

The Partaking Piano, Extended Perspectives: *motivations behind customizing*

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ABSTRACT: This writing investigates my motivation for altering the piano towards a problem causing and problem solving tool for musical creation, approached from the perspective of improviser, composer, artist and instrument builder. It explains how I developed my pianistic voice, from my first solo piano CD, *7CC IN IO*, 1996, up until *Truancy*, (CD/LP, 2014), and puts my approach in a historic context.

INTRODUCTION

During the 1960s in my grandfather's local cafe on the theatre stage stood an old piano with a buzzing sound. When I lifted the top lid, I saw a broken string rattling against the bass strings causing this interesting sound. Ever since that moment I have been fascinated by the inside of the piano. This writing is a result of my experiences during 40 years of experimenting with this instrument in a number of improvisational, compositional and theatrical contexts. One can hardly think of another musical source so poignant, grateful and diverse, visually as well as aurally.

TRIPLE DUTCH

When dancer Michael Schumacher (USA, 1961) asked me in 2003 for a duo project, *Triple Dutch*, as part of the Holland Dance Festival, I wanted to approach it as a *trio* for dancer, pianist *and* piano. In hindsight I was addressing a number of issues I was dealing with around that time:

- The heavy load on a pianist's shoulders of the heritage of piano repertoire from Haydn and Debussy to Art Tatum and Bill Evans.
- Why did jazz pianist Thelonious Monk often step away from the piano and danced around it in the middle of a concert?
- The use of tactile intimacy versus detached spectatorship as musical parameter.
- Moving away from the expectation of 'soloist with musical accompaniment' towards a more holistic relationship.

For our concept certain conditions were needed: a grand piano, sounds from the piano without the necessity of my physical presence, and a floor allowing free movement of the piano. By moving the piano around, I would shape the space into various forms which consequently the dancer could use as anchor for his actions. In this way we were able to give the piano an equal role in the performance and engage in a discourse.

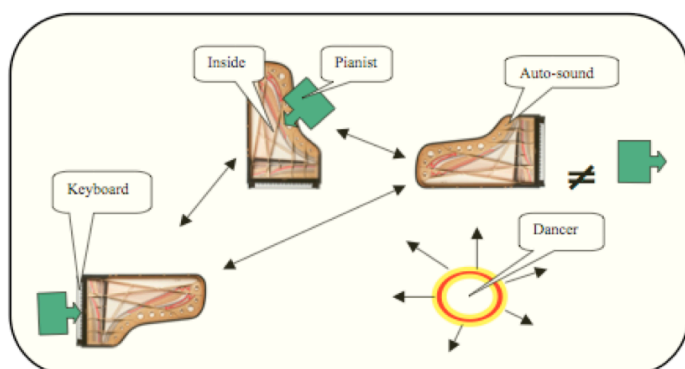


Figure 1. The piano and pianist alternating between placement and between relationships: via keyboard, via inside and independent/separated, all this juxtaposed with the actions of the dancer as 'soloist'. [1]

How did I arrive at this performance in 2003 and how have I proceeded since? Why do I do what I do, and why do others do what they do?

HISTORIC CONTEXT

FOLEY ARTISTRY

There are many examples of 18th century music in which keyboard instruments imitate thunder and canons by playing clusters, and the performers may also have played inside the instrument. There are similarities between using various thunder imitating devices for sound illustration in theatre and opera in the 18th century, and the use of a grand piano as sound source by composers and Foley artists for film in the 20th century.

In the following quote from 1908, concerning the accompaniment in silent films, the words 'music' and 'effects' are not separate terms but interchangeable and equally important.

