universität wien

MASTERARBEIT

Titel der Masterarbeit

„The Aesthetic Reset – Mechanism and Function of Aesthetic Experience in the Predictive Mind“

Verfasser

Mag. Thomas Wolf

angestrebter akademischer Grad

Master of Science (MSc)

Wien, 2014

Studienkennzahl lt. Studienblatt:	A 066 013
Studienrichtung lt. Studienblatt:	Masterstudium Joint Degree Programme MEi:CogSci Cognitive Science UG2002
Betreuerin / Betreuer:	Dr. Hong-Yu Wong

To my parents Angelika and Erich Wolf.

Table of Contents

Preface and Acknowledgements

Aesthetic experience has ackompanied me now through three different stages in my education. As I will describe it later, it started during my studies at the Musicology Department at the University of Vienna, where I started to pursue this topic, because I was unsatisfied with the presented theories of aesthetics. Having the vague idea that I would need some basic knowledge in phenomenology to continue, I applied for a scholarship in Copenhagen, at the Masters Program for Phenomenology and Philosophy of Mind and thereby decidedly declared aesthetic experience to be my main research area. It was in Copenhagen, where I discovered Martin Seel's book *Aesthetics of Appearing* (2005), which seemed to describe exactly, what I understood as aesthetic experience. After the scholarship it was clear to me that phenomenological work alone would not be enough to satisfy my urge to understand aesthetic experience and I was searching for a way to approach the phenomenon of aesthetic experience from various viewpoints. Hence, I applied for a master program in cognitive science, again with my studies of aesthetic experience in the research proposal. It was during this master that I became acquainted with the predictive coding framework that soon served me as an anchor for the phenomenology of aesthetic experience. It seems appropriate to finally put down the basic principles and ideas I fostered for the last couple of years in this master thesis.

In my private life aesthetic experience has always been about marvels, wonder and astonishment. It is my preferred way of how to engage with the world; namely with an eager willingness to marvel at it. The possibility to do so, is something I owe to several people; first and foremost to my parents, who support me in all my decisions and are still willing to provide me with long running and unconditional funding. I also owe them so many experiences full of awe that they made possible by inviting me to travels far and near. My boyfriend's support and love is such an important source of strength and persistence that I am not sure whether I would have come so far through my academic career without it.

For scientific inspiration I want to thank Martin Seel and Jakob Hohwy, who

provided me with the necessary theoretical foundation to build my theory upon. I also want to thank the Austrian composer Peter Ablinger and the Islandic artist Olafur Eliasson for their work that has been the source of utmost delicious aesthetic experiences; especially Peter Ablinger's opus “Weiß/Weißlich” and Olafur Eliasson's “Din blinde Passager”.

I do not consider it the norm to have such an extremely helpful and motivating study program coordinator to work with, as Elisabeth Zimmermann was for me. Many thanks to her for her guidance and patience.

Last but not least, I want to thank my band members of “hook+loop”, who put so much effort into the creation of our first album and enabled me thereby to balance my time between studies and rehearsal to the advantage of this thesis.

1 INTRODUCTION

In this chapter I first provide an overview of personal and scientific reasons for studying aesthetic experience, and then introduce the terminology used in this thesis.

1.1 This Thesis as a Guidebook

1.1.1 Getting to the Sacred Chamber of the Building

> *"If for a moment we were to imagine aesthetics as an expansive building that has been worked upon continuously for centuries, that has undergone many redecorations and acquired numerous extensions – let's say, as a museum that has become somewhat labyrinthine in the course of time – then we could consider which of its many entrances is the best for us to commence a tour of the building. It would probably be easiest to meet up at the entrance most conveniently located for reaching the important exhibition halls, the café, the cloakroom, the screening room, and the bookstore. If we were lucky, this would be the main entrance, to which someone giving us directions would in any case send us. But we are not that lucky. As a result of the many renovations and additions to the building, the idea of a main entrance has been forgotten. Instead, there are countless portals from which the various exhibits can be reached more or less easily. Therefore we must first set about finding an appropriate entrance that will lead us without diversion to the heart of the complex." (Seel 2003, p. 18)*

If I were to write a guidebook to the museum that should lead us to the “heart of the complex”, it would probably be very similar to Seel's preferred route. I think the entrance that brings us furtherest into the depth of the building is the one that says “Aesthetic Experience”. This is where the guidebook would start. It seems to me that the shortest route to the sacred chamber is the one that leads through the collection of phenomenological properties. In an entirely different building, on a different road, I know of a museum hosting various exhibitions on unifying brain theories. One of the exhibitions that has quite a few exemplars on display is an exhibition on unifying theories of the predictive mind. It was not easy to find, but there is a small, hidden exhibition in the museum of aesthetics on exactly the same topic. My guidebook's most valuable pieces of information will be about 1) how to get from the phenomenological exhibition to the hidden one and 2) how one can use and combine the exemplars of the hidden exhibition so that they lead the way to the heart of the complex.

1.1.2 Research Question

In this masters thesis I aim to establish a theoretical foundation upon which the predictive coding framework may fruitfully be applied to understanding the phenomenon of aesthetic experience. A critical investigation of current research in empirical aesthetics, phenomenological descriptions of aesthetic experience and theoretical aspects of the predictive coding framework will be combined to form a new theory of aesthetic experience that provides a possible mechanism and function of aesthetic experience in the predictive mind, namely the **aesthetic reset theory**.

Hence the research question: Is there a state of the system that in line with the predictive coding framework could account for the phenomenological properties of aesthetic experiences; and if so: what function could aesthetic experience serve in the predictive mind?

1.2 Why Study Aesthetic Experience?

1.2.1 Personal Story – The Beginning

Everything started with a discussion about a huge upside-down cross. The discussion, which took place in the context of a team-taught lecture series on aesthetics at the Philosophy Department of the University of Vienna, was meandering between an ontology of art and aesthetic experiences. The following thought experiment was proposed by a student:

> *Imagine you find a huge cross apparently installed next to a church. Interestingly enough, it has been installed upside-down. You immediately categorize it as an extraordinary piece of street art with a certain message and you undergo an aesthetic experience. It turns out the cross was blown off the top of the church by a huge storm during the night and landed upside-down as you found it.*

The two professors who were present were quick to brand this as an instance of misinterpretation. The initial experience of the upside-down cross as art must have been a mistake – after all, it turned out not to be a piece of art. Unfortunately, this was the end of the discussion. I felt a strong negative emotional response to this verdict and started reflecting on it. After a while, I realized that putting myself in the shoes of the person in the thought experiment I could readily accept having been wrong about the categorization and the message. It is true that the upside-down cross is not an artwork and nobody created it to convey a socially critical message about religion. However, I can not endorse the view that the person was wrong about her aesthetic experience. It feels like telling a person in the morning that she must be wrong about being tired because, after all, she has just had eight hours of sleep. This was the first time my intuition told me that there must be a difference between experiences of art, the ontology of art and aesthetic experiences.

From that point on I became more and more interested in aesthetics and particularly in aesthetic experience. During my musicology studies I encountered philosophers of aesthetics that focus on the object of aesthetic experiences, but almost always a piece of art. The recipient or the subject in an aesthetic situation – this could be the artist as well as the spectator/listener are completely left out of the observation and investigations in that directions are referred to as receptive aesthetics with the status of a second-class aesthetics, not really worth an investigation.

However, in his book *Der Wer der Musik. Zur Ästhetik des Populären* Ralph von Appen (2007 b) approaches aesthetics from exactly the side of the recipient. To investigate the aesthetics of popular music, he takes dozens of Amazon reviews of specific pop albums as a starting point. The first chapter, however, concerns the recipient von Appen knows best: himself. Using his relation to popular music as a unique point of view, he arrives at the following questions:

> *Es ist kalt, selbst die sprichwörtlichen Hunde wollte man jetzt nicht auf die Straße jagen. Bis Hamburg sind's noch rund 40 Minuten, dann Parkplatz suchen, Karte kaufen (hoffentlich gibt's noch welche), eine Stunde 'rumstehen. Zwei Stunden Musik. Wieder raus in das Sauwetter, Stadtverkehr, 100 Kilometer zurückfahren, mit diesem penetranten Pfeifen in den Ohren, verrauchten Klamotten und schmerzenden Füßen – aber bestimmt glücklich! […] / Aber warum bloß? (Von Appen 2007 b, p. 12)*

At the end of his book von Appen introduces the phenomenological work of Martin Seel. Following Seel's theory allows van Appen not only to focus on the subject, but also to circumvent normative claims about the object of an aesthetic experience. Seel's account of aesthetic experience reassured me in my intuition that aesthetic experiences are not necessarily linked to pieces of art and made me even more curious about the nature of aesthetic experience. It is this curiosity that lies at the basis of this thesis.

