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# Instrumental Parasites: Interfacing the Fragile and the Robust

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## Abstract.

The parasitical relationship between the grand piano and the myriad objects used in its preparation as pioneered by John Cage in the late 1940's is here discussed from a perspective of free improvisation practice. Preparations can be defined as the use of a "non-instrument" object (screws, bolts, rubbers etc...) to alter or modify the behaviour of an instrument or part of an instrument. Although also present in instrumental practices based on the electric guitar or the drum kit, the piano provides a privileged space of exploration given its large-scale resonant body. It also highlights the transgressive aspect of preparation (the piano to be prepared often belongs to a venue rather than to the pianist herself, hence highlighting relationships of trust, care and respect). Since 2007 I have used a guitar-object (a small wooden board with strings and pick ups) connected to a small amplifier to prepare the grand piano in my free improvisation practice. This paper addresses the different relationships afforded by this type preparation which is characterised by the fact that the object for preparation is in itself an instrument (albeit a simplified one), and the preparation is ephemeral and intrinsic to the performance. The paper also reflects on the process of designing an interface from and for a particular practice and in collaboration with a guitar luthier.

**Keywords:** interface design, prepared piano, live-electronics, improvisation, performance

## 1 The Politics of Preparation

John Cage's infamous invention – the prepared piano – is well known for emerging out of the very logistics of musicking rather than any pre-calculated efforts to transgress specific established practices. In 1940, while working as a dance accompanist, Cage was primarily composing percussion music. When asked to write a score for Syvilla Fort's dance *Bacchanale* (1940) the expectations were that the music would be percussion based although all Cage had available for performance was a piano. Experimentation involving wedging objects between the strings led him to transforming the equal temperate pitches of the piano into more complex inharmonic sounds.

The Cornish Theatre in which Syvilla Fort was to perform had no space in the wings. There was also no pit. There was, however, a piano at one side in front of the stage. I couldn't use percussion instruments for Syvilla's dance, though, suggesting Africa, they would have been suitable; they would have left too little room for her to perform. I was obliged to write a piano piece. (Cage, 1979: 7)

After the premier of the work, Cage went back to his percussion music only to revisit the idea a couple of years later. By 1942 he had committed himself to write primarily for the new instrument in the context of his dance compositions and by 1944 his collaboration with Merce Cunningham was fully established with the prepared piano at the centre of a new soundscape of timbral exploration which ranged from dry low register thuds to percussive gamelan piercing tones and rich inharmonic gongs. Considering the new world of timbres opened through a pragmatic approach of expanding on such an ubiquitous instrument, the prominence of the prepared piano in Cage's output is surprisingly short lived (he practically abandoned the instrument by the early fifties). His 1948 *Sonatas and*

*Interludes* remain the exemplar of the most thorough exploration of the implications of preparations on the piano for composition. Meticulously notated, the placement of different sized screws, bolts, rubbers and nuts is specified in relation to which strings are affected and their distance from the piano dampers. Although Cage is forever linked with the prepared piano, other approaches to using the instrument with its full timbral possibilities were explored by Henry Cowell, notably in the piece *Banshee for String Piano* (1925) presumably an influence on Cage himself. Cowell's use of the inside of a piano by directly plucking and scraping strings became known as "string piano" and was also used by composers such as George Crumb. The more broadly named inside-the-piano techniques have since become core vocabulary for improvisors such as Denmann Moroney and Keith Tippett. Tippett explicitly states he does not play the prepared piano and often opts for an exploration of the inside the piano which, although based on direct access to strings and placement of objects is much more transitory, ephemeral and fragile than Cage's methodical, fixed placement of preparations. This key difference between the fixed and the transitory in the context of piano preparations is the focus of this paper. Even though similar timbral worlds might be at play in both approaches there is an intrinsic difference in how the moment of preparation relates to performance action. For Cage, preparing a piano is clearly an activity of making ready; something that happens prior to performing or rehearsing the music. Cage clearly defined the boundary between works for *prepared piano* and works for *piano*, never seeming tempted to add aspects of preparation for standard piano works during performance. This is not the case for improvisors such as Tippett as the state or preparedness is replaced by temporary actions that have an acoustic affect on the behaviour of the piano mechanism but are in themselves performative. This type of "live preparation" invites the listener to witness the gradual making and unmaking of the instrument, whereas in Cage the prepared piano is presented as an already modified instrument. Both approaches touch on the transgressive action of intervening with the otherwise sacred and normally out of bounds environment of the instrument's inside. Although beyond the scope of this paper, instrumental modification as an approach to music making, is in itself a fascinating way of understanding the development of experimental music throughout the 20<sup>th</sup> century. Even more than half a century after Cage's preparations, the act of directly touching, let alone placing screws on the piano strings still causes anxiety to endless festival directors and concert managers around the world<sup>1</sup>. From this point of view, the piano stands at the centre of power struggles and relationships of trust. As one of the very few instruments that is very much of the venue rather than of the musician, inside-the-piano techniques are seen as intrusive, possibly damaging and often capricious. The notion of "live preparation" is the cause of even more suspicion given its unpredictability and the risk of leaving the inside of the instrument exposed to an array of actions during the performance itself. For the public however, the inside of the piano, or rather the changes in playing position between the standard seating on the keyboard and leaning over the strings represents a powerful set of cues for articulating two different sound worlds. The placement of objects, often causing a sound event in its own right, is at the core of a dialogical relationship between the stability / robustness of the pianist at the keyboard and the transitory and at times uncomfortable fragility of the pianist leaning over the strings, where the physical leaning-over of the pianist is in itself somewhat precarious. Not only it is impossible to reach the entire surface of a grand piano by leaning over, hence ergonomically limiting the resonant portions of the instrument that can be accessed, it is also difficult to maintain this leaning position for a very long time. Although some of the strings can be accessed by seating, it is sometimes the choreography associated with these two positions that play a rather more structural and formal role in music making by creating relationships between two sonic worlds. These relationships can range from subtle timbral variation (e.g. a middle C played on the keyboard followed by a pluck of one of the middle C strings) to highly contrasting textures between the pure pitched keyboard sounds and the noise and visceral scrapping of strings. Thinking of the relationships involved in all aspects of physical preparation and modification in my own improvised piano practice has led to the reflection presented here. At the core of this work is the

