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Advocating Sonic Restoration: Les Ondes Martenot in Practice

David Madden

The Ondes Martenot (the Ondes) has recently drawn the attention of researchers, scholars, listeners, documentary filmmakers, musicians, and museums. Sound scholar Owen Chapman is currently working on a genealogical history of the instrument and other early electronic musical instruments, including the Hammond Nova Chord and the Theremin; filmmaker Caroline Martel is in the final stages of editing a feature-length documentary on the Ondes; and musician Jonny Greenwood of Radiohead has been producing music with a synthesizer variation of the instrument for more than ten years. As one of the first and most successful electronic instruments to incorporate radio technology for musical purposes, the Ondes is known for its mysterious timbres, dynamic intensity, affective range, and highly developed user interface. Its first public demonstration was in 1928 in Paris, where its inventor, former radiotelegraphic soldier in World War I, cellist, and pedagogue Maurice Martenot (1898-1980), controlled the device using a small ring attached to a wire to move through the instrument's frequency spectrum. After some design refinements, including the incorporation of a short scale *clavier* and the development of various loudspeakers (or diffusers), the instrument was featured at the 1937 Exposition universelle in Paris, where Olivier Messiaen premiered his musical composition for six Ondes Martenot, *Fête des belles eaux* (Tchamkerten, 2007, p. 65).

My interest in this instrument involves its historicity, where my research seeks to weave together neglected aspects of the history of the Ondes as a performing instrument by focusing on its playability and some of its current interpreters, known as *ondistes*, and the way it is approached as a museum artifact. This article will primarily discuss the latter, through an analysis of some of the work being conducted on the Ondes at Cantos Music Foundation in Calgary, Alberta and the Musée de la Musique in Paris.¹ In these museums' contexts, '*conservation*' acts as the operative metaphor and practice for the Ondes. As a consequence, the instrument's sonority, functionality, and aural palette are diminished. It is for this reason that, since Fall 2008, I have been working on a sonic '*restoration*' of the Ondes, which seeks to keep the instrument's sounds in play through creative interventions, recording the instrument whenever possible, and making all source material and field recordings freely available to others.

Martenot presented the Ondes at the Opéra de Paris on May 3, 1928, after nearly ten years of research and development. Initially called *les Ondes Musicales* (musical waves), it is a monophonic electronic musical instrument that uses two heterodyning radio waves, discussed below, controlled by an interpreter to produce its many sounds. The introduction of the instrument was marked by a collective fascination and admiration of its expressive powers and possibilities (Tchamkerten, 2007, p. 63). Audience members responded to what ondist, theorist, and Montreal resident Jean Laurendeau refers to as "the distinctive sign of direct human interpretation" (as cited in

¹ It should be noted that in February 2012, Cantos Music Foundation became the National Music Centre (nmc, our history section, para. 3).

Tchamkerten, 2007, p. 63). Like the Theremin,² which had been introduced roughly ten years earlier,³ and other electrical performances dating back to at least the mid-eighteenth century (Delbourgo, 2006, p. 87), the Ondes provoked a certain wonder, anxiety even, as it appeared to bring sound out of the ether. Perhaps it spoke from, or at the very least, tapped into, the spirit world. After its successful public presentation in Paris, Martenot toured many parts of the world, showcasing the Ondes in both the United States and Japan in 1931. One newspaper report published during the tour, which ondist Thomas Bloch ties to the *New York Herald*,⁴ suggested that Martenot “would have been accused of witchcraft and burned alive in the town square,” had the instrument been invented during the middle ages (Ondes Martenot section, 2004, para. 11).

Martenot’s design initially employed Audion tubes (invented by Lee de Forest and patented in 1906), as Owen Chapman writes, “to create two supersonic radio signals transmitted at frequencies very close, but not identical in terms of Hertz – producing a resultant beat frequency within the audible realm” (2009, p. 1). Going beyond this

² For a recent perspective on the renewed interest in the Theremin, see Hans Joachim Braun’s “Pulled out of Thin Air? The Revival of the Theremin,” from *Sound Souvenirs* (2009).

³ It is worth mentioning that the chronologies of these instruments and other early electronic musical instruments are somewhat vague and contested. According to Laurendeau (1990), Martenot began working out his ideas for the Ondes during WWI while working as a radiotelegraphic soldier. As Thomas Bloch writes, Martenot noticed “the purity of the vibrations produced by the lamps of a condenser whose intensity can be made to vary” (Ondes Martenot section, 2004, para. 1). Martenot’s musical experiments with the Ondes and heterodyning radio waves began around 1919 and continued until his death in 1980.