1.2.2 Scientific Interest

> *From the perspective of* practical *philosophy, aesthetics makes an indispensable contribution because it is concerned with a particular possibility for human life, one that discloses the presence of one's own being as an end in itself. Since aesthetic world encounter represents an excellent possibility for human life, it should not be neglected – neither by an ethics of the good life nor by an ethics of moral respect. (Seel 2005, p. 18)*

As we will see in chapter 2 aesthetics is a very diverse research landscape with a few reoccurring themes despite the prevailing disagreement on the subject matter. One of this reoccurring themes is intrinsic reward in the form of pleasure. It is frequently used to justify research interest in aesthetics. In psychological aesthetics Helmut Leder et al. argue that these "experiences are particularly interesting because of their hedonic properties and the possibility to provide self-rewarding cognitive operations." (Leder et al. 2004, p. 489) Vessel et al. motivate their studies in the field of neuroaesthetics as follows: "Looking at paintings, listening to music, or reading poems—these are hedonic experiences in which humans consistently choose to engage." (Vessel et al. 2005, p. 1) The reward will also be the main motivation for the scientific investigation in the case of this thesis. To be more precise, there are two aspects to it:

1) Looking at it from an evolutionary perspective, one could take the rewarding nature of aesthetic experiences to be an indication of an evolutionarily beneficial function. If there is a function of aesthetic experience and if it indeed poses an evolutionary advantage, it would be interesting to find out whether the function still has value – just as it is still helpful that we think of baby faces as sweet to keep us engaged with them – or whether it resembles an outdated mechanism such as our craving for sugar, which might have been helpful in a time where energy-rich nutrition was not as abundant as today. However, the rewarding nature could also be an artifact or a side-effect of other evolutionarily beneficial mechanisms and not be of any relevance to our development at all. This would,

however, not jeopardize the entire logic of why aesthetic experience should be studied scientifically.

2) The fact that aesthetic experiences are pleasurable alone makes them interesting to study, regardless of its status in evolution. Why is it pleasurable becomes an even more pressing question if the answer cannot be derived from evolutionary processes. What is happening during an aesthetic experience that rewards us and can we utilize this mechanism? These questions might be very much related to the aspects of an evolutionary perspective, but do not lose their relevance if aesthetic experiences turn out not to be evolutionarily irrelevant.

1.3 Terminology

1.3.1 Aesthetics

With the term “aesthetics”. I am referring to the broadest possible set of more or less scientific or theoretical areas that claim to be related to aesthetics, no matter what is meant by aesthetics in that specific area. The notion of being “more or less scientific or theoretical” is introduced here to exclude purely applied approaches, such as cosmetic surgery, but not theoretical considerations about cosmetic surgery or its underlying studies. This set includes traditional approaches such the branch of philosophy termed “aesthetics”, early empirical aesthetics or philosophy of art as well as more recently established approaches, such as evolutionary aesthetics, everyday aesthetics, computational aesthetics, neuroaesthetics and so forth. Within these areas, “aesthetics” or the “aesthetic” can stand for a variety of subject matters, such as beauty, art, taste, perception, the sublime, design, preferences, judgements, computer-generated textures, nature. To recognize this diversity means to recognize

possible incompatibilities between different areas of aesthetic research, which in itself does not necessarily pose a problem. However, as we will see in chapter 2, this diversity can cause problems when it is adopted unreflectively within an area or even within one study.

1.3.2 Aesthetic Experience

In line with the diverse range of subject matters that investigations of the aesthetic choose the term “aesthetic experience” could stand for various phenomena. Frequently, what is mean by aesthetic experience is art experience. This seems to be an easily applicable understanding of aesthetic experience as this would include all experiences with art; from art production to art perception. Another possible definition of aesthetic experience centers around beauty and the perception of objects and situations that we judge to be beautiful. Yet another approach, namely everyday aesthetics, focuses on situations in which we judge or decide on the basis of our perception, for example when we choose what to wear in the morning (Saito 2008). These different approaches vary not only in the nature of what defines them – be it the object category art, the object property beauty or aesthetic judgement, a specific action based on perception – but also along the dimension of exceptionality. In everyday aesthetics we hardly even notice making aesthetic judgements, and aesthetic experiences are an integral part of our everyday life. When we focus on aesthetic experiences as experiences involving art and/or beauty, we define aesthetic experience as something different from everyday experiences, something that constitutes an exception to everyday experiences (unless of course one works with art on a daily basis).

A bit further along that dimension we can find a notion of aesthetic experience according to which the experience is fundamentally different to how we experience our surroundings usually, and this difference is not only a byproduct of the definition, but included in it. For the rest of this thesis ,it is this exceptional

aesthetic experience to which I will be referring whenever I use the term “aesthetic experience”.

This aesthetic experience can be understood as a specific mode of perception that correlates with a specific state of the mind. Everything can be perceived in that way, and nothing is necessarily perceived solely in this way. It is a form of perception that is less structured by our interest than everyday perception, and therefore closer to bottom-up sense data than the usual form of perception. It appears to me to be related to the sublime and to the sensation of awe. The experience could be triggered by panoramic scenery perceived from a mountaintop, your favorite painting, the sparkling reflections of the moon on the surface of a lake or, albeit less likely, by the contemplation of a traffic light - less likely in part because cultural and societal upbringing, at least in the Western world, does not favor contemplation of traffic lights.

1.3.3 The Predictive Mind

The notion of the predictive mind here refers to the conceptual view of the mind as a prediction and inference machine. This view can be traced back to Helmholtz and evolved into various different formulations (Clark 2013, p. 1). This thesis will focus on the specific predictive coding framework. A theoretical framework that organizes the mind into hierarchically structured layers of predictive coding, as described by Hohwy (2013) or by Clark, who uses the term hierarchical predictive processing (Clark 2013).

2 AESTHETICS

The aim of this chapter is to locate the position aesthetic experience possesses within the area of aesthetics and to give an overview of the current status of empirical aesthetics.

> *"Die im 19. Jahrhundert vorherrschende idealistische Ästhetik hatte durch ihren normativen Gestus die Wertvorstellung und Rezeption musikalischer Kunstwerke maßgeblich bestimmt." (Fuhr 2007, p. 9)*

In recent years the field of aesthetics has diversified into various approaches. Shimamura and Palmer published a book to gather ideas about what an aesthetic science could look like. This book is divided into the three chapters "Philosophical Perspectives", "Psychological Perspectives" and "Neuroscience Perspectives" (Shimamura et al. 2012). The plural form of the word "perspective" gives away that even within these three distinct scientific disciplines there is no unified picture of aesthetics.

In the voids between these loosely related approaches lurks the question about the designated areas and limits of aesthetics, and in that sense about the very object of aesthetic investigations. Is it the beautiful, the artistic, the artful, the moving? Should aesthetics be a science of art or should research be done on all objects that are intrinsically pleasurable to perceive? There is a certain bipolarity about art as the focus of aesthetics. On the one hand it seems to be agreed upon that art lies at the heart of aesthetic research and henceforth also of aesthetic experiences, for example, when the word "aesthetics" seems to imply "sciences of art" (Shimamura et al. 2012) or "aesthetic experience" and "art appreciation" are used synonymously (Leder et al. 2004). On the other hand researchers assure that aesthetics is as much about nature or faces as it is about art – which frequently happens even within one and the same article (Leder et al. 2004).

Trying to solve this bipolarity seems to result necessarily in one of two possible dead ends, which might be the reason why many articles refrain from addressing it altogether: Either aesthetic researchers restrict themselves to the investigation of art, so that aesthetic experience is indeed equivalent to art experience, in which case a) many seemingly interesting phenomena, such as for example the sublimity of a mountain landscape, are outside the limits; and b) the notion of aesthetic experience becomes obsolete since experiences involving art can be of so many different kinds that it becomes as useful to speak of "aesthetic experiences" as to speak of "tool experiences". Or: aesthetics includes research on the perception of nature, faces or any kind of objects, in which case aesthetics becomes a science of perception and aesthetic researchers have to justify the application of the term "aesthetics" or find other rules to define the border between aesthetics and mere perception.

How prevalent the problem of definition is in the field of aesthetics is also addressed by Thomas Munro and Roger Scruton, when he claims that "Indeed, it could be said that self-definition has been the major task of modern aesthetics." (Munro and Scruton, 2014). This problem seems to be carried over from aesthetics to investigations concerned with aesthetic experience, which is why I consider it important to be discussed in this thesis.

2.1.1 Empirical Aesthetics

Contemporary aesthetics is as diverse as the historical development of the field would lead one to predict. Terms associated with empirical aesthetics are "art", "beauty", "judgement", "aesthetic experience", "sublime" and similar. Augustin et al. describe how, on the one hand, empirical aesthetics has been part of psychology for over 100 years now (2012, p. 455) starting with Gustav Theoror Fechner's Vorschule der Ästhetik. Aesthetics continued to be studied by psychologists such as Rudolf Arnheim, Daniel E. Berlyne throughout the 20th century. On the other hand,

however, even though empirical aesthetics has gained considerable traction, it can still not be counted as one of the mainstream areas of psychology.

Just as the philosophical field of aesthetics (Munro and Scruton, 2014), so can empirical aesthetics be divided into three different approaches. They differ mainly in their focus of research: 1) Is concerned with aesthetic objects, 2) with aesthetic actions and 3) with aesthetic states such as the aesthetic attitude or aesthetic experience.

Ad 1) Aesthetic Objects

Augustin et al. equate aesthetic objects with art. This already becomes clear when they write about empirical aesthetics as "the empirical study of art". As we will see in a later chapter this approach holds quite some difficulties, which is also recognized by researchers of that field:

> *The challenges researchers face in this context are very special: Art is not a "standard" stimulus, and the experience that viewers have with real artworks in a museum are difficult, if ever possible, to reproduce in the lab. (Augustin et al. 2012, p. 455 f.)*

Ad 2) Aesthetic Actions

These include aesthetic judgements or decision making based on aesthetic features. In this approach it is also the language of criticism that is of interest. This approach can also help to shed light on questions that are proposed by everyday aesthetics; questions, such as: How we choose what to wear in the morning, how we speak about aesthetic judgements, why we spend considerably more money to save polar bears than for the survival of the blob fish? Stephen Palmer and colleagues address similar questions in their psychological experiments in which common preferences based on aesthetic features are uncovered.

Ad 3) States of Mind

This approach includes the aesthetic attitude and aesthetic experience. Rather than on aesthetic objects, the focus here lies on the subject that aesthetically

encounters these objects. The crucial element here is a specific state the subject is in, whenever she undergoes an aesthetic experience.