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<sup>1</sup> Pianist Denmann F. Maroney has compiled a website listing his own techniques and includes a number of testimonials by both piano technicians and concert promoters addressing perceived harm on instruments (<http://www.denmanmaroney.com/Hyper.html>).

development of an interface – the ‘Plank’ - both derived from and led the practice-based research process that in turn leads to the reflective conceptual framework introduced later.

## 2 The Plank

I have started exploring the resonance of the piano through feedback mechanisms since 2007. The simple use of omni microphones and small amplifiers (placed inside the instrument) created a rich spectral world in which the piano soundboard provided body, resonance and some unpredictability to the standard microphone-amplifier feedback loop. In this setup, the manipulation of the sound world relied on the position of the microphone (often moved gesturally with one hand), the amplifier settings, the use of the sustain pedal and, perhaps most intriguingly, the relationship between the acoustic feedback of the system and the pitches played on the keyboard. For example, an established feedback tone close to a high C could be made unstable by playing the high C on the keyboard. This instability created by the clash between the resonant spectrum of the soundboard as activated by feedback and the equal tempered pitches accessed by the keyboard became the core of an exploratory practice focusing on the establishment and dismantling of feedback tones as can be heard in the improvised piece *Inside/Out* with saxophonist Franziska Schroeder.

This manipulation of feedback led to further experience with the ultimate feedback machine - the electric guitar. As one can predict, the placement of a small electric guitar with its strings facing the piano strings led to a much richer, complex and unpredictable feedback loop. This time articulated by all of the elements mentioned above with the microphone system, plus the non-linear relationship between the strings of the guitar and the strings of the piano. After exploring this technique with a small commercial electric guitar as can be heard in the trio *FAINT* (Creative Source Recordings 088) a number of possibilities began to emerge. Most of these, in Cage’s vein, fuelled by pragmatism leading to something that could be carried in a suitcase instead of using a full guitar.

A hacked together guitar-like object using a piece of floor board and four strings served as a first iteration of a portable and more easily manipulated object. The increased flexibility in terms of positioning in relation to piano strings afforded by the smaller size translated in more possibilities for influencing feedback and a range of “prepared sounds” which result out of the interaction between the piano strings and guitar strings when a key in a specific register is pressed - a kind of electric prepared piano sound.

In collaboration with Irish luthier John Catherwood, in 2013 we developed the ‘Plank’ which retains enough guitar like characteristics to perform the feedback and preparation functions described above but is rather more ergonomic and has a characteristic sonority related to its wooden solid body, two pickups (coil and piezzo) and a moveable bridge.



**Fig. 1.** Current version of the Plank

In addition to conventional electric guitar behavior the Plank also has a built-in x-OSC, a wireless I/O board with on board gyroscope, accelerometer and magnetometer for use in a live-electronics/laptop

setup, mostly used to detect the position of the board in relation to the piano and affect live processing accordingly.