⁴ I can only assume that Bloch is referring to the *New York Herald Tribune*, rather than the *New York Herald*, which ceased publishing in 1924. The *New York Tribune* acquired the *New York Herald* in 1924 and became the *New York Herald Tribune*. However, I was unable to locate this article and cannot confirm its contents or origins.

technical-speak, when you tune a radio and hear those fluctuating, wobbling sounds, that is heterodyning. As David Kean, founder of the Audities Foundation (Calgary, Alberta),⁵ suggests, “you’re listening to it [the Ondes] sweeping through the frequencies of the radio. It’s dividing down into the audio range and that’s what you are hearing” (personal communication, July 21, 2008).⁶ The Ondes allows one to control these frequencies in the audible range, primarily through a *clavier* or keyboard with six visible octaves,⁷ and a *jeu au ruban*, or ribbon, that sweeps through the frequency range of the instrument, both of which are controlled by an interpreter’s right hand. The musical term used for this tonal sweeping or sliding is *Glissando*, from the French word *glisser* (to glide). The *clavier* was added in the 1930s, thereby alleviating many – but not all – of the tuning issues that plagued early electronic musical instruments based on heterodyning radio waves (such as the Theremin). The development of the keyboard also made the Ondes somewhat more accessible in comparison to traditional string instruments, which require considerable dexterity and muscular endurance to produce *any* sound. As previously mentioned, Martenot was a cellist, and the cello heavily informed the design of the Ondes; however, the inventor was interested in making an instrument that was more playable, perhaps even more democratic (Laurendeau, 1990, p. 227).

⁵ The foundation houses an extensive collection of electronic musical instruments, including an Ondes Martenot, and rare studio gear.

⁶ This heterodyne principle enabled the audibility of wireless radio transmissions. It is worth noting, as Anna Friz writes, that “radio at its most basic is the perception of frequencies in the electromagnetic spectrum between 3Hz and 3000MHz, or below visible light” (2009, p. 1).

⁷ The instrument has a total range of nine octaves, which can be adjusted by transposition buttons.

Its volume or intensity is controlled by a foot pedal and an extremely sensitive *touche d'expression* (also referred to as the *touche d'intensité* or intensity key) built into a small drawer, which an interpreter works with his or her left hand, along with various switches for timbre and transposition adjustments. As Chapman puts it, the intensity key is a “mechanism for *articulating* the notes played on the Ondes” (2009, p.11, emphasis in original), with a dynamic range from silent to violently loud, capable of producing drawn out crescendos and more percussive strikes depending on the touch of an interpreter. Like a bow for a string instrument, no sound is made unless this key (or foot pedal) is employed. For ondiste Suzanne Binet-Audet, the Ondes’ special expressive powers are intimately linked to the expression key. As she puts it:

In regards to the expressive power [...] it is particular to the Ondes. It is an interesting question. Because of the way the Ondes are made, and because of the highly sensitive touch, we can make perfect continuous sounds! We can go all the way to the fortissimo, the four *f*'s, really! The touch can therefore correspond very precisely with the unconscious musical intent. When you play, not everything is conscious. There is also a musical form of thinking, a musical intention, and then there is what carries us, the momentum [...]. Like a continuation of the nervous system, it translates, just like the voice does. Even more, perhaps. It is really, really intimate. So in terms of expression, the Ondes is a very malleable instrument, you can totally shape the sound. (personal communication, April 16, 2008)⁸

The sounds of the instrument are projected through a series of loudspeakers or diffusers (from the French word *diffuseurs*), each with their own tonal/timbral possibilities. Martenot developed four different diffusers in his lifetime: the *diffuseur principal*, which was constructed as the initial loudspeaker for the instrument; the

⁸ This interview was initially conducted in French with the assistance of Kloé Rahilly. David Paquette translated this part of the interview.

flame-shaped *palme* (developed in 1950), which resonates sets of tuned metallic strings over a wooden case; the *resonance* from 1980, which sustains notes using stretched coiled strings in the same way as the *palme* (Bloch, Ondes Martenot section, 2004, para. 22); and the *métallique*, first employed around 1930, which creates “an aural halo around the principal sound,” to quote Tchamkerten, by vibrating a gong (2007, p. 67). The inventor developed these speakers along with other improvements to the Ondes until 1980, most notably a transistor version in 1975, with production coming to a halt in 1988 when Martenot’s assistant, Marcel Manière, retired (Bloch, Ondes Martenot section, 2004, para. 26). Martenot produced seven different versions of the instrument, the last being the one produced in 1975. Less than 400 instruments were built, with Bloch estimating their number to be around 370 (Ondes Martenot section, 2004, para. 25). From Bloch’s estimate, it might be tempting to say that the Ondes is endangered, especially considering that many of the remaining instruments are not even playable.