2.1.2 Phenomenon-Oriented Cognitive Science

As a cognitive scientist, I endorse the phenomenon-oriented approach. Out of the multifarious field of aesthetics, I have picked only one phenomenon for this thesis, namely aesthetic experience. This is still a substantial task, but it is one where previous theoretical considerations of adjacent topics can be pushed aside enough to minimize the number of assumptions at the outset. The multi-disciplinarity nature of cognitive science offers a great foundation for an investigation of the phenomenon from several viewpoints. This thesis is in fact an attempt to formulate a cognitive science of aesthetic experience.

3 PREDICTIVE CODING AND THE PREDICTIVE MIND

This chapter will introduce the main concepts of predictive coding, focusing on the components of the underlying mechanism important for the **theory of the aesthetic reset**.

3.1 Predictive Coding Framework

3.1.1 An Introduction

The idea of the brain as a hypotheses-testing machine dates back to Helmholtz. This general theme has been spelled out in several theories, predictive coding being one of them. (Clark 2013, p. 1) Certain properties of the predictive coding framework make it appear especially compelling as a resource for research on aesthetic experience: In recent years, it has been the subject of a considerable amount of discussion and theoretical investigations, leaving it spelled out on many different levels; from a purely conceptual level to possible neuronal implementations. This prior research provides a wealth of reinterpreted experimental data and philosophical arguments that can be imported into aesthetic theory. It is a very elegant framework that is able to provide considerable explanatory power, despite its limited set of necessary "but powerful tools [with which] it is possible to re-assess, recalibrate, and re-conceive many issues in philosophy of mind and cognitive science. In some cases this allows us to see new kinds of solutions to

long-standing problems." (Hohwy 2013, 96)

One way to look at our perception of the world is that there is way too much information in the world for the limited capacity of our senses and, ultimately, of the brain. As a result, data-compression is necessary, and this is where predictive coding can help: Predictive coding has originally been developed as a means of data compression in signal processing. In "Whatever next?" Andy Clark (2013) describes image transmission as a clear illustration. A possible way to decrease the amount of transmitted data from a digital picture is to send only unexpected changes rather than transmitting information for every single pixel. As previous pixels can be used to predict forthcoming ones, only expected errors in the prediction need to be sent.

If we transfer this example onto the mind, the crucially necessary mechanism for a successful mind becomes immediately apparent. The better our predictions about the world are, the lower the prediction error; and the lower our prediction errors are, the better we are at predicting the world. The most important aim for a well-functioning predictive mind is therefore prediction error minimization. This is supposed to happen through a constant checking off the prediction against incoming data and a constant updating of our models of the world if necessary. If my current model of the world depicts me sitting in a train, causing ever-growing prediction errors, because everything on the surface of the earth is gradually becoming smaller and smaller, I need to reassess my model. Maybe a model that depicts me in a plane causes considerably less prediction errors.

To illustrate the mechanisms at work, Hohwy compares predictive coding to statistics (Hohwy p. 42): The typical tasks of the statistician includes the generation of models that fit a certain set of data well. Given a certain data set, the first model could consist simply of the mean value of all the sampled data points. This would not be a very sophisticated model of the world and given the world's complexity, it would probably cause considerable prediction error. Furthermore, if we elaborate more on this metaphor, it becomes apparent how predictive coding can lead to the view that the world itself is off limits. The mind is left with the task of making sense of it by only using a limited amount of data. Speaking with the metaphor once again, the mind has only access to samples of the world, as the whole population would

simply be too much to process.

Andy Clark puts the idea that the world itself is off-limits into words even more drastic:

> *"Thus consider a black box Thus, consider a black box taking inputs from a complex external world. The box has input and output channels along which signals flow. But all that it "knows", in any direct sense, are the ways its own states (e.g., spike trains) flow and alter. In that (restricted) sense, all the system has direct access to is its own states. The world itself is thus off-limits (though the box can, importantly, issue motor commands and await developments). The brain is one such black box." (2013, p. 3)*

A more forward-oriented approach than the calculation of the mean can be described by Bayes' rule. I will not elaborate on Bayes' rule for two reasons: first, it is not necessary to describe Bayes' rule in order to convey the principles of the aesthetic reset theory. Second, it is not clear and agreed upon whether predictive coding is strictly governed by Bayesian inference. An introduction can be found in Hohwy (2013, p. 34 ff.), and a more technical demonstration, which aims to provide all necessary means to enable the reader to use it for statistical problem solving can be found in Kruschke (2010).

To emphasize that predictive coding views the mind as a prediction machine that spreads across multiple hierarchically organized layers, Andy Clark introduced the term hierarchical predictive processing (Clark 2013, p. 3). Propagating through this hierarchy are top-down predictions and bottom-up sense data. Each layer compares its predictions to the upcoming data that originates from the same process one layer below and sends the results to the next layer above. As the bottom-up sense-data is actually only the difference between predictions and incoming data, it makes more sense to speak of the residual prediction error rather than of sense-data. The difference here is that the prediction error is sense data stripped of everything that has already been predicted.

An interesting feature of the layered hierarchy is the mapping of levels to

time scales. “In this way there is a cascade of precision-weighted messages passing between processing levels, spanning from the local and short-term to the global and long-term.” (Hohwy 2013, p. 68)

The mechanism of prediction error minimization, where predictions are updated according to the up-propagated prediction error can only work reliably if there is an additional second-order mechanism at work that is able to inform us about the precision of the incoming data. After all, one would not like to throw all models overboard just because it is misty outside:

> *“The fundamental purpose for precision processing is to enable the activities of internal models of the world to be driven by reliable learning signals: if there is confidence in a signal then it should be allowed to revise the hypothesis […]. The assessment of confidence should therefore impact on the strength of the prediction error message being passed up through the system.” (Hohwy 2013, p. 66)*

This precision-weighting is said to control the gain on the prediction error units, where lower gain means less influence of the resulting errors on the models. (Hohwy 2013, p. 113)

> *“Recall that the need for precision optimisation arises because the input from the world has state-dependent levels of noise and uncertainty, which must be extracted to enable the second-order statistics of assessing confidence in perceptual inference. If we cannot assess confidences, then we cannot use perceptual inference to learn about the world.” (Hohwy 2013, p. 71)*

As the precision of the incoming sense data is state dependent, our models learn not only to predict hidden causes in the world, but also how noisy the incoming signal is, given a certain state. Going back to the analogy with the statistician, the prediction error can be likened to the report of a sample mean, whereas the precision is akin to estimating the variance. (Hohwy 2013, p. 194 f.).

3.1.2 Possible Criticism

Frameworks offer tools that can be used to form theories. This is also true for the predictive coding framework. It offers us tools that can be used to formulate theories that eventually should be tested. In this sense, if the aesthetic reset theory proves to be testable and we can gather data in favor for it, this would also add weight to the power of the framework.

When Hohwy states that predictive coding can be used to "re-assess, recalibrate, and re-conceive many issues in philosophy of mind and cognitive science" (2013, p. 96), than we can not only perceive this as an advantage, but also as the core of a problem the predictive coding framework currently still suffers from. Most research that has been done in the light of the predictive coding framework reinterprets already existing findings. Very little data has been gathered using experiments that are specifically designed for testing the explanatory power behind theories inspired by the predictive coding framework. In other words, data is missing from experiments that have been designed to asses theories generated within the predictive coding framework.

In this light, if the operationalization of aesthetic experience through the use of the tools of the predictive coding framework succeeds, predictions can be formulated that not only deliver data relevant for experimental aesthetics, but also evidence for the predictive coding framework itself.

4 AESTHETIC EXPERIENCE

This chapter is more or less the attempt to merge two rather distinct theories from different fields of research. On the one side I will focus on Martin Seel's phenomenology of aesthetics as presented in *Aesthetics of Appearing* (2005). On the side of the predictive coding framework, I will mainly consult Jakob Hohwy's book *The Predictive Mind* (2013).

4.1 The Phenomenon

4.1.1 Aesthetic Experience – A Preliminary Definition

To clarify what is meant by aesthetic experience in this thesis, it is important to provide one specific negative definition first: Aesthetic experience as I will use it here is **not equivalent to art experience** – in fact, as I will explain in the following paragraph, it is not useful to speak of art experience at all. Art might play a role in aesthetic experiences we undergo, but not a defining one. Aesthetic experience is an experience that comes about as the conscious experience accompanying a mental state. This experience is correlated with a state of the mind that allows for a specific and extraordinary mode of perception, different from how we usually perceive the world.

Claiming that aesthetic experience has nothing at all to do with art would indeed be an exaggeration, but quickly conveyed that in my usage of the term "aesthetic experience", it does not equal art experience. In fact I doubt that it would be useful to speak of something which could be labeled art experience. If art experience is simply defined by the object of the experience being a work of art, the experience can exhibit a whole range of different phenomenological qualities. The phenomenological quality might for example depend on the reason for which we approach a work of art. Are we looking for a risk-free investment or a new desktop background? Is it our job to determine whether it is the original or a counterfeit, or are we actually ourselves perhaps engaged in the act of counterfeit? Maybe we have just realized how good-looking the person in the picture is, or maybe we want to put our art expertise to the test by guessing the artist, the technique or the time of production. Maybe this work of art evokes childhood memories or sheer horror. The list could be continued with increasing uncertainty about a common property other than the object category.