The Plank is then a simplified guitar, which attempts to optimise contact points between its own strings and the piano's string surface. It does however afford the quasi-instrumental status of a table-top guitar and associated techniques. The practices of prepared guitar explored by Keith Rowe, Fred Frith and others come into relevance here as when the guitar is positioned strings up on the piano frame, it provides access to a timbral range, which shares the preparedness of the objects on the piano strings. This allows for a set of timbral relationships between the two instruments when played separately (albeit that the guitar amplification is coming from inside the body of the piano to maximize resonant proximity).

To a greater extent than the array of objects used to prepare a piano, the Plank affords a performative engagement that lives off both the performer and the piano itself. As it integrates an improvised performative practice if, it provides opportunities for what Owen Green has called *livedness*:

"Navigating such folds, such as those between designing and practising, emphasises the extent to which the concerns of practice are diachronic and, as such, lived." (Green, 2014: 5)

### 3 Piano Parasites

The inside-the-piano practices described above go beyond Cagean preparation and are characterized by the inter-relationship between objects (in this case the Plank and the piano soundboard). The notion of the parasite is an apt and suggestive metaphor for describing the field of relationships discussed here. Deriving from the Latin and Greek *parasitos* for a person eating at another's table (*para* - alongside, *sitos* - food), the term has since the mid 16th century been associated with the biological notion of "an organism which lives in or on another organism (its host) and benefits by deriving nutrients at the other's expense"<sup>2</sup>. The notion of parasite suggests a hierarchy and a system of values. Although some parasites can be inoffensive or even beneficial to the host, the term is normally applied in a derogative manner to articulate the "taking advantage of" that much defines the parasitical. The parasite also defines a relationship of scale; it is always smaller than its host. As Serres puts it in his "The Parasite", a sequence of fables articulating the nature of human relationships according to this very metaphor: "The animal-host offers a meal from the larder or from his own flesh; as a hotel or a hostel, he provides a place to sleep, quite graciously, of course." (Serres, 2007: 6)

In the case of live inside-the-piano techniques, the piano acts as a host and provides its rich resonant world and acoustic fingerprint to lesser objects, objects that often do not have the status of instrument (or organism to carry out the biological metaphor) even though they play a crucial role in the production of a particular "inside-the-piano" sound. The parasitical object can be attached to a string in a way that it will radically change the sonic character associated with the action of depressing the corresponding key. It can also inhabit the piano in a freer manner, being affected by the physical forces at play at any given moment (e.g. ping-pong balls bouncing on top of strings as the keyboards is played). The reason the parasite is an pertinent metaphor for the kind of preparations and modifications discussed here is because it deals with the notion of how a smaller entity (a screw or object of some sort) can utilise resources of a larger, established entity (the piano) to create relationships of interdependence which musically give rise to possibilities of both ambiguity and contrast between parasite and host. This complex relation is again described by Serres:

We parasite each other and live amidst parasites. Which is more or less a way of saying they constitute our environment. We live in that black box called the collective; we live by it, on it and in it. (Serres, 2007: 10)

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<sup>2</sup> <http://www.oxforddictionaries.com/definition/english/parasite>

## 4 The Fragile, the Robust and the Anti-fragile

With a parasitical environment constituted between the piano and its preparation with devices like the Plank, there is the dialogical relationship between fragility and robustness suggested in the act of modifying the piano in a live context. The parasitical relationship addresses a key element of the instrumental ecology discussed here, namely the grand piano being “live-prepared” by a guitar-object which has its own agency and musical history, or at least to a greater extent than a screw or a bolt. This guitar-object is a musical parasite because it *lives* off the piano resonance. The emphasis on *living* is key here, as this is a musical device that as it is positioned over the piano string surface generates feedback inside the piano soundboard, in an active, generative and to some extent unpredictable given the non-linear system created by multiple sets of strings touching at numerous points. The scale and identity of the guitar-object is, to some extent hosted by the piano at the same time as it has the power to modify the piano’s musical identity. The parasite and its host, create, through their symbiotic relationship, an interdependency which is at the core of a musically rich system. I will explore this interdependency in musical terms by categorising a number of “inside-the-piano” techniques according to three descriptors: Fragile, Robust and antifragile. These three conditions are investigated by Nassim Nicholas Taleb to describe notions uncertainty and risk. Taleb’s notion of the *antifragile* addresses those things that need chaos and uncertainty to flourish and thrive.

Some things benefit from shocks; they thrive and grow when exposed to volatility, randomness, disorder, and stressors and love adventure, risk, and uncertainty. Yet, in spite of the ubiquity of the phenomenon, there is no word for the exact opposite of fragile. Let us call it antifragile (Taleb, 2012).