"A piano properly handled . . . will be found to an almost complete equipment. When people see an object fall, a natural tendency makes them listen for some sound as it strikes, and a thump on the proper key of a piano will give all the realism necessary . . . the various realistic effects which it can lend to an exhibition is indeed surprising. The tramp of feet, thunder, gay scenes, tragic scenes, military spectacles and all the different situations to be found in the pictures to-day, demand different accompaniment by music." [2]

In 1963, sound engineer Brian Hodgson used a piano to create the sounds for the 'TARDIS' (the time machine in the shape of a telephone box) in the British science fiction television program *Doctor Who*, sounds still used in the series in 2016.

In general, one can safely presume pianos have been tampered with from their very beginning, either in a formal or an informal way.



Figure 2. Brian Hodgson in the BBC radio phonic workshop, London, with a gutted piano for the extraction of sounds.

INSTRUMENT BUILDING

Opera, theatre and film need sound effects, and the piano offers many options to produce these effects. Coin-operated pianos and related instruments were produced from around 1800 until the first half of the

20th century. The strings of the piano were manipulated in various ways with a '**mandolin attachment**'. This device could be activated in the same way as the practice pedal on a contemporary upright piano by placing a rail with a piece of cloth in between the hammers and the strings.

"The mandolin attachment was a basic feature of many coin pianos. In its simplest form this attachment consisted of a cloth or leather strip on which metal studs were affixed. When called for by the music roll, the mandolin strip of bar would drop between the piano hammers and the piano strings. A metallic mandolin-like tone resulted. Many varieties of mandolin attachments were made, including the Nelson-Wiggen 'banjo attachment' which used hardwood blocks instead of metal studs, the Coinola (also used by others) system which used a series of wood pegs, and an early Seeburg system which used a series of brass strips which rested against the piano strings (below the hammer striking point) and which vibrated against the strings after they were struck." [3]

Tack pianos were a common sight in public places even before 1800. It has tacks or nails permanently placed at the end of the hammer to produce a tinny, loud and percussive sound in order to be heard amongst a noisy crowd. We can place both tack piano and the mandolin attachment in the area of traditional instrument building: *creating a homogeneous sounding instrument which can be used for already existing music and musical strategies.*



Figure 3. Glenn Gould performing Bach's *Brandenburg Concerto* in 1962 on a tack piano he called 'harpsipiano'. [4]

In the late 1820s Joseph Angst built a forte piano in which a strip of wood covered with cloth or leather could be lowered and rested on the bass strings to produce a nasal effect imitating a bassoon. Aside from the strip of wood, this forte piano also had a mallet hitting the soundboard to imitate a drum/gunshot and a strip of felt to produce a 'celestial' sound. This instrument was based on **turquerie**: an imitation of Turkish military bands. **The luteal** is a more or less standard grand piano with four added sound-effects/registers, such as harmonics/partials, tacks and combinations of these (18 in total). The instrument was first patented in 1919 by Belgian composer George Cloetens. The luteal disappeared until the 1970s when Dutch violinist Theo Olof asked piano builder Evert Snel to repair one of the last existing luteals. **The choralcelo** ('heavenly voices') is a hybrid acoustic and electro-acoustic instrument developed by Melvin Severy around 1900. It used a piano to generate sounds by using electromagnetic waves to excite the strings similarly to the working of an ebow. [5]

FORMAL EXAMPLES EARLY 20TH CENTURY

In the 1920s and shortly after, a number of similar ideas involving the inside of the piano emerged independently. In the mid 1920s, Swiss Bauhaus artist Xanti Schawinsky (1904 - 1979) wrote the following:

“Later, someone donated an old piano to the theatre workshop and we transformed it into a sort of orchestrion by sticking thumb tacks into the hammers and by covering the strings with paper, nails, screws and other objects. This produced sounds somewhere between a harpsichord and a motorcycle.” [6]

It is not useful to discuss ideas to alter a piano chronologically, since it can take years before an idea is being used within a *formal composition* (if at all).