If one is interested in the phenomenon on the experiential level, it should have become clear that no commonalities can be found in the experiential quality. Even if one were to investigate art as the object of experiences, not much seems to be gained by the compilation of a catalogue of possible experiences, as it would hardly differ from a catalogue of possible experiences with pieces of furniture, tools or plants. It seems to be important to emphasize this negative definition, as considerate amounts of psychological research in the field of modern, empirical aesthetics seems to build upon the assumption that aesthetic experience and art experience are synonyms for one and the same phenomenon. Shimamura for example asks: "What happens when we experience a work of art? What does it mean to have an aesthetic experience?" (2012, p.3). I claim that this assumption is a hasty premise and poses a dangerous threat for the field of empirical aesthetics. Indeed, it could be one of the most fundamental problems that prevent the field of neuroaesthetics from overcoming its infancy (Chatterjee 2011, 2012).

To illustrate how difficult it is to define aesthetic experience, and yet how readily the link between aesthetic experience and art experience is accepted, I want

to elaborate on an existing definition. Johan Wagemans used Leder et al.'s definition of aesthetic experience (2004, p. 493) on one of his slides at the VSAC 2014 in Belgrade, where he gave a talk as invited speaker with the title “What is missing for a proper visual science of art?”. The definition reads:

> *“We show how aesthetic experiences provide cognitive and affective processing, which we suppose is somehow art-specific and, in many cases, both pleasing and self-rewarding. Exposure to art provides the perceiver with a challenging situation to classify, understand and cognitively master the artwork successfully. It is this entire process that we call an aesthetic experience.” (Leder et al. 2004, p. 493)*

Asking Wagemans after his talk about this definition, he agreed that one does not always have an aesthetic experience when one engages with an artwork, and also that aesthetic experiences can occur with objects other than artworks (e.g. car interiors or scenes of nature). In our brief conversation, he furthermore acknowledged that a one-to-one mapping of aesthetic experience and art experience is not possible, especially when it comes to what he casually called “real aesthetic experiences”. This expression was apparently meant to describe a special case of aesthetic experience; one where knowledge about an artwork, or understanding of its meaning, is irrelevant, and where this somewhat enjoyable experience evolves solely around what is presented to the senses, just as “the word *aesthetic* is derived from the Greek αἰσθητικός (*aisthetikos*, meaning "esthetic, sensitive, sentient"), which in turn was derived from αἰσθάνομαι (*aisthanomai*, meaning "I perceive, feel, sense").” (Online Etymology Dictionary, http://www.etymonline.com/index.php?term=aesthetic&allowed_in_frame=0, retrieved Sept. 28th, 2014.)

In this sense, it is the “real” aesthetic experience I am trying to capture. In line with this endeavor, I consider it acceptable to use the term “aesthetic experience” for instances of “real” aesthetic experiences, and the term “art experience” for the “not so real” aesthetic experience. General difficulties with the concept of an art experience have been and will be discussed in other paragraphs.

By de-coupling aesthetic experience from art experience, and by

bootstrapping it onto a specific way of sensing, we are also able to free it of cognitively higher processes, which are arguably an integral part of art experience, such as “explicit classification”, “cognitive mastering”, “expertise”, “pre-classification” and aesthetic judgement “as the result of the evaluation of the Cognitive Mastering stage” (see Leder et al. 2004). This allows me for example to undergo an aesthetic experience on a mountain-top while looking at the scenery without the possession of expert-knowledge about its geological history.

As the kind of aesthetic experience I am concerned with is not considered to map well onto art experience, a new starting point for a definition of aesthetic experience other than “when examining art” is required. Rather than defining the experience via its content, my starting point will be on the subject's side of the phenomenon; and indeed the phenomenology of an aesthetic experience seems to be the most defining element on a conscious level. In a way, it is the aim of this work to find a possible and testable definition of aesthetic experience. Starting with a catalogue of phenomenological peculiarities, which will be provided through the course of this chapter, the definition's inventory should eventually be joined by a mechanistic and functional description of the system's state during an aesthetic experience. This will be the subject of a later chapter, when the aesthetic reset theory will be discussed.

4.1.2 Aesthetic Experience and Art

Now that I have made it clear that I am not primarily interested in art, I can admit that there might indeed be a link between art and aesthetic experience. I see three possible explanations for this, but every single explanation is based on the idea that whenever we encounter art, be it in a museum, a concert hall or on the street, it only serves as a context or a background for an aesthetic experience and not as the trigger. 1) The context of a museum or another place of aesthetic practice (Seel

2005, p. 20) could either help us to be more open to undergoing an aesthetic experience, in which case we could observe an actual increase in aesthetic experiences in this context. 2) We are more likely to realize the fact that we have just had an aesthetic experience in such a context, as this is where we expect aesthetic experiences to happen. 3) We might call the same type of experience by different names, depending on the context. Having an aesthetic experience on a hike, we might call it an experience of nature, or we might call it religious experience, when it happens in a monastery, and only aesthetic when it happens in the context of art. As I claim that the same mental state constitutes the common origin and the defining element of all these phenomena, I argue accordingly against a restriction of the term "aesthetic experience" to any of these contexts or object classes, but instead favor of a conception that embraces all possible occurrences of this mental state.

Furthermore, due to the aforementioned possibility of perceiving art without undergoing an aesthetic experience and aesthetic experiences without the involvement of art, it should be clear that this phenomenon cannot serve as a bearing element of an ontology of art. The same argument can be brought forward in respect to beauty: not everything that is beautiful triggers an aesthetic experience and not everything that triggers this mental state is beautiful.

> *"Beauty is central to most people's concept of aesthetics (Jacobsen, Buchta, Kohler, & Schroger, 2004). Of course, not all art is beautiful and artists do not always intend to produce beautiful things. However, beauty remains a central concept in discussions of aesthetic experiences. Understanding the neural basis of the perception of and response to beauty might give us insight into the perception of and response to visual art. Facial beauty has received most attention in cognitive neuroscience."* (Chatterjee 2011, p. 56)

This quote is supposed to serve as an example of how difficult it is to pinpoint the role beauty should play in neuroaesthetic enquiries – and any other area investigating aesthetics in general for that matter. Chatterjee points for example at the lack of a mapping between art and beauty. Freeing aesthetic experience from its supposedly direct relation with art and beauty, by shifting the focus from the object of an aesthetic experience to the mental state of the subject, helpfully narrows down

the scope of the phenomenon at hand.

4.1.3 Three Personal Examples of Aesthetic Experience

The following personal examples of aesthetic experiences should help to illustrate and flesh out the preliminary description given above. By no means are these accounts intended to be professional phenomenological descriptions. The sole purpose of the following examples consists of helping the reader to develop an intuitive understanding of the phenomenon, and may serve as points of reference to link to instances of the phenomenon the reader herself has undergone.

- Sound of automatic blinds at Copenhagen University:

In the cafeteria at Copenhagen University's Amager campus, I was one day surprised by the sound of the automatically adjusting blinds. The sound, reminiscent to singing whales, seemed to expend throughout the whole building.

- Olafur Eliasson's work of art: “Din Blinde Passager”:

While I studied abroad at the University of Copenhagen, I took advantage of various excursions offered by the university, one of which included the visit of ARKEN Museum of Modern Art (“ARKEN Forside”, http://www.arken.dk/, accessed July 1st, 2014). On display were, among others, several installations by Damien Hirst (“Damien Hirst – ARKEN Museum of Modern Art”, http://www.arken.dk/content/us/art/exhibitions/damien_hirst , accessed July 1st, 2014.) and Olafur Eliasson (“Past Exhibitions – ARKEN Museum of Modern Art”, http://www.arken.dk/content/us/art/exhibitions/past_exhibitions/2011, accessed July 1st, 2014); one of which was Eliasson's “Din Blinde Passager” (“New Olafur

Eliasson Installation at ARKEN – ARKEN Museum of Modern Art", http://www.arken.dk/content/us/press/news/new_olafur_eliasson_installation_at_arken, accessed July 1st, 2014).

> *Eliasson's installation Din blinde passager (Your blind passenger) is a 90-metre-long tunnel. Entering the tunnel, your body is surrounded by dense fog. With visibility at just 1.5 metres, museumgoers have to use senses other than sight to orient themselves in relation to their surroundings. Accordingly, the work demands your singular, intense attention. ("New Olafur Eliasson Installation at ARKEN – ARKEN Museum of Modern Art", http://www.arken.dk/content/us/press/news/new_olafur_eliasson_installation_at_arken, accessed July 1st, 2014)*

I entered the tunnel on one side and slowly moved through, what seemed to be an endless vastness of fog that constantly changes its color. No matter what shade and hue the colored light took on, it seemed to be vibrating with saturation.

- Religious Experience during the Preparation Phase of my Confirmation

When I was 16 years old I was still religious and decided to participate in the catholic confirmation. As a part of the preparations, we spent a weekend in the Missionshaus St. Gabriel ('Missionshaus St. Gabriel', *Wikipedia*, http://de.wikipedia.org/w/index.php?title=Missionshaus_St._Gabriel&oldid=131765852, accessed July 1st, 2014). a missionary institution in Mödling, Austria. I think it was in the morning, when I stepped through a double door into a courtyard of the building and found a small and seemingly wild growing hayfield circumscribed by the inner walls of the building. I felt a flush of fresh air and the warmth of the sun, as suddenly everything I perceived appeared in more vivid and vibrant colors as I, in this moment, thought to have ever seen before.

Despite the variety of these three examples, they shared a common phenomenology. Their sum of commonalities is what constitutes an aesthetic experience for me. This is what I will try to rediscover in phenomenology and to naturalize via the predictive coding framework. During all of these experiences, my perception seemed to change substantially. Everything seemed cleaner, crisper and richer, and I also felt pleasantly overwhelmed by this richness. My attention seemed to rest solely at the percepts, and a sense of an expansion of time held these experiences together. In all three instances, the experience struck me suddenly, and seemingly without any conscious contribution from my side. Furthermore, the diversity of these three examples should once again highlight that it is not the content of the experience that determines its aesthetic nature, but the state the subject is currently in, including the resulting phenomenology. Interestingly, when I underwent the experience in the missionary institution, I was convinced that I had just had a religious experience. By the time I lost my religious faith later on, it became clear how similar the phenomenology was to other aesthetic experiences, except of course for the religious setting.

