaceship in an alien atmosphere.

In the scene in Morbius’ study, the film’s music, like its visuals, are neither
here nor there. That is, they are clearly emanating from a source—the recording
device that Morbius activates—and yet the listener has no way of knowing the
music’s reference point. This scene is a good example of what Pierre Schaeffer
theorizes as *acousmatic music*—digetic music that is nonvisualized, that “one hears
without seeing their originating cause” (Chion 71). That is, we are watching
characters listening to music that is dramatically separated from its source—these
long dead Krel musicians. Such a disconnect complicates the very notion of source as
it demands that the listener/viewer reevaluate the music that has so far remained at its
proper “distance.” In addition to being *acousmatic music*, it is also what Chion refers to
as “on-the-air” sound: “sounds that consequently are not subject to ‘natural’
mechanical laws of sound propagation,” which are “usually situated in the scene’s
real time, [and that] enjoy the freedom of crossing boundaries of cinematic space”
(76). In this moment, the Barrons’ tonalities truly become both “music” and “sound”
and saturate every level of the cinematic space. The initial boundary-crossing here is such that the moment when Morbius plays the Krel music is profoundly disorienting. Yet it isn’t enough that the music and on-screen effects collapse into each other; now the kind of music the audience has been listening to is broadcast to the characters as well. What seemed the film’s accompanying soundscape is, this scene suggests, the work of Krel composers.

In ascribing these (by now) familiar tones to long dead alien musicians, Morbius is drawing attention to the remarkable technological advancement of the Krel recording medium and playback device. Unlike the Krel’s towers of “adamantine steel,” that crumbled back into the surface of the planet, these little pills resist the degradation that threatens all archival media. These recordings seem to exist outside of their representational medium: there is no hiss or crackle as Morbius plays the song—it carries with it no sign of age. The music sounds just as it has throughout the film.

There is a temporal flattening here that almost ignores the great distance between what Chion terms the initial source and the terminal source\(^{21}\) (Chion 76). Instead of focusing on the music’s “recordedness” or placing “emphasis on the acoustic properties of the place where it is being listened to,” the Barrons’ soundtrack and its use in the diegetic text of the film collapses this great temporal and technological distance between the source of the sound and the sound itself. The music moves beyond the diegetic and nondiegetic categories here as its unfamiliarity

\(^{21}\) quick explanation as to what he means by this and how it fits into the larger picture.
is no longer understood simply as a product of experimental electronic tonalities, but now also as a cultural artifact of advanced long-dead advanced civilization. It is as if this indeterminate, yet obviously filmic, space between “effects” and “music” has collapsed into something between the non-narrative presence of the composers and the invisible powers that made this powerful machinery and music possible. It is a more literal rendering of Chion’s “on-the-air” categorization, certainly, wherein the overlap becomes a moment of meta-awareness where the audience is forced to reflect not only on the music itself, but on the advanced nature of the technology that created the music in and for this film The Barrons themselves become “alien musicians” whose tonalities aren’t new at all—they are relics of something distant and advanced, something familiar, yet beyond human capabilities. (It is, then, no coincidence that the Krel machinery that powers Morbius’ dream monster dramatically resembles the typical electronic gear found in a studio such as the Barrons’. ) The Barrons, with their otherworldly sound and otherworldly machines create music that is, finally, as Bebe Barron puts it, what “dreams sound like.”

But dreams in Forbidden Planet are dangerous things—they more often tend to be nightmares. These nightmares have presence: in particular, the “villain” of the movie, the “id-monster” is a physical manifestation of Morbius’s dreams. Because Morbius himself becomes less reliant on the physical, he inadvertently creates a monster that is all id, all physical urge and instinct (making him a perfect psychoanalytic case study in the process). The monster itself is a brutal presence that easily bridges unbridgeable spaces and begins to penetrate the dreams of others.
Following the first appearance of Morbius’ monster, the crewman who thought he only dreamt about the intruder elicits anger from the commander who replies: “A dream! I’ll have less dreaming aboard this ship!” This anger comes, perhaps, from a fear of this dream space where the diegetic becomes mimetic—this nightmare space where the unnatural is made tangible. As if to rebuke the commander’s edict against dreaming, the doctor makes a plaster cast from the footprint in the sand of a large griffin-like foot, remarking that this dream monster is physically impossible, that “anywhere in the galaxy, this is a nightmare.” But yet there is this very physical remnant of the nightmare available for all to see. The walls between dream and reality are permeable and representational objects are able to move back and forth.