Following its public presentation and ensuing tour in 1928, the Ondes was used compositionally by almost every major European art music composer until around the late 1940s (Arthur Honegger, André Jolivet, and the French composer and pedagogue, Olivier Messiaen, for instance), and was interpreted by performers such as Martenot’s sister, Ginette Martenot (the Ondes’ first established virtuoso), and Jeanne Loriod,⁹ the younger sister of pianist Yvonne Loriod, Messiaen’s second wife. The Ondes is most

⁹ Jeanne Loriod (1928-2001) became the Professor of Ondes at the Paris Conservatoire, succeeding Maruice Martenot. Tchamkerten refers to Loriod as “an impressive musician,” who “considerably expanded the possibilities of playing the instrument,” most of which is detailed in *Technique de L’Onde électronique, type Martenot* (2007, p. 72)—her three-volume work on the instrument (1987; 1998; 1999).

commonly associated with the work of Messiaen, in particular, with his *Trois Petities Liturgies* (May 21, 1945), and *Turangalîla-Symphonie*, which premiered in February 1948 in Paris (Tchamkerten, 2007, pp. 67, 71). Messiaen's incorporation of the Ondes shows "the expressive and melodic qualities of the instrument," as Tchamkerten writes, "rather than the searching for new sounds to make with it" (2007, p. 67). According to Laurendeau, the composer was a devout catholic and apparently drawn to the Ondes because he felt it could produce the voice of god, or of angels (personal communication, March 17, 2008). In an interview with Claude Samuel, Messiaen elaborated on its sonic possibilities, although his account is slightly at odds with that of Tchamkerten: "I've a great affection for the Ondes Martenot," Messiaen stated, "which allows for the creation of new timbres and new accents at will" (1994, p. 31).

Yet, these very timbres and new accents would prove difficult for some composers and listeners to engage with, as the Ondes was rejected by certain European composers/musicians, such as Pierre Boulez, and critics for its expressive and seemingly uncontrollable sonic beauty. This unfortunate turn for the Ondes came in the late 1940s, in reaction to the instrument's greatest masterpieces, the abovementioned *Trois Petities Liturgies* and *Turangalîla-Symphonie* (Tchamkerten, 2007, p. 71). While both of these musical pieces were considered great public successes, critics and numerous composers and musicians rejected Messiaen's lyrical, feminine incorporation of the Ondes, and in particular, "the disconcerting ambiguity of the *jeu au ruban*" (Tchamkerten, 2007, p. 71). In addition to Boulez, René Leibowitz and many of his followers regarded the Ondes as a gimmick, and "were filled with horror" at

Messiaen's development of the instrument in these pieces (Tchamkerten, 2007, p. 71). In other words, for these men, it was too girly. Chief among its detractors was avant-garde composer, conductor, and eventual first director of IRCAM (Institut de Recherche et de Coordination Acoustique/Musique), Boulez. Ironically, Boulez was an ondist himself, who had studied with Messiaen and Martenot in Paris. Not only was Boulez seen reacting "violently" at the Paris premiere of *Turangaḷīla* (then titled *Trois Tāla*¹⁰), he vowed to never conduct either *Turangaḷīla-Symphonie* or *Trois Petites Liturgies*, which he deemed "brothel music" (Tchamkerten, 2007, p. 71). This connects the Ondes to the "discourse of 'classical music,'" which, as Tia DeNora writes, construes Glissandi "as 'unclean,' that is, part of different and 'less tasteful' musical discourses" (1997, p. 58). I asked Binet-Audet, who studied with Martenot and Jeanne Loriod in Paris, about Boulez's hostility towards the Ondes' expressive powers, and this is how she responded:

Ce qui est amusant c'est que Boulez a dans sa jeunesse été séduit par les ondes au point d'étudier avec Martenot et de s'en servir pour sa musique de théâtre. En a-t-il eu honte un jour comme d'un catholique contrit étant allé au bordel? C'est plutôt une réaction face au style messiaennique (!). Un véritable instrument est polyvalent et peut se prêter à tous les styles, non?