As stated above, the aim of the following chapters will be to rediscover my experiences in phenomenological descriptions by Martin Seel, which should provide me with an experiential framework of aesthetic experiences, functioning as a groundwork on which to base a predictive coding account of aesthetic experience.

4.2 Phenomenological Description

4.2.1 Why Phenomenology?

Aesthetic experience has proven to be an extremely elusive phenomenon. No means have yet been discovered to reliably induce aesthetic experiences in subjects. Eskine and colleagues, for example, set out to discover "which specific emotional state affect aesthetic experiences or whether general physiological arousal is sufficient" using conditions with various degrees of physical exercise and two conditions with either happy or scary videos (2012, p. 1071). Neuroaestheticians frequently display paintings to capture aesthetic experience (see for example Vessel et al. 2012), but as I have claimed earlier, there is no one-to-one mapping of art experience and aesthetic experience, which leaves the question whether this is a fruitful way of operationalizing aesthetic experiences. Admittedly, our understanding of empirical underpinnings of aesthetic experience is simply too low to operationalize it directly. The most reliable connection is still the one to our own aesthetic experience. Phenomenology is the only tool we have with us whenever we encounter an aesthetic experience. To accept the fact that our understanding of aesthetic experience is still too fragile to be operationalized experimentally is a necessary step for an advancement of the field of experimental aesthetics.

To get a grasp of the phenomenon, phenomenological descriptions will prove valuable to the establishment of a set of properties that describe aesthetic experience. This set will originate from phenomenological descriptions and provide the means to define aesthetic experience, to distinguish it from other experiences and finally also to connect it to a specific mental state in the predictive mind. The predictive coding framework should help to ground the phenomenology of aesthetic experience in the neuroscience of the predictive brain, which should ultimately, lead to an operationalizable account of aesthetic experience. First, however, I will introduce Martin Seel, whose work on the phenomenology of aesthetics will provide the

necessary descriptions to start the process.

4.2.2 Martin Seel's Phenomenology of Aesthetics

The German philosopher Martin Seel has developed a phenomenologically motivated theory of aesthetic experience, and articulated it in two published books (von Appen 2007, p. 10): *Eine Ästhetik der Natur* (Seel 1996) and *Ästhetik des Erscheinens* (Seel 2013). The latter has been translated by John Farrell. The English version was published at Stanford University Press in 2005. Robert Guay, who reviewed the English edition, concludes his report by claiming that Seel aims "to fold, at the least, modernist art and more recent accounts of subjectivity back into a very traditional picture of aesthetics" (Guay 2007, p. 451). I agree with Guay that this endeavor is "impressive in its scope" (ibid., p. 451); however, I will focus only on one fraction of Seel's theory. In fact, I will limit myself to Seel's examples and descriptions of aesthetic experiences.

To be a bit more precise: Seel develops his theory around three concepts concerning aesthetic experience: aesthetic contemplation, aesthetic correspondence, and aesthetic imagination. In Ralf von Appen's application of these concepts to the realm of music, he paraphrases them to fit his endeavor as:

> *"the merely sensual attraction of music; the significance of music in everyday life; and what is generally referred to as art." (von Appen 2007, p. 10)*

Especially useful to my endeavor will be Seel's notion of aesthetic contemplation, which is not concerned with meaning, but rather with how objects appear to our senses, in there full sensual richness. Martin Seel exemplifies the difference between this mode of perception and our everyday mode of perception in his example of the red ball lying on the green lawn.

> *"Aesthetic contemplation does not try to understand, interpret or define anything; it is not interested in meaning but in the purely sensual appearance of an object or a situation." (von Appen 2007, p. 10f.)*

Throughout his book *Aesthetics of Appearing* (2005) Seel uses this example of a red ball on a green lawn to illustrate several details related to aesthetic perception and the differences between this mode and our everyday perception. Generally, he distinguishes three layers of perception: "perceiving of" something, which is the basic form of perception. "Perceiving that" and "perceiving as" require the ability to handle concepts. Our everyday perception, which Seel for example also refers to as "conceptually articulated perception" (2005, p. 25) allows us to determine objects and there properties in our environment (2005, p. 26), which is a very useful way of engaging with our environment and helps to navigate our everyday lives.

Seel characterizes aesthetic perception as disregarding the conceptual determinacy of the "perceiving as", making it a presupposition of aesthetic perception. "Whoever can perceive something that is determined can also disregard this determination, or to be more precise can disregard the *fixation* on this determination. The perception of something *as* something is a condition for being able to perceive something in the palpable repleteness of its aspects, something in its unreduced presence" (2005, p. 25), with which Seel refers to aesthetic perception, as we will see later on.

One could also draw an analogy to robot perception, where information entering the system through sensors needs to be processed in some way for the robot for example to classify objects sensed by its camera. Before the robot engages in perception, visual input consists of a so-called point cloud, an array of pixels with certain values. For propositional seeing to take place, pixels need to be combined, grouped, highlighted or disregarded following rules describing how to proceed. Generally classifying anything within visual range can be an interest in itself, but one could easily think of more restricting interests, such as discerning a red cup from a blue cup.

But let us get back to Seel and how he describes conceptually articulated perception of a “red ball lying on a green lawn”:

> *“Everyone […] can see that it is thus. They can see that the ball is red, […] that it is Oscar's ball, […] and much more. They can classify this object as a ball and attribute various properties to it. All this is not an accomplishment first of seeing and then of an interpretation of what has been seen; rather, it is an accomplishment of propositional seeing, where something is perceived as something. This kind of seeing takes place from different perspectives and with diverse interests.” (Seel 2005, p. 26)*

These diverse interests are an important guiding component of our everyday-perception. Seel asks us to imagine a murder investigation is taking place on the very same property on which the red ball is lying on the green grass. As the detective hypothesizes that the injured culprit has fled through the garden, it is the forensic expert's job to examine the red ball for possible traces of blood and doing so, Seel argues, she “will nonetheless remain blind to the appearing of the ball. […] her viewing remains an ascertaining viewing” (2005, p. 29). She perceives the ball under certain aspects and can therefore not “encounter it in its appearing” (Seel 2005, p. 25).

In contrast to this, aesthetic experience is driven by disregarding the praxis of conceptual determination, and Seel interprets Kant's notion of “disinterestedness” at one point as distancing one from “theoretical and practical interests (of knowledge and utilization) […] or at least from there exclusive pursuit.” (Seel 2005, p. 31). This represents a stark contrast for example to Leder and colleagues' point of view. As their model is based on the idea that art appreciation, aesthetic appreciation, aesthetic experience and aesthetic judgements are phenomena overlapping to such a high degree that they should be accounted for with just this single model, they need to include “explicit classification, implicit classification, cognitive mastering and evaluation” in their understanding of aesthetic experience (Leder et al. 2004, p. 489).

5 AESTHETIC EXPERIENCE IN THE PREDICTIVE MIND

In the chapter on personal aesthetic experiences I have already hinted at a set of properties that characterizes aesthetic experience for me. Some of these properties resonate quite well with Seel's account, which the phenomenological parts of the following chapters will be based upon. As we shall see, it will be helpful to use Seel's phenomenology as a pool of observations to draw from. Each chapter comprises (first) a subchapter about the phenomenological description according to Seel, and (second) a subchapter in which I attempt to deliver a possible account of the phenomenology in terms of the predictive coding framework. In a last recapitulatory chapter, it will hopefully become obvious how many elements of the phenomenology of aesthetic experience can be rephrased as predictive coding mechanisms using the parsimonious theory of the aesthetic reset.

I will start the following chapters with the view of aesthetic experience as a specific mode of perception, which corresponds to a noticeable shift in how we perceive the world. This special mode is accompanied by a certain disinterestedness, which as we will see differs substantially from Kant's homonymous notion, and characterized by a richness of percepts that at times seems to overwhelm us. Nevertheless, this flood of percepts resembles a pleasant rush that only lasts for moments and happens rather rarely. Furthermore, this flood appears to lie outside of our conscious control, and cannot really be triggered deliberately.

These claims about the phenomenology of aesthetic experience are to be understood as descriptive claims. Even if the reader does not agree with each and every one of these properties, I hope to build a case based on several pillars, which will therefore be strong enough to amount to a convincing theory.

5.1 Property I: Aesthetic Experience as Mode of Perception

In this chapter I will discuss the concept of aesthetic experience as a specific mode of perception. The first subchapter will summarise Martin Seel's account. In the second subchapter I will elaborate on the influence of predictive coding mechanisms on perception, and describe a mechanism that could lead to the phenomenology of a shift in the modes of perception.

5.1.1 Phenomenology: A Particular Mode of Perception

> *"To perceive something in sensuous appearance is how one could characterize the* general *procedure of sensuous perception. Aesthetic perception is a particular mode of this perception. It is distinguished by a specific polarity of seeing, hearing, touching, smelling, and tasting. We should not therefore disconnect aesthetic from other kinds of perception; rather, we have to recognize its particular accentuation."*
> (Seel 2005, p. 24)

In this quote, aesthetic engagement with the world is described by Seel as a "particular mode of perception". The quote raises three questions that will be addressed here: 1) What is the concrete connection between this mode of perception and aesthetic experience? (can these two terms for example be used synonymously?); 2) What does it entail for an experience to be tied to a mode of perception; and 3) What is Seel referring to when he designates it to be "a particular mode" and of "specific polarity"?