Supposedly, French composer **Eric Satie** (1866 – 1925) used a piece of paper to prepare the strings of the piano in his 1913 piece *Le Piège de Méduse*, [7] to produce a more mechanical sound, however, this was not written into the score. Australian composer **Percy Grainger** (1882 – 1961) wrote *In a Nutshell* around 1916. The third part, *Pastoral*, ends with three notes with instructions for the pianist: ‘strike strings with soft marimba mallet’. [8] A more integrated approach to inside piano playing is shown by Danish composer **Rued Langgaard** (1893 - 1952). The score for *Insectarium* [9], for piano solo from 1917, comes with the instructions: ‘Grasp the bass strings’, ‘Strike the piano lid with the knuckles’, ‘gliss on the treble strings’ and ‘hands above the head, ad libitum!’. In *Music of the Spheres (Sfærernes musik)*, for orchestra from 1918, Langgaard has the piano played solely inside, which he calls ‘glissando piano’. Composer **Henry Cowell** (USA, 1897 – 1965) wrote a number of pieces for what he named the ‘string piano’, in which the strings of the piano are played directly with the hands. In *Aeolian Harp* (1923) the strings are strummed directly with the hands in a homogeneous way so that the focus is not so much on timbre but on harmony. In *The Banshee* (1925) Cowell focusses more on timbre by sweeping lengthwise along the round wound lower strings.

Up until this moment, mostly piano alterations aim at a homogeneous overall sound or use the inside of the piano as an atmospheric side effect. A next step is a form of composing where changes of tone colouring are not avoided but sought after as *an independent parameter and foundation for composition, validated by its time*.

THE PREPARED PIANO, SCREWS AND BOLTS

John Cage’s motivation in preparing a grand piano lay behind wanting to write a percussion piece for a dance performance but having no space for percussion instruments and only a grand piano at his disposal. Cage (USA 1912 – 1992) *was confronted with a practical issue of limited space similar to those of orchestrion or coinola builders: how to extract different timbres from a piano to imitate an ensemble*. Well aware of Cowell’s inside piano pieces, Cage started to experiment with various objects in between the strings. In some of Cage’s early pieces he uses a more or less homogeneous preparation. The materials mainly alter the timbre by dampening the note without adding other interfering frequencies and leave the fundamental frequency intact, functioning similarly to the mandolin attachment or the luteal. In other early pieces, mostly for dance, Cage uses more types of material but limits the number of sounds and focusses on making rhythms resembling a small percussion ensemble. Cage employs a timbre focussed approach in later dedicated pieces, such as *Sonatas and Interludes*, 1948, and *Works of Calder*, 1950.

Cage was not the first to prepare a piano [10], but as far as we know he was the first to use *solid materials such as bolts structurally attached to the strings as opposed to resonating material resting against the strings*, in formal compositions.

Bolts and screws cause a significantly different sonic alteration in the sound of a string compared to previous methods. They form a ‘third bridge’ caused by their mass without annihilating the fundamental frequency, resulting in three different pitches that interfere with each other.

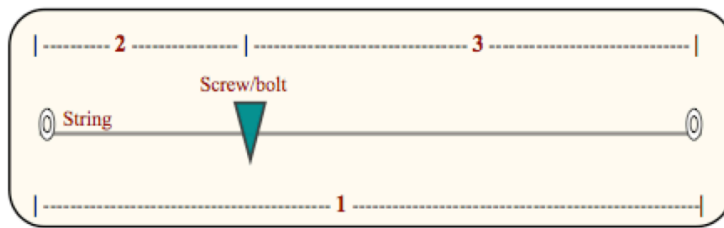


Figure 4. A screw or bolt dividing a string, and by doing so adding two new *interfering* frequencies (2 + 3) to a then distorted fundamental (1), causing a complex bell type of sound.