Boulez face à Messiaen, c'est le scepticisme versus la foi franciscaine, l'ascétisme versus le délire du vivant, une esthétique lumineuse et froide versus une autre chatoyante et quasi fellinienne. Irréconciliables! (personal communication, February 24, 2008)

¹⁰ *Turangaḷīla-Symphonie* was commissioned for the Boston Symphony Orchestra by Serge Koussevitzky. Although it officially premiered on 2 December 1949 in Boston, the third, fourth, and fifth movements were performed as *Trois Tāla* in Paris before the American premiere (Tchamkerten, 2007, p. 71).

Unfortunately, after almost twenty years of consistent development of an Ondes repertoire, there was a decline in composing for the instrument by established Western art music composers from the 1950s onwards, whether electronic, electroacoustic, *musique concrète*, or otherwise. Although the Ondes is an important electronic musical instrument, it did not fit into the post-war agendas of the prominent *elektronische Musik* composers working in Cologne at Westdeutscher Rundfunk (WDR), like Herbert Eimert and Karlheinz Stockhausen. The WDR studio wanted to break from identifiable sounds, using simple sine tones produced by oscillators and employing the serialist approach to composition. Serialism is associated with the Austrian composer Arnold Schoenberg (1874-1951) and his followers, Alban Berg (1885-1935) and Anton Webern (1883-1945). In very general terms, it involves composing music with twelve note tones rows, instead of using traditional major/minor key signatures. In the 1950s, serialist composition techniques were taken to stereotypically masculine extremes, as composers like Boulez, Milton Babbitt, and Stockhausen, among others, attempted to control all aspects of composition. For the European serialist composers of the early 1950s, Joel Chadabe writes:

[...] serialism was a compositional technique wherein every aspect of a composition – not only notes, but also loudness, timbre, duration, type of attack, and every other imaginable parameter of a sound – could be based on and derived from the same row, or *series*, thereby producing a kind of total structure wherein every detail was organized. (1997, p. 37)

Not only was the Ondes too expressive and feminine for this colder aesthetic (Chadabe, 1997, p. 37), it relied on interpreters to perform compositions at a time when many

composers were looking to bypass the necessity of using interpreters in favour of total control.

However, even Pierre Schaeffer, initially a proponent of acoustic and identifiable sonic material, and figurehead of *musique concrète* and the Groupe de recherche musicale in Paris at the Studio D'Essai at Radiodiffusion-Télévision Française (RTF), was not interested in composing with the instrument. While interviewing Laurendeau at his home in 2008, he informed me that Schaeffer found the instrument “too human,” much like Boulez and Liebowitz. In Laurendeau’s words, this amounted to placing the Ondes in a wastebasket with “white gloves on” (personal communication, March 17, 2008). Perhaps Schaeffer’s rather elegant disposal of the instrument comes from his total dismissal of identifiable sound sources after initially embracing this material for musical purposes. As Douglas Kahn points out, in the very same year that Schaeffer produced his first *concrète* piece, *Étude aux chemins de fer* (1948), he rejected it for its incorporation of identifiable sound sources – in particular, the train station sounds (1999, p. 110). Kahn writes that from this point on, Schaeffer “employed a variety of manipulation techniques that would more assuredly diminish or entirely eradicate any associative properties a sound might have,” echoing the compositional strategy of Stockhausen *et al.* at the WDR studio in Cologne. Schaeffer felt that this break from the identifiable sound world was a necessary condition for making music (Kahn, 1999, p. 110).

It seems hard to imagine that this hostile reaction towards Messiaen's expressive writing for the instrument from some of Europe's most important and powerful composers and critics did not contribute to the declining interest in the instrument after World War II among *composers*. In fact, Messiaen would not produce another work with the instrument until 1983, with the premiere of his opera, *Saint Francois d'Assise*, after nearly thirty years of not working with the Ondes Martenot – although he apparently never lost interest in the Ondes during this period (Tchamkerten, 2007, p. 72). Yet, while many European composers moved away from the instrument, having found it (sonically) uncontrollable in so many ways, a new group of *ondistes* (interpreters) continued training at the École normale de musique in Paris and the Paris Conservatoire: most notably, the aforementioned Jeanne Loroid, along with Laurendeau and Binet-Audet, who were pivotal in bringing the instrument to Canada and specifically, to Quebec. In addition to writing *Maurice Martenot, luthier de l'électronique* (discussed below), Laurendeau established the first course in Canada on the Ondes and taught for many years at the Conservatoire de musique du Québec (CCM). Together, Laurendeau and Binet-Audet founded the Ensemble d'Ondes de Montréal in 1976 with Marie Bernard, Lucie Filteau, and Johanne Goyette.