Ad 1) It is hard to find one specific word on the relationship between the concepts of aesthetic perception and aesthetic experience in Seel's *Aesthetic of Appearing* (2005). At first, this seems rather surprising, as the former is a key

concept in his work, and the latter has been a hugely debated concept in aesthetics (for an overview of the debate, for example, between Dickie and Beardsley, see Iseminger 2003) and not just any key concept, but the one that comes closest to Seel's aesthetic perception. In fact, in his writings, these two concepts are indistinguishable. So on second thought, it is probably save to assume that Seel uses them synonymously. However, it is noticeable that he uses "aesthetic experience" only in the context of traditional philosophy (see Seel 2005, p. 57 on intuitions about aesthetic experience that are "well anchored in the tradition"). As soon as he turns back to his account and its terminology he employs the term "aesthetic perception" (see for example ibid., p. 20).

If one wanted to classify Seel's account of aesthetic perception in the catalogue of aesthetic experience theories, it would clearly pass as an internalist as opposed to an externalist theory, as described by Shelley in his entry "The Concept of the Aesthetic" in the *Stanford Encyclopedia of Philosophy*:

> *"Internalist theories appeal to features internal to experience, typically to phenomenological features, whereas externalist theories appeal to features external to the experience, typically to features of the object experienced."(Shelley 2009 / 2013)*

If Leder and colleagues define aesthetic experience as "the entirety of cognitive and affective processes involved when examining an artwork" (as summarized on a slide by Wagemans at the VSAC2014 conference, after Leder et al. 2004), a clearly externalist account of aesthetic experience, I would replace some concepts to twist this claim so that aesthetic experience is the entirety of cognitive and affective processes involved when one is engaged in aesthetic perception. Undergoing an aesthetic experience, which equates to being engaged in aesthetic perception, is to perceive the world in a particular way via cognitive processes that entail several implications for the phenomenology of the system, as we will see in the following chapters. This shifts the focus from object features to aesthetic experience and its distinct experiential quality.

Ad 2) Thinking of aesthetic experience as the phenomenology of a certain

mode of perception has an important implication for the concept of aesthetic objects. If the crucial property of an aesthetic object is to be the object of an aesthetic experience, to be the object perceived during aesthetic perception, what follows is that "what is sensuously perceivable and can therefore be the occasion of aesthetic perception is not for that reason already an aesthetic object" (Seel 2005, p. 22). As an analogy, one could think of night vision. Objects that we perceive with our night vision are objects of our night vision, but only as long as they are indeed objects of our night vision. When encountered in broad daylight, they are no longer objects of our night vision. There is not a single class of objects that can be designated as "night-vision-objects" independently from night vision, and there is hardly anything that cannot become a "night-vision-object" in the context of night vision. Returning to aesthetic perception, one can find Seel arguing that we "can react aesthetically to anything and everything that is anyway sensuously present […]" (Seel 2005, p. 34). When we claim that aesthetic experience goes hand in hand with aesthetic perception, just about anything can become an aesthetic object, in the same way that almost anything can become an object of our night vision. Therefore, henceforth the term "aesthetic object" stands for the more precise phrasing "object or content of an aesthetic experience".

Ad 3) The particularity of aesthetic perception hints at the discernability of this mode. It establishes a mode of perception that, when we look at the level of the system, differs from other modes of perception. Aesthetic experience is the phenomenological result of that mode of perception that enables us to recognize these differences, and that allows us to compile a catalogue of phenomenological properties, which forms a set that is unique to aesthetic experience and hence also to aesthetic perception.

However, if we claim that this mode is distinguishable, we also need to address the question of what it is distinguishable from. For our purposes and following Seel's aesthetic it might be enough to investigate how it differs from the mode of our everyday perception, the mode in which we usually engage the world. The first important aspect that Seel discusses already in *Eine Ästhetik der Natur* is the act of determination that characterizes our everyday perception and that we

disregard during aesthetic perception:

> *"Die kontemplative Wahrnehmung verweilt bei den Erscheinungen, die ihr Gegenstand aufweist, sie ergeht sich in den Unterscheidungen, die sie ihrem Gegenstand abgewinnt, ohne darüber hinaus auf eine Deutung zu zielen. Ihre Begegnung mit den Phänomenen läßt deren Bedeutung außer acht." (Seel 1996, p.39)*

In the following chapters we will discuss more differences between our everyday perception and aesthetic perception, especially differences in the phenomenology of these two possibilities for approaching the world around us.

5.1.2 Predictive Coding: Action, Perception and Cognition Unified

One of the great virtues of the predictive coding framework is its claim to tie perception, cognition and action together using only one mechanism. Prediction error minimization accounts for how we perceive the world, and the active inference that comes with it activates motor plans and corresponding actions.

> *The constant theme in all these theories is that the brain optimizes a (free-energy) bound on surprise or its complement, value. This manifests as perception (so as to change predictions) or action (so as to change the sensations that are predicted). Crucially, these predictions depend on prior expectations (that furnish policies), which are optimized at different (somatic and evolutionary) timescales and define what is valuable. (Friston 2010, p. 135 f.)*

The optimization of prior predictions across various timescales corresponds to cognition in more traditional theories.

If we take Seel literally, his account of everyday perception reflects

Helmholtzian theories of the hypotheses-testing brain. He formulates the way our everyday perception is dominated by determination as follows: “One way or another, perception is exercised here in order to ascertain, *en passant* or explicitly, something about the object.” (Seel 2005, p. 26) In the terminology of the predictive coding framework, this could easily translate to a determination of our environment through the means of models about the world. It is the duty of perception to determine and ascertain how accurately these models fit the incoming samples of the world in the form of sense-data. According to Seel, aesthetic experience is shaped by the disregard of this determination – like looking at the data without trying to fit a model to it, disregarding the hypotheses our models provide. The focus in aesthetic experience lies not in determining the cause and making sense of the incoming data, but in letting the data come.

To summarize this in terms of predictive coding, aesthetic experiences are correlated with an ongoing disregarding of prior models and their top-down predictions. What this withdrawal of the system's top-down processes implies will be discussed in the following chapters alongside the corresponding phenomenological properties of aesthetic experience. Nevertheless, it needs to be emphasized that here we have the first pillar of the aesthetic reset theory that describes a first component of the mechanism underlying aesthetic experience.

5.2 Property II: Without Relevance

5.2.1 Phenomenology: The Phenomenology of “Relevanzlosigkeit”

> *“[...] contemplation is observation that is without relevance and that in this sense takes nothing [in particular] into consideration; and only for this reason can it take everything that appears into consideration”(Seel 1996, p. 39)*[1]

This quote is from Seel's book on *Eine Ästhetik der Natur* from 1995. “Observation without relevance” might sound reminiscent of Kant's notion of disinterestedness. In his more recent book *Aesthetics of Appearing,* however, it becomes clear that Seel's “Relevanzlosigkeit”, the German noun for “without relevance”, is not akin to Kant's concept, no matter whether Kant's disinterestedness is understood as emotional distance towards an object of beauty or as an argument for the intrinsic value inherent to aesthetics. First, it is important to note that Kant is mainly concerned with beauty and aesthetic judgements. Internalist views of aesthetic experience focus on the phenomenology of an aesthetic experience, which is neither limited to beauty nor does it necessarily produce judgements. Second, as Munro and Scruton (2014) have noted, Kant's reason to introduce emotional distance lies in his effort to load aesthetic judgement with objectivity. Seel however, does not require “Relevanzlosigkeit” to incorporate objectivity into his theory. He is able to establish a certain amount of objectivity by the following line of argument:

> *“if it is plausible to attribute a specific objectivity to the appearance of an object, then the same must apply to the appearing of the object. Appearances are something that can be perceived in the object: qualities that are ascribed to the object independently of ongoing exercises of perception, even though they can be given, in principle, only from the*

1 translated by John Michael, German original: “Kontemplation ist relevanzlose, in diesem Sinne rücksichtslose Betrachtung; nur deswegen kann sie auf alles ihr Erscheinende rücksicht nehmen.”

perspective of an appropriate perception. […] In every moment of its lying on the green lawn, a play of appearances is perceivable on our red ball, even if no one is there who could linger in their intuition. Thus, if we can say in agreement with McDowell that we can speak of the experience of an objective reality whenever the object of this experience exists independently of the exercise of the experience, then the experience of appearing is also an objective experience. It is a special way of participating in the reality of its objects." (Seel 2005, p. 48f.)

Seel is therefore able to describe something different with "without relevance" than disinterestedness, without losing the possibility of claiming a certain objectivity for the appearing of the objects of aesthetic experiences. But what does it mean to take "nothing [in particular] into consideration"?

If we examine the entirety of the appearing of an object, we must assume that it consists of several aspects simultaneously. In the case of the red ball, Seel lists for example features of form, like the roundness of the ball, the coloring, color differences between the red ball and the green grass, how the blades of the grass bend on being touched by the ball, lighting and shadows "and all the other things that can be seen in and around this object" (Seel 2005, p. 26f.), only to conclude that everything "together is the focus of reflection here" (ibid., p. 27) "without being fixed on a given aspect" (ibid., p. 30).

This equal distribution of reflection is in stark contrast to our everyday perception, of which determination is an important aspect. "Every determination under which we grasp an object leaves many other aspects of its constitution out of consideration; otherwise it would not be a determination." (Seel 2005, p. 52).