Most of the treble part of the piano has three strings per note. By placing a screw or bolt in between strings 1-2 or 2-3, activation of the left pedal of a grand piano will have an impact on every key *individually*. In this way Cage created a new tool by having the option of engaging the left pedal which immediately accesses a full alternative set of timbres and pitches.[11]

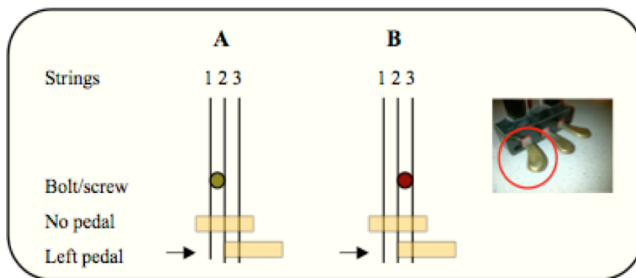


Figure 5. Two examples of changes caused by the left pedal. The activation of the left pedal causes the hammer (the yellow rectangle) to strike two strings (2+3) instead of all three (1+2+3).

THE PIANO AS OBJECT AND ANCHOR IN SPACE

The piano, usually a solid and fixed object in a room or venue, can evoke many strong associations. It can be seen as furniture, associated with the establishment and the decadent upper class, or represent middle-class tradition and stability. Assumptions, expectations and associations can be used (or abused) to wrong-foot an audience.

The piano as symbol was a perfect tool for the conceptual ideas of Fluxus and similar artists.

In *Piano Activities (piece for many pianists)*, 1962, by Philip Corner (USA, 1933), the piano is the epicentre of the event. The score describes certain roles pianists should take, how to make sounds, and gives a number of options for creating an overall form. In Cornelius Cardew's *Memories of You*, for piano solo, 1964, the piano is not played directly but solely used as a spatial reference point from where a sound, made by objects and/or body parts, is to be produced. Corner and Cardew display two extremes in objectifying a grand piano: in *Piano Activities* every part of the piano is played, touched, hammered, chopped, stroked and permanently altered or dissected, in a one-dimensional relationship of lust and physicality bordering on rape, as opposed to *Memories of You*, in which the piano is not played or touched but dominantly visually present as a ceremonial object in a platonic affair.



Figure 6. The 1960/70s Fluxus idea was not new and is still being used today. Above are two examples of a juxtaposition of a grand piano with a large animal: Laurel & Hardy in *Wrong Again*, 1929; and Michael Parekowhai's *Chapman's Homer*, 2011.

MY OWN PRACTICE: 'HANDS ON'

In my teen years in the 1970s, I experimented in my upright piano with sardine cans, aluminium foil, paper and other materials between the hammers and strings. Around 1981 I built a 'train' with three guitar pickups so I could pick up resonating strings and send the frequencies to an amplifier. Naturally this 'train' could pick up any strings, and with the use of FX stomp boxes such as 'wah wah' and 'fuzz', the piano could sound like a rock guitar. From 1983 I had access to grand pianos at the Sweelinck Conservatory in Amsterdam and I started to experiment adding 'Cagean' preparations (but unaware of Cage's work).

SUSTAINABILITY

Around 1990 I bought my own grand piano, which gave me the opportunity to extensively experiment, build, play and record in any way I wished. One of my aims had always been to produce sustained sounds. For that I used fishing wire and mentioned guitar pickups. *Then I bought an ebow*, a device originally for electric guitar which creates a sustained note by ways of electro magnetic waves. In my first public solo concert May 2nd 1991[12] I premiered a number of my works using three modified ebows[13], and in 1994/95 I recorded my first solo CD *7CC IN IO* [14].

INSTANT PREPARATIONS

For *7CC IN IO* I composed pieces using the same preparations in order to play them live in one program. If I wanted to add or replace a piece in my program I was forced to work within the same setup. *I felt as if the preparations were the actual composition and I was only making variations and thus repeating the composition.* If I wanted to move forward I had to forge a new path and abandon all previous pieces. I started focussing on a more open system of 'instant' preparations. This more open approach[15] was used in *The Hands of Caravaggio* by MIMEO/John Tilbury[16], 2001, and *HHHH* by the Cortet[17], 2005.