Both the fragile and the robust can be measured in terms of the reaction to external events; the fragile being more affected than the robust which is often characterised by redundancy. “Recall that the fragile wants tranquility, the antifragile grows from disorder, and the robust doesn’t care too much” (Taleb, 2012). The antifragile then stands as a category, which deals directly with the unpredictable, with the unknown, a pertinent quality in the context of a complex, improvised musical situation. In order to make these descriptors more concrete and to clarify how they relate to the notion of the parasite I will present some illustrative examples based on improvised musical practice “inside-the-piano”, relating fragility and robustness to the “re-action” of the piano to parasitical forces.

**Table 1.** Examples of inside-the-piano techniques

<b>Fragile</b> (piano changes its character based on parasite influence)	<b>Robust</b> (piano remains largely unchanged upon parasite influence)	<b>Antifragile</b> (piano and parasite are engaged in unpredictable interdependency)
Screw wedged between two mid-register strings	Sheet of paper over mid-register strings	Ping pong balls bouncing on the string surface
Rubber wedged between two low-register strings	Light metal chain over high register strings	Stochastically touching string/soundboard at high speed
Strings made vibrate by an electromagnetic field (e.g. e-bow)	Strings plucked directly with nail or plectrum	Feedback inside the soundboard
Pressing a key while sliding a metal bar over corresponding strings	<i>Flageolet</i> (stopping strings with finger while pressing corresponding key to get a harmonic)	The inside-the-piano surface replete with objects in ad-hoc positions resulting out of a session of live preparation

The three categories are associated with different types of preparation or inside-the-piano techniques. Under the fragile category we see a radical change of sound quality achieved by, for example, stopping a setup of two or three strings with a wedged object to create an inharmonic tone (the piano’s fragility giving in to the introduction of an external object which radically modifies its

character). The robust category deals with techniques, which subtly affect the piano timbre but do not fundamentally change its character and spectral envelope. The antifragile appears here as a distinct category given a more complex and unpredictable parasitical relationship in which both host and parasite are working together to create something they could not achieve independently. The Plank interface has been designed to somewhat optimise (if that's not a contradiction in terms with the notion of the antifragile) these complex interdependencies. The mere placement of the guitar-object strings down on the piano's string surface will cause each depressing of the correspondent keys to be prepared in an almost Cagean manner but with the additional complexity of the amplified response of each of the four Plank strings, themselves resonating within the piano soundboard. The key element of this antifragile condition emerges, of course, due to the introduction of microphones or pickups in the system, moving from a one-way condition in which parasitical objects affect the piano to one in which the piano and the object are affecting each other.

## 5 Conclusion

This paper presents practice-based research associated with the practice of free improvisation performance on the piano with inside-the-piano, or extended piano techniques. The lineage of Cage's prepared piano is here set in contrast with practices of live-preparation in which the making and unmaking of the instrument becomes performative. These assemblages that take place during performance are aligned with Bowers and Hass' research in their hybrid resonant assemblages project (Bowers and Hass, 2014) through the notion of instrumenthood. Here, the complex interactions between the piano and the Plank become a mechanism for making and unmaking instrumental entities. This type of relationship, described here as parasitical, given the interdependency established between two instrumental entities, is in a way alternative to the notion of interface and certainly distinct from concepts of meta or hyper instruments. The case for alternative approaches to the ubiquitous instrumental *enhancement* through interfacing with the digital is eloquently put forward by Bowers and Archer in the notion of infra-instruments. As with the inside-the-piano strategies discussed here, Bowers and Archer are primarily concerted with emergent interactions rather than mapping. Whereas the interface presumes interactions between two or more distinct systems (e.g. human vs computer), the parasitical lives off interdependency and resists mapping. This interdependency offers rich ground for musical exploration in the context of inside-the-piano techniques. The particular example presented here – the Plank, acts as a way of defining certain qualities of improvised practice (here associated with the notion of the antifragile) favouring uncertainly, complexity and emergence. These qualities translate sonically into the interdependent resonant worlds of the piano and the guitar-object. The more conventional interfacial element of the practice presented here is the digital bridge the Plank makes through its sensors. This bridge is intended to contribute to the system as another parasite (the computer) which feeds off the piano resonance and the physical placement of the Plank to pick up and re-inject further sonic layers into the system.

By exploring the parasitical as a metaphor for describing a set of relationship between instrumental entities we open possibilities for re-thinking the prosaic mechanics of inputs and outputs. Instead, the parasite encourages the design of instrumental conditions which through improvisation emerge their own behaviour and resist the determinacy of control as they revel in the antifragile.

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