During the monster’s second and more brutal attack on the crew, the music is given over to an almost verbalized roar amidst the more familiar tones. Alta emphasizes the monstrous sounds when she relates that she has had an “awful” dream in which she could “hear it roar and bellow.” Here the dream represents the space between the filmic and narrative boundaries traversed by the Barrons’ tonalities. It is the space in which these electronic tones can fly from the throat of an invisible and “unnatural” monster as a roar and cry, where they can mimic of the ebb and flow of an alien computer’s inner workings or the whirring of the vaguely advanced propulsion device of the earth ship. The film suggests that this dream space is ultimately held together by the sound of the Barrons’ circuitry—a seamless substance that moves between human and alien, human and machine, and finally, the physical and the disembodied. It suggests the inevitable turn from “visual” technological
symbols to those of “the newly proliferating electronic technologies… [that] are invisible, circulating outside the human experience of space and time” (Bukatman 2).

The counterpoint to this seamless dream monster that moves from here to there above the visible experience of technology without so much as a click is Robby, the universal physical instrument, who can create precious gems in under twenty-four hours and (at the urging of one of the crewmembers) process his own Kentucky Bourbon. Robby is both what Morbius calls “simply a tool” and what critic J. P. Telotte terms the “ultimate appliance” (119). Robby is suggestive of a technology that works within existing human analogies/frameworks; while the dream-monster is profoundly “unnatural,” Robby’s body and voice approach the human. His voice seems most human of all; he not only speaks hundreds of languages and dialects, he also sounds like a human, with surprisingly fluid speech patterns. But Robby is *not* aurally seamless; unlike the Krel’s more advanced machines whose musics and voices permeate every level of the film’s acoustic discourse, his transitions between thought and action are punctuated by the click and whirr of his internal machinations. Robby is a creature of waking moments as opposed to the monster who is “a kind of psychic robot” (Telotte 12). Like L. Frank Baum’s Tinman of Oz, Robby is an almost 19th century vision of clockwork innards that demand regular oiling and maintenance. Despite his astounding verbal abilities and physical strength, which are far beyond the reach of humankind, his motions are stilted, jerky. Yet even as his body is metal, marked fissures and seams, Robby’s music—that is, the music that frequently accompanies him as he goes about his daily tasks—is all bubbles and
plash; there is a liquidity about the Barrons’ Robby-song that seems oddly juxtaposed with his own machine whirrs.

It is within the constraints of his corporeal nature that Robby proves to be the waking side of the dream economy. Like Morbius with his expanded brain power, Robby represents a physical space between the Krel and humankind, but he’s familiar and humanlike—without Morbius’ dark ambitions or the unnatural claw that cannot exist in nature. Telotte writes that Robby is “an emblem of how much we are ultimately tied to the technological and its powers”—what Morbius consistently refers to as “physical instrumentality” (125). Because of this, Morbius downplays Robby’s tremendous abilities; Robby is, after all, merely Morbius-as-Prospeso’s own creation, his servant. Although he may be able to internally manufacture industrial metals (and still take time to water the flowers), he is dismally incomplete in Morbius’s eyes: a body, a thing.

Robby’s gift and his curse is that he is built “in our own image”—he represents “our own failure to see doubly, to perceive the destructive capacity that lurks in our every creative effort or technological advance” (ibid). This is made most clear when we first meet Robby and the cook asks “is it male or female?” Though Robby replies that such classifications are not significant in his case, these classifications are, in fact, crucial. As a corporeal being, his non-gendered status signifies a boundary-crossing ability beyond that of his creator(s); the Commander says he “looks after us like a mother” and that he is a “housewife’s dream” while
Morbius refers to him as a “gentleman.” Robby is an all-body: he is all things to all people. Although the commander remarks (somewhat finally) “no offense, but you’re a robot,” there is no offense to be taken: it is this very physical “instrumentality” that allows him to live on in the end. Robby is, after all, kind of cute, as the moniker “Robby the Robot” (a title used only in the credits, not in the text of film itself) suggests. And finally Robby is the only Krel artifact to survive the planet’s impending destruction because unlike the monster who imposes his “unnatural” body on the crew, Robby’s body is innocuous, neither seductively female nor threateningly male. Though he is not easily categorized, he is admittedly and quite humanly physical.

After Morbius realizes that his dream of a world without physical instrumentality is subject to very real physical dangers, he is forced to confront his own subconscious made manifest. And it is this confrontation that ultimately destroys him and Altair IV itself, for Morbius then realizes that what he thought was an immaterial technology was actually very tangible after all—the instrument was the planet itself and it, in a sense, played him. In a move that is either supremely altruistic or devastatingly selfish, Morbius gets Adams to key in (a conveniently accessible) self-destruct mechanism before the Commander is aware of what he is doing. Morbius gives the Commander twenty-four hours to get Alta and the remaining crew.

Yet this genderless characteristic was emphatically downplayed in the poster for the film which portrayed a far more menacing masculine Robby holding the limp body of a scantily-clad Alta—a scene not found in the film itself.