Figure 7. Selection of tools: the 'rubber squeegee grout spreader' for safely evoking partials, mallets, an ebow, a milk frother for spinning around thread to activate strings, a handheld electric motor, and duct tape to imitate

pitched woodblocks by taping the strings near the bridge. For my twelve customized ebows I had made a system of red and yellow stickers: more red indicates more distance between electromagnet and strings; more yellow indicates less distance.

Around 2005 I became aware of the 'super magnet', an extremely strong type of magnet developed in 1982. Putting a magnet on a string makes it act as a bolt/screw with comparable results. *The super magnet makes it possible to use a form of 'instant Cagean preparation', which is more in line with the philosophy of the 'open piano'*. When one puts a magnet on a set of mid range steel strings, these can be activated by an ebow which will expand the range of pitches of sustained sounds considerably. In 2006 *Lighton* by Buck-Fuhler-Zaradny[18], and *Stengam*[19] for solo piano, were recorded.

SPEAKER AND BATTERY

After recording *Stengam* I revisited some of my 1980s experiments that used electronics in its simplest form: speaker and battery. I wanted to add something to my piano setup using vibrating strings as conductive connection. When a battery is connected to a speaker the cone moves in or out, when disconnected it moves back in its original position.

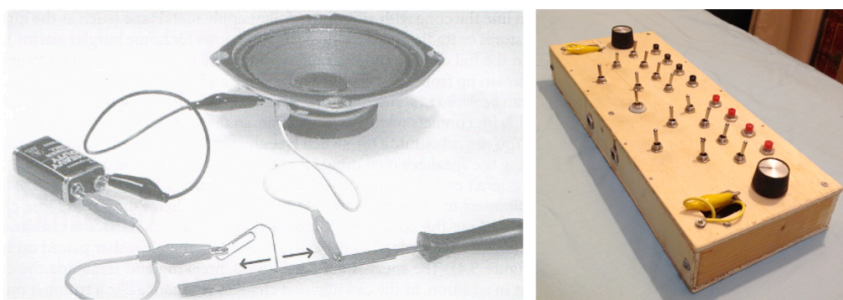


Figure 8. Battery and speaker connected via paperclip moving over a nail file, causing erratic contact which produces electronic sounds.[20] Basically I wanted to replace the nail file in above picture with a piano. On the right is my self built router.

In my piano setup I use a hanging wire (the *plus*, also placed at the end of a mallet) and the metal parts of the piano (the *minus*: strings and frame), to stream the electricity to a number of speakers via a self built router. When I was offered a carte blanche by the UK label 7HINGS to do a concert in the Huddersfield Contemporary Music Festival in November 2006, I organised a duet with guitar/electronics musician Keith Rowe, This resulted in *The Culprit* [21] in which I used this setup.

PIANO STRINGS AS SPEAKER

One quality of microphones and speakers is that they can function in both ways. Around 2007, I started to experiment by sending audio to anything having a plus and minus. If one replaces the battery of the ebow by an audio signal, the ebow translates the audio into electromagnetic waves that activate the strings. *The normal way of amplification by a speaker activating air is replaced by electromagnetic waves activating piano strings.* I now had the option of using the strings of the piano to amplify my choice of audio input (radio is a favourite). By choosing certain strings I could control the timbre and harmony the audio would actuate. In order to improve the workings of ebows and guitar pickups I developed my own electromagnetic devices.