With a repertoire of approximately 1,500 works covering numerous genres and practices (Bloch, Ondes Martenot section, 2004, para. 8), the instrument is also known for its presence within popular culture, largely in film scores and (popular) music. For instance, it is prominently featured in *Ghostbusters* (1984) and *Mars Attacks!* (1996). In popular music, the Ondes is most commonly associated with the recent work of

Radiohead's multi-instrumentalist Jonny Greenwood on many of the band's recordings, including *Kid A* (2000), *Amnesiac* (2001), *Hail to the Thief* (2003), *In Rainbows* (2007), and *The King of Limbs* (2011). Greenwood also scored Paul Thomas Anderson's *There Will Be Blood* (2007), parts of which feature the instrument. It is worth mentioning that Greenwood primarily employs a [synthesizer version](#) of the Ondes, developed in collaboration with Analogue Systems (developers of analogue synthesizers), called a *French Connection*. According to Bloch, there are about ten professional ondistes in the world (Ondes Martenot section, 2004, para. 9), including Laurendeau and Binet-Audet, along with heretofore not mentioned Estelle Lemire and Valerie Hartmann-Claverie.

Les Ondes Martenot as a Museum Artifact

While it is unclear just how many Ondes are still in existence, it is safe to say that these remaining instruments are primarily in the hands of ondistes, private collectors, and museums, where they are generally maintained and displayed for historical reasons. As mentioned at the opening of this article, the Ondes is considered to be one of the most important early electronic musical instruments for its novel use of radio technology for musical processes, its highly developed user interface, and its timbral/dynamic range. Two museums in particular are currently working on conservation projects: the aforementioned Cantos Music Foundation in Calgary, Alberta and the Musée de la Musique in Paris. The former is devoted to the preservation of historically important musical instruments, both acoustic and electronic (and/or electrically powered). According to its website, the Cantos Music Collection is the "largest of its kind in the

world,” and comprises over “700 keyboard instruments and other musical artifacts” (Cantos). In the foundation’s own words, the collection tells “a musical story spanning from 200 BC through to the present,” and “serves as a touch point for learning, engagement, healing and entertainment for people of all ages and interests” (Cantos).

Cantos has one Ondes in its collection and it is displayed in the museum’s electronic music collection, alongside a Theremin, Hammond Nova Chord, Robb Wave Organ, and other musical instruments and devices. It took them seven years to find the instrument and they paid around \$20,000 CAD, which according to the Cantos Electronics Technician, John Leimseider, is considered a reasonable price (personal communication, July 22, 2008). Leimseider’s focus and expertise are primarily oriented towards the foundation’s electronic/electric musical instruments, although he spends time working on the acoustic instruments as well. He dates Cantos’s Ondes to either 1975 or ‘78 (i.e. the seventh version), noting “that they bought it from a dealer in France who specializes in acoustic instruments and would not give many details about the instrument” (personal communication, July 22, 2008). I visited the foundation in July 2008 as part of a research trip with the abovementioned Chapman and Dr. Andra McCartney. While testing and recording Cantos’s Ondes, we found that the keyboard was not working and its *métallique* diffuser was not functioning properly, although the instrument’s ribbon worked very well.

In an article published in 2004, Sylvie Ramel, Head of Preventive and Curative Conservation at the Musée de la Musique, posits that of the museum's collection of 4,300 musical instruments "and a totality of 6,500 works," 280 instruments are from the twentieth century (2004, p. 87). Although Ramel does not specify the exact number, she notes that "the museum has a large set of diverse Ondes Martenot," which form part of its "electrophones" collection of electric and electronic musical instruments (2004, p. 87). Ramel writes that "a condition for the selection was that any instrument considered was to be a technological breakthrough and have generated a musical repertoire" (2004, p. 87). The Ondes and the rest of the electrophones fall under the same guiding principles that govern all of the museum's instruments. As Ramel puts it, "we have to acquire, conserve, describe, and display them," as outlined by the Statutes of the International Council of Museum Art (2004, p. 87.). The Ondes are not currently on display at the Musée, however, and their collection can only be seen "by appointment and for specific research purposes only" (Ramel, 2004, p. 90).

At the Musée de la Musique, they are currently developing a "model approach" to conservation for these instruments, which, as Ramel writes, "involves organizing the instruments, studying them in order to outline conditions of appropriate conservation, and determining which kind(s) of restoration should be undertaken" (2004, p. 87). In addition, the museum focuses on preventive conservation, which, according to Ramel, "includes management of age-dependent parameters and the conservation of collections. Essentially it is based on the conservation of material forms" (2004, p. 87). However, Ramel is careful to point out that the development of conservation and

restoration practices of electronic and electroacoustic musical instruments is a relatively new field, and “we still have many unanswered questions” (2004, p. 90). Leimseider also acknowledges the lack of codified practices for electronic musical instruments and suggests, “there isn’t a real plan for how you keep the instruments” (personal communication, July 22, 2008).