More than just an alliterative moniker that infantilizes “robot,” Robby’s name also refers to Issac Asimov’s first robot story, “Robbie,” published by Frederick Pohl in Super Science Stories in 1940. The film is also indebted to Asimov in its (loose) adoption of his famous “Three Laws of Robotics.”
away from the planet before it and all of the Krel’s “supreme” technological achievements are destroyed. The next scene is in the human ship now far out in space, or at least far enough away from Altair IV to watch its destruction safely. In addition to Alta, the ship now features Robby as navigator. After all of Morbius’ imaginings, it is the burbling, bubbling, seamlessly seamed creature (and not the seamless and, finally, grounded character of the id-monster) who has made the transition, who will go on to have a new life\textsuperscript{24}. It is the more recognizably human non-human that will survive the planet’s downfall.

In its conclusion, \textit{Forbidden Planet} and its use of the Barrons’ electronic music presents its audience with a very clear choice: technological advancement without familiar human “guidance,” (without grounding in physical “instrumentalities”) that leads to a deadly and inhuman end; or a technological framework built up in “our own image”—a Robby model, an intelligent appliance that is bodily without the immediate trappings of the flesh. Morbius believes in and yearns for what he terms “true creation”—a world \textit{without} instrumentality, without the constraints of the body. Just as the astronauts in \textit{2001} believe that there are limits to HAL’s perception, only to realize that HAL’s body is the ship itself, so too does Morbius and his model “without reality” fail to fully recognize that planet \textit{itself} is the physical instrument, the material body.

\textsuperscript{24} Robby had a future both within the film’s narrative and without--to justify the cost of producing the Robby costume, the studio made sure Robby appeared in three more feature films and seven television shows.
Though critics such as Scott Bukatman argue that “science fiction denies the body, displacing its attention instead onto the cool mechanics of telematic viewscreens, phallic spaceships, and androgynous android…” (264) in the end of *Forbidden Planet* it is the body that triumphs: not just Robby’s android body, but the body of Morbius’ daughter Alta who shares a name with her home planet. Alta, the innocent, has fallen in love, succumbing to the pleasure of the flesh and it is this that saves her in the end, even as it (in Garden of Eden fashion) destroys her planet. Although the human body is often obscured and homogenized by this vision of a uniformed future, we do see Alta’s body, at first rigid and uncertain, giving itself over to another body, at least insofar as 1950s censors would allow. Because she learns how to interface with another human, to use her body as an instrument—and because she has learned to separate from the bodies of both her father and, in a metaphoric sense, her mother, the planet itself—she is saved.

Thus as Alta travels with the crewmen away from Altair IV, the only remnants of this advanced—but ultimately physically indistinct—race are their most basic technological abilities which enabled Morbius to build Robby, the human woman who is the planet’s namesake and has never know Earth, and, most surprisingly, the Barrons’/Krel’s music that surrounds them all. For finally it is only that which manages to include both the alien and the human, the immaterial and the physical, that can survive in this environment. Because Morbius (as well as the planet) sought to deny the necessity of this balance, burying the immensities of their own physical nature, they had to be destroyed. For, the film’s ending suggests, the notion of an
instrument that *appears* to move beyond the human, beyond the necessity of a physical interface, cannot be allowed to exist in a material economy.

It is this very notion that motivated (in part) the Musician’s Union’s reaction to the Barrons’ seemingly “magical” instrument, as well as a similar response to the Moog Synthesizer a decade or so later. It is the same feeling that demands the destruction of Altair IV—that makes it “forbidden” and threatening. The fear is that a technological object that can exist without physical instrumentation can ultimately exist without the physical itself—and finally without the human “operator.” But as the space ship begins its year-long journey back to Earth with its (mostly) human cargo, the viewer/listener is left with the very real notion nothing has actually been destroyed. The Barrons’ music (which still plays away in the vacuum of space) suggests a new possibility for human/machine interaction that doesn’t necessitate a binary relationship between the physical and the immaterial but creates instead a productive conversation between the two.

6. Epilogue: Synthesizers

As the Barrons were mediating the physical and the immaterial through their electronic music (and changing the sound of science fiction cinema in the process), the larger world of electronic music was undergoing an equally dramatic revision. The year of *Forbidden Planet’s* release engineers Harry Olson and Herbert Belar built the RCA Mark I programmable digital synthesizer. Theoretically similar to Scott’s Electronium, the RCA synthesizer was initially conceived as an electronic
songwriting apparatus based on mathematical probability systems. While still quite different from modern conceptions of the synthesizer, the RCA instrument, especially in its second iteration, the Mark II, was an extremely powerful and flexible instrument for its time. Also that year, Vladimir Ussachevsky and Otto Luening founded the Columbia-Princeton Electronic Studio, the first academic institution designed to promote electronic music and experimentation with electronic instruments. And finally, in 1955 a twenty year old engineering student named Robert Moog visited Raymond Scott at his studio on Long Island. As a result of the meeting, Moog was later given a job assembling the Clavivox, a job he would keep through the early 60’s until he began building the Moog Synthesizer, possibly the most influential electronic instrument and the direct successor to Barrons’ experiments.