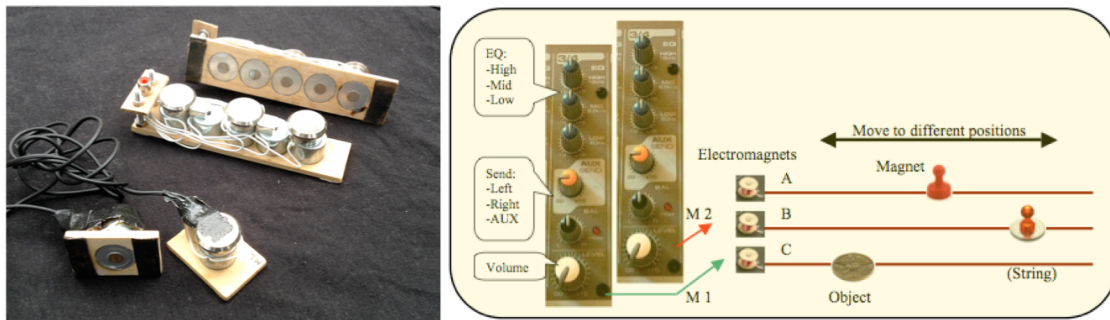


Figure 9. The self built electromagnetic devices, and the schematics as used in *Truancy*, 2014. [22]

MORE DEVICES

Emptied music box (EMB). I removed the comb from a music box and used its mechanics to rotate a set of four plectrums for plucking piano strings. The music box has three super magnets glued underneath that make it sit securely on the strings. Half of the strings are ‘instantly prepared’ by the magnets and the other half left open. I used four of these devices in *18 Spoonfuls* [23] for violin and piano from 2011.



Figure 10. EMBs, from above and the bottom.

Bow hair. I wanted to create something that was pressure sensitive, something resembling the hairs of a violin bow. I removed a part of the soft lid of a peanut butter jar in order to replace it with elastic band. With the use of a low noise adjustable speed drill for rotation, I could apply pressure and speed similar to a violin bow. In this way I had significantly more control over volume and timbre when ‘bowing’ a string.



Figure 11. The FRA: Flexible Rotating Actuator.

Erratic vibrations. Vibrators are useful for creating repeating notes and percussive sounds with an erratic pulse. Some I let roam freely, others I put in a holder so they stay in a more or less fixed position.

PROBLEM SOLVING VIA DIALOGUE

When one works with uncontrollable elements, one can attempt to control them, or give up, or start to incorporate chance factors. Cage says:

“When I first placed objects between piano strings, it was the desire to possess sounds (to be able to repeat them). But, as the music left my home and went from piano to piano and from pianist to pianist, it became clear that not only are two pianists essentially different from one another, but two pianos are not the same either. Instead of the possibility of repetition, we are faced in life with the unique qualities and characteristics of each occasion . . . all led me to the enjoyment of things as they come, as they happen, rather than as they are possessed or kept or forced to be.”[24]

I am comfortable with responding to situations in an improvisational setting, where being confronted with external sounds can easily trigger a clear idea. But playing solo in a traditional sense is like a monologue whilst facing yourself in the mirror. One has to constantly self motivate and generate momentum and pace. In a solo concert I often look for several inputs from the world around me, e.g. unstable feedback caused by contact microphones; or radio fragments. In other words: *unpredictability as creative source for problem solving, to find a catalyst for elements that would otherwise stay separate*. One can incorporate chance factors for reasons of practicality, as Cage did, but one can also deliberately look for them to enhance a dialogue between pianist, piano, acoustic phenomena, ether, audience and other.

COGNITION AND PERCEPTION

The following definition of cognition makes it clear how the use of actuating devices influences the act of performance, especially when improvising or performing an open piece in which many decisions must be made in real-time.

“Cognition is the set of all mental abilities and processes related to knowledge: attention, memory and working memory, judgment and evaluation, reasoning and "computation", problem solving and decision making, comprehension and production of language, etc.”[25]

During a concert, a musician’s brain is extremely active on many fronts. Apart from expanding the physical options and reducing physical fatigue, the use of motorized devices, such as vibrators, ebows and ‘emptied music boxes’, frees part of the ‘mental ability bandwidth’, which then can be used for other activities such as planning and preparing a next move.

Physical fatigue influences one’s perception of time. Diminished physical fatigue and enhanced objectivity helps the process of creating an overall form that now is easier to grasp. The musician becomes player, audience and planner simultaneously.