In aesthetic perception, by virtue of not attributing relevance to specific aspects of a scene, we are able to grant everything that appears the same level of relevance. This does not mean however that, for example, in Gestalt paradigms in which local and global features are contrasted, the global features are preferred. If they were, it would again hint at a preference akin to ascribing a higher level of relevance to global features. Instead, according to Seel, global features and local

features should appear simultaneously together with all other features of the scene.

5.2.2 Predictive Coding: The Order of Things

If we want to spin the predictive coding story of aesthetic experience further, as a next step we should identify the implications of the beginning. If we see a tiger, one fact about the tiger that we might want to check is whether there is a set of massive bars between the tiger and us. My model of meeting a tiger (which I have only done in zoos so far) certainly includes a cage, and the apparent absence of it would definitely fire up processes to determine the actual presence or absence of bars. This immediately brings an order to the way I will probe the environment with a higher priority for "checking for bars" than for "checking for a body of water". Although Hohwy's ultimate aim is to describe the relation between attention and conscious perception (see Hohwy 2012), one can also draw conclusions from his speculations about attention only. Hohwy emphasizes that in terms of the predictive coding framework, it is possible to understand attention as the optimization of expected precision (Hohwy 2013, p. 191ff. See also Friston 2009).

> *"The mechanism [of prediction error minimization] is doing two jobs concurrently, first-oder statistical inference of what the prediction error is reporting (akin to estimating the mean), and second-order statistical inference of the precision of the prediction error (akin to estimating variance).*
>
> *Now imagine this layered landscape of prediction error minimization, where minimization efforts are shaped by expected precisions. Effort is put in where the prediction error signal is expected to be precise."*
> *(Hohwy 2013, p. 195)*

Both layers, the prediction error and the estimated precision, are driven by

our internal models about the world and its uncertainty. Therefore, in both cases the order of where we focus our efforts is determined by top-down predictions. If we disregard them, it is not clear which mechanism could take over, and suddenly there is no relevance imposed on the incoming sense data. This could indeed lead to a phenomenological lack of highlighted or relevant features in the environment leaving everything to seemingly appear in equal importance. It should be noted however, that it is not impossible for stimuli to modulate our attention in a bottom-up fashion. Hence, the described state of the predicting system is not necessarily completely void of attention during aesthetic experiences.

In any case, it seems plausible that a disregard for top-down predictions may underlie the lack of ascertainment. Moreover, the phenomenology of "Relevanzlosigkeit" as the disregard for predictions entails a disregard for an order of where to focus our efforts "and only for this reason can it take everything that appears into consideration." (Seel 1996, p. 93)

5.3 Property III: The Flood – Rich, Sublime and Unreduced

In this chapter I want to describe two phenomenological notions, and link them to one and the same predictive coding story. The phenomenology of a richer quality of percepts during aesthetic experiences as well as the overwhelming components of aesthetic experiences that could be related to the feeling of the sublime, both can be linked up with the increase of incoming data as a result of the suspension of top-down predictions.

5.3.1 Phenomenology: Richness in the Phenomenology of Aesthetic Experience

A consequence of the "Relevanzlosigkeit" that I have discussed in the previous chapter is the possibility to "take everything that appears into consideration" (Seel 1996, p. 39). Seel argues for a "simultaneous giveness of this repleteness", in our case, of aspects of the ball lying on the green lawn (Seel 2005, p. 26f.). The results of this simultaneous intake of everything that appears is described by Seel as "richer than everything that can be distinguished in an object through conceptual discrimination" (ibid., p. 51). He continues to specify this richness not as a quantitative richness but as a richness in quality, through which we can become aware of the phenomenal individuality of the object at hand (ibid., p. 26). However, Seel also emphasizes that this notion should not be confused with a superior form of perception, one that reveals the true meaning of objects (ibid., p. 51). The richness emerges as the object becomes a "source of appearances that can be concurrently discerned in it, but cannot be simultaneously or successively grasped with determinacy" (ibid., p. 52). This "full" and "unreduced presence" of an object can be experienced whenever we let go of assertions.

5.3.2 Phenomenology: Simultaneous Percepts Overtax and the Sublime

This richness does not come without a cost though. The repleteness of the experience "cannot be exhausted conceptually" (Seel 2005, p. 27). The simultaneity prevents a complete characterization of all distinguishable features, and leads to a "conceptual incommensurability" (ibid., p. 34).

> *"The aesthetic object is perceived in a simultaneity and a combination of its appearances that defy description. One could speak here paradoxically of an overdeterminacy of the object grasped in its*

unreduced phenomenal presence. The play of appearances renders a cognitive availability of the object impossible – not only because of the huge number of aspects that can be distinguished in it and the multitude of interests that can be directed at it, but because of the simultaneity and momentariness of the facets and nuances in which the object attains attentiveness here." (Seel 2005, p. 52)

This leaves the organism overwhelmed and spellbound (ibid., p. 34). Aesthetic experiences are not about identifying single features of a scene, but about the entirety of the features' interplay from a specific viewpoint and at a particular point in time (i.e., now) (ibid., p. 27). When Seel describes two ends of a scale on which aesthetic contemplation can happen, namely contemplation of space and contemplation of objects, one might be reminded of Burke's distinction between beauty and the sublime. BURKE USES FOR EXAMPLE SIZE CONTEMPLATED OBJECTS ALONG THE FEELING OF BEAUTY AND THE SUBLIME ARE LOCATED ON OPPOSING ENDS. He links smallness to beauty and greatness to the sublime (Burke 1990 , p. xxiii). Seel talks about how the entire scenes break down in the case of contemplation of space (Seel 1996, p. 59f.). The sublime may be indeed a feeling that arises as part of the phenomenology of intense and all-embracing aesthetic experiences, stemming from the sheer incommensurability of the simultaneity of features.

5.3.3 Predictive Coding: Flooding the System with Sense Data

"A standard conception is that the senses convey a rich signal that somehow represents worldly states of affairs, which the brain is passively soaking up in a bottom-up manner. If there is any top-down interpretation of the incoming data, then this is mere feedback from the cognitive system on the key bottom-up signal. On the prediction error

minimization view, this picture is reversed." (Hohwy 2013, p. 47)

In the predictive coding framework, the rich data is represented in the top-down predictions, and the bottom-up channels provide feedback on the predictions. In the course of explaining away the incoming, the "brain happens to represent the world." (ibid., p. 55) Bottom-up data is drastically dampened away in order to make sense of the world. (ibid. p. 21). Usually the content of our perception lies therefore in our predictions.

When we think of aesthetic experience as a suspension of predictions, however, the picture is turned upside down again. The system reverts to the standard conception, as the suspension of predictions leads to a dramatic increase in prediction error. The layers of the hierarchy are literally flooded with bottom-up prediction error, which is suddenly much closer to the incoming sense data, because due to missing predictions, lower levels had no chance to explain away the incoming stream of information. This might constitute the qualitative richness Seel attributes to aesthetic experiences.

Hohwy interprets the notion of waking up – as viewed through the lens of predictive mind theories, and discussed in a paper by Hobson and Friston (2012) – as an example for this flooding: "Think of what happens when we wake up in the morning, and the sensory data starts flooding in in the shape of the morning sun, the cosiness of the warm doona, the smell of coffee, the sound of the bins being emptied out on the street." (2013, p.47) The claim is as follows: When we wake up, our predictions do not kick in immediately, but rather slowly start to predict away the incoming flood. I agree that the situation Hohwy describes here sounds indeed like an incoming flood of sense data. In fact is sounds like an aesthetic experience. I disagree, however, that this is the default of waking up, simply because not every morning is as delightfully sublime as the one described by Hohwy above. I only have to think about my morning today, when my predictions made me perfectly aware of my situation in the world immediately as the alarm clock went off at 6:15. Nevertheless, whenever the top-down flow of predictions is dampened, suspended or slow to come up, the phenomenological features might indeed be very similar to the ones we experience during an aesthetic experience.

In binocular rivalry, two distinct stimuli are presented to each eye, so that they appear to be positioned at exactly the same spot. Hohwy uses the example of two pictures, one of a face and one of a house. What happens when presented with such a situation is that instead of merging the face and the house, our model of the world is not adjusted to incorporate to objects at exactly the same spot, and uses top-down predictions to explain away one or the other stimulus. The result is that we perceive either the face or the house, but not both. This usually seems to work until evidence piles up that something is wrong, for example with the face we perceive, and the prediction error increases throughout the system until a threshold is reached and the house seems to be a more precise prediction. Our percept then flips to the house, and new predictions are trying hard to explain away interference caused by the face. (Hohwy 2013, p. 19 ff.) This is an example of how actual input can be overwritten by top-down predictions. Even though this seems to be an undesired mechanism at first, as it seems to imply that we are living in a convenient illusion rather than the real world, it is supposed to be absolutely necessary to make sense of the world without being overwhelmed by uninformative data overtaxing the senses (ibid., p. 21). One of the main achievements of predictive coding is how it provides mechanisms for data compression and reduction. We need top-down predictions to reduce the amount of information that needs to be up-propagated through the hierarchy. As soon as we suspend all predictions, the incoming flood of data and the increase in prediction error is bound to overwhelm the system.

5.4 Property IV: Intrinsic Reward

5.4.1 Phenomenology: Being Enraptured

> *"The conception developed so far makes it possible to understand why aesthetic perception is often attributed a heightened sense of the real. It is not indeed a higher reality, simply an otherwise obstructed dimension of reality that we enjoy by virtue of our attentiveness to appearing." (Seel 2005, p. 57)*

> *"The richness of the real that is available – indeed, released – in aesthetic contemplation is experienced as a pleasurable confirmation of the extensive determinacy of reality by us human beings." (Seel 2005, p.5)*

The notion of qualitative exceptionality can be used to characterize two sets of feelings and emotions that accompany aesthetic experience. Aesthetic experience feels exceptional, first, due to its intrinsic reward; and even more importantly, due to a specific and rare combination of emotions that, in its more extreme forms, could be described as the sublime. I consider the rewarding and the sublime as two separate components, not because I am sure that they are, but rather because I am not sure that they are not. It seems to me that these two parts vary in a non-linear fashion in their intensities. Although I consider most aesthetic experiences to be rewarding, I consider only a more intense subset to be sublime. Furthermore, it is important to highlight that these two components of aesthetic experiences appear to vary independently of each other.