But for all of the Barrons’ vision and Scott’s dreamings, the immediate future of the electronic musical instrument and its use in film scores (and soon, popular music) was to be determined by the synthesizer. Trevor Pinch and Frank Trocco, authors of Analog Days: The Invention and Impact of the Moog Synthesizer claim:

> Although ingenious inventors have come up with many ways of making and controlling sound and created many precursors to the synthesizer, nearly all of these inventions have remained merely museum oddities… The synthesizer is the only innovation that can stand alongside the electric guitar as a great new

25 Generally a synthesizer is defined as an electronic instrument that combines and modulates sounds to produce more complex ones—synthesizer developer Bob Moog notes that a synthesizer is “anything that creates sound and has the capability of being reconfigured” (Moog 35). There are a few early electronic instruments that could be called synthesizers by this definition—such as Hugh Le Caine’s Electronic Sackbut and even Cahill’s Telharmonium—however, the RCA instrument was the first to use the name consistently.
instrument of the age of electricity…. [but] in the long run the synthesizer may turn out to be the more radical invention… (7).

Despite its radical quality, the Moog synthesizer and the instruments it spawned are quite traditional. Moog’s instrument grew from its early Barron-and-Scott-ish prototypes to look more and more like a traditional keyboard instrument26, along the way losing a good deal of its power as a flexible multi-timbral instrument. But Moog’s model was not the only option at the time. The same year Moog invented his synthesizer, on the West Coast Don Buchla was taking a very different approach to his own version of the synthesizer. Buchla was designing instruments that, while similar in their internal nature to Moog’s synthesizer, attempted to rethink the very physical nature of the interface with the electronic instrument. He “saw no reason to borrow from a keyboard, which is a device invented to throw hammers at strings” (Pinch and Trocco 44). Buchla “wanted something more imaginative as a controller, something that would connect the performer to this new source of sound” and he called them “kinesthetic input ports” (ibid). Unlike Moog, Buchla, like the Barrons with their circuit designs or Scott with his “cockpit,” was trying to create a interface that matched the potential of the instrument.

But Buchla’s designs never caught on outside of the experimental music set of the West Coast in the 60s and early 70s. Moog’s original synthesizer and its immediate successor, the Minimoog, would come to define the course of the

26 Moog is currently reissuing an updated version of his most famous synthesizer from the 70s, the Minimoog as well as a device called the “PianoBar” which equips a traditional piano with MIDI capability.
electronic musical instrument for the next forty years\textsuperscript{27}. But this is not to say that there is no longer a serious interrogation of the physical and material nature of the electronic instrument that was so much a part of its early history. In fact, as computing power and storage continue to increase, not only have digital synthesizers and samplers have advanced to such a degree that only the most trained ear can tell the difference between the physical instrument and its digital iteration, but new instrument designers are beginning to find a way to better mediate the human and mechanical aspects of the technology. The company Realtime Music Solutions now offers an instrument called the Sinfonia that uses a combination of computer and piano keyboards to allow one person to play a digitally modeled orchestra in real time. Not surprisingly, like the Moog synthesizer and the Barrons’ tonalities before it, the Sinfonia has faced a tremendous amount of resistance from the Musician’s Union, who refuse to consider it an instrument. However, this instrument represents a remarkable mediation of the often unwieldy nature of symphonic music and the technology of the electronic musical instrument itself, by turning the act of programming an orchestral “block” of sounds into the act of playing a virtual orchestra.

With the Sinfonia controversy, as with \textit{Forbidden Planet} (both in reaction to the score as well as in the narrative of the film itself) one can still sense a very real fear of the destructive potential of advances in ‘instrumentality’—a very real desire to destroy that which does not acknowledge the primacy of physical instrumentality. It

\textsuperscript{27} In 2004, software versions of these early Moog synthesizers by a company called Arturia are tremendously popular.
shows, what Telotte calls, the fear of “a kind of mirror of the human that magnifies our problems by showing them in stark or alien terms, and suggests how easily we might be replaced by something else” (Telotte 119). And yet as the history of the electronic instrument shows, it is not so much that the human will be supplanted, but that the human will be forced to change to keep pace with the changing physical medium, even as s/he is effecting these changes. The electronic instrument, far from replacing the human, becomes a part of a peculiar hybrid, one that allows room for continued development of physical instruments while not unseating those instruments that have become so much a part of the ways we define ourselves as culturally and technologically mediated beings.