MY APPROACH AND AIMS

In a setup for piano alterations I aim at a balance between *problem causing* devices and *problem solving* tools, in other words, the classic *tension and release* principle. In designing my devices, I aim to avoid a one-dimensional functionality. Most devices can be used both ways and it is only after playing and practising a setup that I can decide if the balance is right. Mostly a setup differs from ensemble to ensemble and changes continuously, depending on developed skills, newly added ideas, or just the mood

of the day. *I aim at creating a dialogistic playground inside the piano using rearrangeable and redefinable objects in a modular fashion.* It remains a work in progress.

SUMMARY

Having looked at a number of compositions, instruments, inventions and strategies involving alterations of the piano, I can place them in a 'motivational category' in order to understand why these alterations were made and what effects were being sought.

To devise a homogeneous alternative for already existing music and strategies.

- tack piano
- mandolin attachment
- Cage - *Music for Marcel Duchamp*

To accommodate space limitations.

- orchestrions, coin pianos, photoplayer, Angst's forte piano
- Cage's prepared piano pieces for dance

To produce a sound to mimic an external event.

- foley artistry
- Joseph Angst's forte piano and Turquerie (imitation of Turkish military bands)

To create and prescribe a new language and new music.

- Cage - *Works of Calder, Sonatas and Interludes*
- Fuhler - *7CC IN IO, Stengam*

To facilitate a dialogue between performer and instrument via deliberate unpredictability.

- Denley / Fuhler - *Truancy*
- Rowe / Fuhler - *the Culprit*

To create a spatial anchor and source of energy.

- Cardew - *Memories of you*
- Corner - *Piano Activities,*
- Schumacher/Fuhler - *Triple Dutch*
- Visual art and film (Laurel & Hardy, *Wrong Again*, Buñuel, *Un Chien Andalou*)

Many pieces or instruments, of course, have multiple motivations. For example, the lutheal and the mandolin attachment have both options for juxtaposing timbres and transformation of a musical segment. The choralcelo seems to seek a homogeneous alternative, but achieving a musical 'transplant' would require a dedicated arrangement. Cage sometimes focusses on timbres, sometimes rhythms and sometimes melody. *Stengam* showed me the way into the next phase in a natural and gradual way.

THE FUTURE

Foley artists have always used a piano for their purposes. Both Cowell and Langgaard opened a window towards a new formal language with their pieces *the Banshee* and *Insectarium*. Cage revealed the prepared piano as a new instrument. I myself have continually juxtaposed the classical tradition of piano playing with explorations of the piano as conceptual object or as intermedium incorporating actuating objects and external inputs. Who knows what windows onto strategies and music lie ahead to be opened by future generations, whatever their motivations might be.



Figure 12. Fuhler, Cor. *Cordially Yours* (for upright piano, music box installation, water guns and fire). Performed during the exhibition 'The piano has been drinking' at the Maitland Regional Art Gallery, NSW, May 2nd 2015.

BIBLIOGRAPHY

- Bowers, Q. David. *Encyclopedia of Automatic Musical Instruments*. New York: Vestal press, 1972.
- Browne, van Dyke. *Secrets of scene painting and stage effects*. London: G. Routledge and Sons; New York: E. P. Dutton, 1900.
- Cage, John. *Prepared Piano Music Volume II, 1940-47*. New York: Henmar Press, 1999.
- Chilvers, Ian. *The Oxford Dictionary of Art*. Oxford University Press, 2004.
- Collins, Nicolas. *Handmade Electronic Music, the art of hardware hacking*. New York, London: Routledge, 2006.
- Higgins, Hannah. *Fluxus Experience*. Berkely and Los Angeles: University of California Press, 2002.
- Lang, Edith and George West. *Musical Accompaniment of Moving Pictures*. New York: Boston Music Co, 1920.
- Morgan, Ann Lee. *The Oxford Dictionary of American Art and Artists*. Oxford University Press, 2007.