It is worth mentioning at this point that restoration and conservation are not the same practices. According to Leimseider, again, the head electronics technician at Cantos, a restored version of an instrument is one that is playable with little to no regard for employing original parts. Conservation, on the other hand, implies maintaining ‘original’ parts, with little to no regard for an instrument’s playability or functionality (personal communication, July 22, 2008). Ramel addresses this distinction as well, although in slightly different terms:

[A] restoration to improve the state of presentation or to restore the ability to play an instrument is obviously neither the same intervention nor involves the same level of intervention. One has to remember that the more of an intervention is encouraged, the more one touches the authenticity of the instrument. (2004, p. 89)

However, Ramel does not specify exactly what comprises the authenticity of an instrument. Again, given that musical instruments like the Ondes are often maintained in museum settings like Cantos and Musée de la Musique, conservation, with its emphasis on the preservation of ‘original’ parts, is generally the preferred approach. As Leimseider mentioned to me during an interview at Cantos, conservation is generally

upheld as a practice, as it is considered more “important if you’re trying to keep things for historic reasons” (personal communication, July 22, 2008).¹¹

While acknowledging the importance of creating and establishing general principles for museum-based conservation practices, the privileging of conservation with a secondary concern for restoration creates fundamental problems for the Ondes (and other electronic musical instruments) as a sounding instrument – namely, it keeps it silent, or at the very least, distorted. As Barbara Kirshenblatt-Gimblett points out, “museums by their very nature tend to be conserving and conservative institutions” (2006, p. 361). As a consequence, very little work is being done to make the Ondes playable or functional in these settings. For instance, while visiting Cantos, it was unsettling to tour through its prominent collection of electronic musical instruments that appear to be maintained for the purpose of display only, as many of them are not even plugged in. Moreover, the Foundation’s Ondes is difficult to even turn on, in addition to it having a malfunctioning keyboard and loudspeakers.

The Ondes is known to be a finicky instrument, temperamental in terms of tuning and delicate in some areas, and requires regular maintenance for its upkeep. Electronic musical instrument developer Adrian Freed even suggests that “each instrument has its own quirks and temperament” (personal communication, November 21, 2010). Taking a conservation approach, and thereby hesitating to make even limited interventions, denies the regular maintenance that the instruments demand. Part of this upkeep

¹¹ According to Leimseider, it should be noted that sometimes a mix of both conservation and restoration is employed by museum practitioners (personal communication, July 22, 2008).

involves turning the Ondes on and playing it regularly to prevent oxidization problems and galvanic corrosion, otherwise the components degrade. Any keyboard with mechanical switches faces this oxidization problem, unless one seals the switch contacts in a vacuum or with an inert gas. As of 2004, the Musée de la Musique was just starting to “study the efficacy and the potential harm of plugging in or even playing an instrument,” writes Ramel (2004, p. 89). Furthermore, before making any intervention, including turning an instrument on, as Ramel states, “we first have to start defining the levels of intervention” (2004, p. 90). Does this process involve considering and defining the consequences of inaction? Unfortunately, Ramel does not mention the key oxidization problem that contributes to the degradation of the Ondes, including the corrosion of original and/or *authentic* parts that might not be manufactured anymore. It is worth mentioning that this oxidization problem can usually be overcome by simply spraying contact cleaner on the contacts and playing the instrument regularly.

Freed encountered this oxidization problem while working on (*ondiste*) Mary Chun’s Ondes while she prepared for an engagement with the instrument. The problem was most likely caused by Chun’s proximity to the ocean and salt water, as she lives in San Francisco. Although the oxide would not have been a problem if the instrument had been played daily, Freed overcame the problem by using contact cleaner. After successfully making this initial (restorative) intervention, Chun asked Freed to make other improvements to the instrument; namely, to adjust some of its very old cables/connectors and create another output for recording, thereby making the instrument more suitable in a studio setting. From Freed’s intervention, three important points of

interest emerge. First, it is clear that as an ondiste and interpreter, Chun is less concerned about maintaining authentic or original parts than having the Ondes work reliably when she needs to play it. Before making the adjustments, Chun's Ondes produced undesirable "very high, crazy wiggly frequency" sounds, "something like short-wave radio signals," and its lower three octaves were not in tune (personal communication, November 21, 2010). After the modifications, the instrument was performance ready, both in and out of the studio, which perhaps suggests that active musicians/ondistes are more likely to take care of these instruments according to the criteria of restoration and keep them sounding.

Hesitating to make this type of necessary tune up and strictly maintaining a conservation approach also somewhat undermines the *lutherie* tradition, as instruments have long been constructed for the purpose of future adjustments. In this way, conservation freezes the Ondes as a static artifact, when, in fact, a musical instrument is a continuously changing process. The only book written on Maurice Martenot, entitled *Maurice Martenot, luthier l'électronique*, or electronic luthier, a turn of phrase coined by Martenot himself (Battier, 2004, p. 47), provides a clue to the inventor's thinking behind the instrument. Martenot was a very respected luthier who understood the tradition of making and repairing stringed instruments very well, even integrating it into the construction of the Ondes. For instance, as Freed describes, the inventor included a nail file to clean the contacts, which is "just the sort of thing luthiers would expect who work on pianos and violins: they leave messages or tools for future generations who work on the instruments they have worked on" (personal communication, November 21,

2010). Furthermore, Freed argues that instruments like the Ondes “should be improved and modified as has always been the case until the recent and hopefully short-lived cults of authenticity and acousticity,” adding that “it is impossible to preserve a musical instrument ‘as it was’ because ‘it was’ designed to be played and performers have always tweaked their instruments – as you can observe listening to a high-level performer discuss how they want their piano tech to voice their piano” (personal communication, November 21, 2010). It is important to stress that Freed presumes a definition of preservation that is at odds with those of the museum practices outlined above. Additionally, his comments seem to suggest that there are competing, and incommensurable, criteria at work here.

The final point that I would like to emphasize in this section relates to the way that so many ondistes offer to demonstrate the instrument, which touches on a long history of demonstration of instruments.¹² Lilian Pérez writes that “with the commercialization of leisure” in Europe in the eighteenth century, “‘technological tourism’ emerged. Tools, mechanisms and processes were exhibited and workshops were open to potential investors and privileged customers” (2008, pp. 25, 27). Pérez adds that “[W]orkshops became places of display,” where demonstrations “blurred the boundaries between mechanical arts and polite arts, between pleasure and instruction” (2008, p. 41). Similar to the “technical shows” detailed by Pérez, which “emphasized operations,” and “processes” (2008, p. 41), Chun wanted to present the Ondes to some of Freed’s students when the final revisions were carried out.

¹² For an elaborate detailing of this history vis-à-vis electrical performances and demonstrations, see James Delbourgo’s *A Most Amazing Scene of Wonders* (2006).

Laurendeau and Binet-Audet also frequently demonstrate their instruments when performing or giving public lectures. This generally entails elaborating on the Ondes' construction and sound making processes and its musical gesture or technique, in addition to allowing audiences to touch and play the instrument.

In these various contexts, the three ondistes offer to “perform the knowledge” of the instrument, to borrow from Kirshenblatt-Gimblet’s phrasing (2000, p. 125). While studying “how knowledge is performed in several Swedish museums,” Kirshenblatt-Gimblet partly focuses on the Ausburg art cabinet, a gift presented to Gustavus Adolphus in 1632 (2000, p. 129). The construction of the cabinet was so complex that the person who commissioned it, Phillip Hainhofer, had to demonstrate the cabinet and its contents. As Kirshenblatt-Gimblet puts it, “it had literally to be performed to be known” (2000, p. 129). The cabinet is currently housed in the Linnémuseet, where many of its contents have been separated from it and no “inventory” was ever taken of the vital performative knowledge that connects the contents to the cabinet. As a result, “these objects are now easy to expose, but difficult to know” (2000, p. 132). Perhaps the same can be said of the Ondes as it rests silently in a museum, whether displayed publicly or by appointment. While Cantos and the Musée de la Musique have certainly made the Ondes more accessible to the eyes of visitors and researchers, they have also made it difficult to know, neglecting that its contents and sounding possibilities must be demonstrated and performed.

In keeping with the idea of the necessity of performing the knowledge of the Ondes, two video demonstrations are attached to this text. The first video, which is entitled *Music from the Ether*, is of a demonstration of the instrument by its inventor, Maurice Martenot, from 1934. The second is a recent video recording of Jean Laurendeau demonstrating the gesture of the instrument to me in his studio in Montreal.