NOTES AND REFERENCES

- [1] The performance can be seen on: Schumacher, Michael with Han Bennink, Cor Fuhler and Wilbert de Joode. *Triple Dutch*. Amsterdam: Holland Dance Festival/Datalimages 01, 2003. DVD.
- [2] Views and Film Index. *Exhibitions with Sense*. Films Publishing Company, 4 January 1908. p11.
- [3] Bowers, Q. David. *Encyclopedia of Automatic Musical Instruments*. New York: Vestal press, 1972. p354. Underlining done by me to emphasize the different materials used.
- [4] Gould – *Brandenburg Concerto*. <https://www.youtube.com/watch?v=jmeTZ8aNr1M>, accessed 08/05/2015.
- [5] The 'electronic bow' for electric guitar invented 1969 by Greg Heet, patented in 1978.
- [6] Schawinsky, Xanti. *From the Bauhaus to Black Mountain*. MIT Press: The Drama Review, TDR 15 (3), 1971. p 35
- [7] Satie, Eric. *Le Piège de Méduse*. Paris: Salabert, 1954.
- [8] Grainger, Percy. *In a Nutshell*. New York: G. Schirmer, 1916.
- [9] Langgaard, Rued, and Steen Pade. *Insectarium: 9 Puzzle Pictures*. Kopenhagen: Samfundet til Udgivelse af Dansk Musik, 1993.
- [10] Piano tuners use rubbers to isolate a string in order to tune the piano: the actual first preparations.
- [11] All of Cage's prepared piano pieces assume a left pedal that moves the hammers to the right and by doing so hit strings 2+3, however, in some pianos the hammers go to the left and hit strings 1+2. Cage does not address this possible problem.
- [12] Cor Fuhler solo-piano, Guus Janssen solo-clavecimbel: <http://bimhuis.nl/concerten/cor-fuhler->

solopiano-----guus-janssen-solo-clavecimbel, accessed 07-06/2015.

[13] Alvin Lucier's *Music for Piano with Magnetic Strings*, also using ebows, was premiered in 1995.

[14] Fuhler, Cor. *7CC IN IO*. Amsterdam: Geestgronden GG15, 1996. Compact Disc.

[15] This approach to leave the piano 'as is' and add only instant alterations is comparable to George Crumb's *Macrocosmos* for piano from 1972-79.

[16] MIMEO/John Tilbury. *The Hands of Caravaggio*. New York: Erstwhile021, 2002. Compact Disc.

[17] Cortet. *HHHH*. Amsterdam: Unsounds10, 2005. Compact Disc.

[18] Buck, Tony, Cor Fuhler and Anna Zaradny. *Lighton*. Poland: MusicaGenera mg011, 2007. Compact Disc.

[19] Fuhler, Cor. *Stengam*. Paris: Potlatch P206, 2006. Compact Disc.

[20] Picture taken from: Collins, Nicolas. *Handmade Electronic Music, the art of hardware hacking*. New York, London: Routledge, 2006. p21

[21] Rowe, Keith and Cor Fuhler. *The Culprit*. UK: 7HINGS 9, 2007. Download Release.

<http://www.seventhings.co.uk/A%20Brief%20History%20of%20Seven%20Things.html>, accessed 10/07/2015

[22] Denley, Jim, and Cor Fuhler. *Truancy*. Sydney: Splitrec24, 2014. Compact Disc, LP and Download.

[23] *18 Spoonfuls* appears on: McMichael, Anna, and Tamara-Anna Cislowska. *Close your eyes and I'll close mine*. Australia: Tall Poppies TP228, 2013. Compact Disk.

[24] Liner notes from: Cage, John. *Prepared Piano Music Volume II, 1940-47*. New York: Henmar Press, 1999.

[25] Cognition. <https://en.wikipedia.org/?title=Cognition>, accessed 19/06/2015

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