[*Music from the Ether*](#)

[*J.Laurendeau*](#)

Notice the way that the instrument's sonority and musical gesturing is related to the cello and various string instruments. Once again, an interpreter must press the intensity key with his or her left hand while moving the ribbon or playing the keyboard in order to produce sound. While using the keyboard or the ribbon, an interpreter can mimic the subtle, yet essential, vibrato of a cello by very slightly rocking his or her right hand back and forth. It is worth mentioning that while Messiaen heard the "voice of angels," Laurendeau, who is also a clarinetist, was initially drawn to the instrument because of its affinity to the clarinet (personal communication, March 17, 2008). While connecting the sounds of the Ondes to the cello, angels, and the clarinet might seem to create a vague and confusing sounding profile, such comparisons are invoked in order to present the instrument's exceptional range of timbre and dynamics.

Sonic Restoration and les Ondes Martenot

I would like to conclude by discussing a musical work (attached below), entitled “Magic Numbers,” that I produced using recorded samples of an Ondes Martenot. The piece was very deliberately guided by ‘*restoration*’ as a production metaphor. As previously mentioned, this sonic restoration involves recording the Ondes whenever possible, creating sound pieces, and making the recorded source material available to others for further interpretations, in an attempt to keep its sounds in play (rather than actually working on instruments to make them playable). Conservation, on the other hand, implies not only a fixed idea about the instrument’s working parts, but when it is pursued sonically, it would entail remaining faithful to an original and authentic sound, if there even is such a thing. I will detail parts of my production process as a potential method for those who might be interested in participating in such a restoration project. All sound files included in this text can be downloaded below.

Researching the Ondes and drawing together neglected aspects of its historicity involves moving through various international, national, and local circuits, collecting sounds, stories, documents, contradictions, and artifacts. For this restoration project, I spent one week in Calgary, Alberta visiting Cantos Music Foundation and The Audities Foundation, where I interviewed Leimseider and Kean, along with recording the Foundations’ Ondes. In addition, I have had numerous ongoing engagements in the last four years with Freed, Laurendeau, Binet-Audet, Chapman, and (filmmaker) Martel in Montreal, where I currently reside. Future trips might involve going to the Musée de la

Musique, seeking out Martenot's family in France, or attempting to interview composer Takashi Harada in Japan.

The source material for "Magic Numbers" was recorded while on the aforementioned research trip to Cantos and Kean's Audities Foundation with Chapman and McCartney in 2008. The Ondes was recorded in Kean's studio using a portable sound recording setup, including two microphones, Chapman's laptop, and a digital audio recording suite (Protools). The first audio sample that is embedded below is a drawn out recording of Chapman, McCartney, and I playing Kean's Ondes. Although the three of us are experienced soundmakers and musicians, it should be noted that none of us have spent much time playing the Ondes. As the audio file should make very clear, we are merely exploring the instrument's ribbon, keyboard, and sonic potential. Only one of the speakers was working; however, the ribbon and keyboard were functional. It is worth mentioning that Kean is conducting a 'restoration' on this Ondes, as he is more concerned with making the instrument playable, rather than maintaining 'original' parts and/or making limited interventions.

Ondes Martenot, field recording

After making initial source material recordings, I then listened repeatedly to these various sound files and 'cut' them into shorter, more workable samples. These remaining samples comprise what I call an aural palette. While a palette might be more commonly understood as a surface that visual artists use for mixing various colours for a painting, I employ "aural palette" to represent a set of sonic material choices to draw

from while producing a sound piece. Moreover, palette seems like a suitable metaphor given that the discrete sound identities created for this project were primarily created through transformations to timbre, which is often thought of as a sound's colour. Below are two examples of samples that I edited from the initial audio recording, entitled "sample 1" and "sample 2." Both files are used in "Magic Numbers," which is included in its entirety following the two samples.

[Ondes Martenot, samples](#)

[Magic Numbers \(2010\) by David Madden](#)

After listening to "sample 1" and "sample 2," it should be noticeable that significant changes were made to the initial source material recording. These changes include layering multiple octaves together to create thicker sounding samples, adding digital delay to create more sonic space, and making minor equalization adjustments. In addition, I added a simple rhythm foundation using prerecorded samples of various drum sounds, including a bass drum, snare drum, and handclaps. Advocating sonic restoration acknowledges that an instrument's sound should never be thought of as static or fixed. Just as the various social practices and musical styles around the Ondes change depending on the cultural context, it is fair to assume that its sounds should be open to transformation as well. Keep in mind that we construct our ideas about an instrument based on many factors: it is not merely a question of audible frequencies – recorded or otherwise – technology, and (authentic) components. So even though the pieces created for this project employ a variety of digital effects processes, including

delays, filters, and pitch shifting, and low quality recordings, the instrument at the centre is still an Ondes Martenot.

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