As we will investigate in the theory of the aesthetic reset, the intrinsic reward might stem from a simple ontogenetic advantage an organism relishes by undergoing aesthetic experiences. However, the combination of emotions corresponding to the

sublime calls for a closer look in this subchapter. Emotional states I would attribute to intense aesthetic experiences include awe, wondrousness, to be overwhelmed and to be in a state of motionlessness. Indeed, Edmund Burke states in his *Philosophical Enquiry Into the Origin of Our Ideas of the Sublime and Beautiful* (1990): "Astonishment […] is the effect of the sublime in its highest degree; the inferior effects are admiration, reverence and respect" and "astonishment is that state of the soul, in which all its motions are suspended […]" (Burke 1990, p. 84). In the following chapter on "Terror" he continues: "No passion so effectually robs the mind of all its powers of acting and reasoning as fear." (Burke 1990, p.84). In the formulation of the aesthetic reset, we will examine how this deprivation of powers of acting can not only pose as a possible side-effect of the aforementioned rich release of possibilities to act (Seel 2005, p.5), but eventually as a necessary part of this richness we encounter during aesthetic experiences. Seel refers to aesthetic experiences also as enrapturing (Seel 2005, p.34).

5.4.2 Predictive Coding: Calling for a Function

According to the predictive coding framework, the organism lives to minimize prediction error, and also lives because it minimizes prediction error. Having the wrong predictions about the world would lead to substantial trouble for the organism, if not death. It is like trying to ride a bicycle being convinced that you are actually on skis. Everything feels off and weird, and one would probably not survive for long "skiing" through the traffic on a bike. If we assume the predictive coding account of the mind to be true, the same would be the case for not having predictions at all. And in fact it seems that we are so eager to form predictions that we sometimes overshoot, for example when we start to predict a singing choir or bells into the constant stream of white noise. This phenomenom works both visually and auditorily and is often termed Ganzfeld illusion (Hohwy 2013, p. 69.[2] Without

2 For a less scientific but none the less interesting way to study this phenomenon see

predictions we have no lever on our environment and therefore no way to adapt to it.

Even if the connections between phenomenological descriptions and predictive coding mechanisms that I have provided so far are convincing, it seems to be counterintuitive that an organism following the predictive coding principles would allow its key mechanism for survival to be suspended. Even if this happens only temporarily and not too often (as is the case with aesthetic experiences, as I will argue in the following chapter), it is, to say the least, surprising that aesthetic experiences appear to be intrinsically rewarding. One way to account for the paradox of aesthetic experience in the predictive mind is to assume that aesthetic experiences, and with them the temporary suspension of top-down predictions, help the organism in some way and hence, serve a specific function. This one point will be reserved for the discussion in chapter 6.2 "The Function behind the Aesthetic Reset", where I will claim that the proposed suspension can indeed help the organism to eventually form more precise predictions about the world.

5.5 Property V: Timing: Momentary and Rare

5.5.1 Phenomenology: Momentariness and Rareness

Now, after having argued that aesthetic experiences occur when we engage in a particular mode of perception, and that this mode is distinguishable from other modes, it should be interesting to investigate how this mode relates to other modes. When we discuss its "exceptionality", we also need to consider its temporal

the Austrian composer Peter Ablinger's opus Weiss/Weisslich: "Weiss / Weisslich 1980 – 1999". http://ablinger.mur.at/werke.html#a2, accessed July 23rd.

qualities. It is extraordinary in the sense of being the exception to the ordinary mode in regards to the amount of time we spend in these modes. Here we are concerned with the quantitative amount of time we spend in aesthetic experiences. In short, this raises the question as to how often and for how long we experience the world aesthetically?

Seel uses the term "propositional" to describe our ordinary mode of perception. In this mode of perception, we rely on the determination of objects and their properties to successfully navigate the world. As we would not be able to do so, while disregarding the determination, aesthetic experience can only be the exception to this in a functioning organism.

Furthermore, as Seel states, we live in a fixation on this propositional mode, it is our default, and we spend considerably more time regarding the world in this mode than in the aesthetic mode, which is only possible when we disregard this fixation. While "classifying and determining appearances" are "central to the capacity to survive" (Seel 2005, p. 30), Seel refers to Kant, when he argues for what the aesthetic perception is necessary for:

> *"In the aesthetic state, we are free from the compulsion to determine ourselves and the world. […] In the play of aesthetic perception, we are free to experience the* determinacy *of ourselves and the world." (Seel 2005, p.5)*

It seems to be impossible to engage and disengage in aesthetic experience at will. However, certain circumstances facilitate and others decrease our possibilities to undergo an aesthetic experience. When Seel confirms that simply everything can be experienced aesthetically, he immediately adds that whether we do or not depends on the circumstances we are in. (Seel 1996, p. 63) It might be difficult to pinpoint the necessary factors. Seel hints at the possibility of distancing oneself from the objects of experience as one requirement. When we are required to determine the objects around us in order to navigate the world successfully, it is important to ascertain concepts like the colors of a traffic light and their corresponding meanings.

When we are about to cross the street, it is unimportant to contemplate the form and lighting of the traffic lights, and in indeed actually dangerous to disregard our usual fixation on determination. However, this does not mean that it is impossible to have aesthetic experiences in dangerous situations. Once I have proposed a possible function of aesthetic experience, we will see that it might even be important to do so in specific situations, but only for brief moments. Nevertheless, in dangerous situations for which we already possess working determinations, aesthetic experiences could hinder quick responses.

The duration of aesthetic experiences seems to be determined by our ability to linger in the presence of the appearing object. As soon as our system tries to ascertain or to determine our environment, we fall out of aesthetic experience and back into our everyday perception.

> *"Not only is repleteness but also its being made present, its being brought to awareness, is a specifically temporal relation. Beholding the play of appearances on an object is possible only if we linger in its presence and encounter it with an end-it-itself attentiveness. We linger in an act of perception not because of individual perceptions that would be of service to knowledge or action but for the sake of what is perceived in the act." (Seel 2005, p. 28)*

Seel also compares aesthetic perception with a "game that we play and that is played with us." (Seel 2005, p. 37). Something that sometimes simply "befalls" us (ibid., p. 34).

Furthermore, it seems to be the case that being struck by the experience apparently without any conscious contribution from the subject is the reason why aesthetic experience has so frequently been attributed to certain objects. It is the object that seems to have triggered the experience, and which is actively causing the experience – and which therefore appears as an aesthetic object. In fact, however, it must have been a specific mental state that triggered the experience; otherwise, why would an object sometimes cause an aesthetic experience and sometimes not?

5.5.2 Predictive Coding: Simply Too Dangerous!

From a predictive coding standpoint it is almost self-evident why an organism can tolerate suspension of top-down predictions only for a short amount of time. Hohwy explains this quite drastically: “I should minimise prediction error because if not then I fail to insulate myself optimally from entropic disorder and the phase shift (that is, death) that will eventually come with entropy.“ (Hohwy 2013, p. 181) Hence, simply put, suspending predictions for a longer period of time is life threatening.

6 THE AESTHETIC RESET

This chapter will start with a summary of the mechanism that has been provided in the previous chapter for each phenomenological property. Thereafter, it will focus on a possible function of aesthetic experience as proposed by the aesthetic reset theory for the predictive mind. A short subchapter in the end describes the implications of the aesthetic reset for the value of art.

6.1 The Mechanism behind the Aesthetic Reset

If the predictive coding framework is indeed a unifying and universal theory of how the mind works, it should be able to describe system-wide configurations that correspond to phenomenological experiences of the organism. Additionally, its mechanisms can be described on the conceptual, algorithmic and implementation level (Clark 2013, p.). Here, I will focus on the conceptual level, but briefly sketch the levels below as well.

One consequence of these observations is that there should be a state of the system that correlates with aesthetic experience, and discovering and describing this state should help to explain the phenomenology and properties of aesthetic experiences, as well as provide a basis from which empirically testable predictions can be generated.

6.1.1 Suspension of Top-Down Predictions

The theory of the aesthetic reset proposes a conceptually simple alteration to the usual state of the system. In its usual state, it is of the utmost importance to the mechanism to minimize prediction error. Prediction error is reduced in one of two ways: either it is explained away by better predictions, or the incoming sense data is changed through action. This is what the system does most of the time. The one fundamental difference between this everyday state of the system and aesthetic experience concerns the role of the predictions being passed downwards through the hierarchy. During an aesthetic experience, according to the theory of the aesthetic reset, top-down predictions are suspended without a reduction of precision-weighting on the incoming sense data.

We know now that according to the predictive coding framework, when the incoming data is compared to predictions, only the residuals are passed upwards. This happens between all levels of the hierarchy. Each level only receives that part of the signal from the level below that could not be explained away by its prediction. This reduces the amount of information that travels upwards immensely. In the case of a perfect prediction, the resulting prediction error is simply non-existent. In the case of an aesthetic experience, instead of a good or even perfect prediction, we have no prediction. Having no predictions is fine as long as there is nothing to be explained away. In most cases however, there will be incoming data that needs to be dealt with, and suspending predictions will have severe implications.

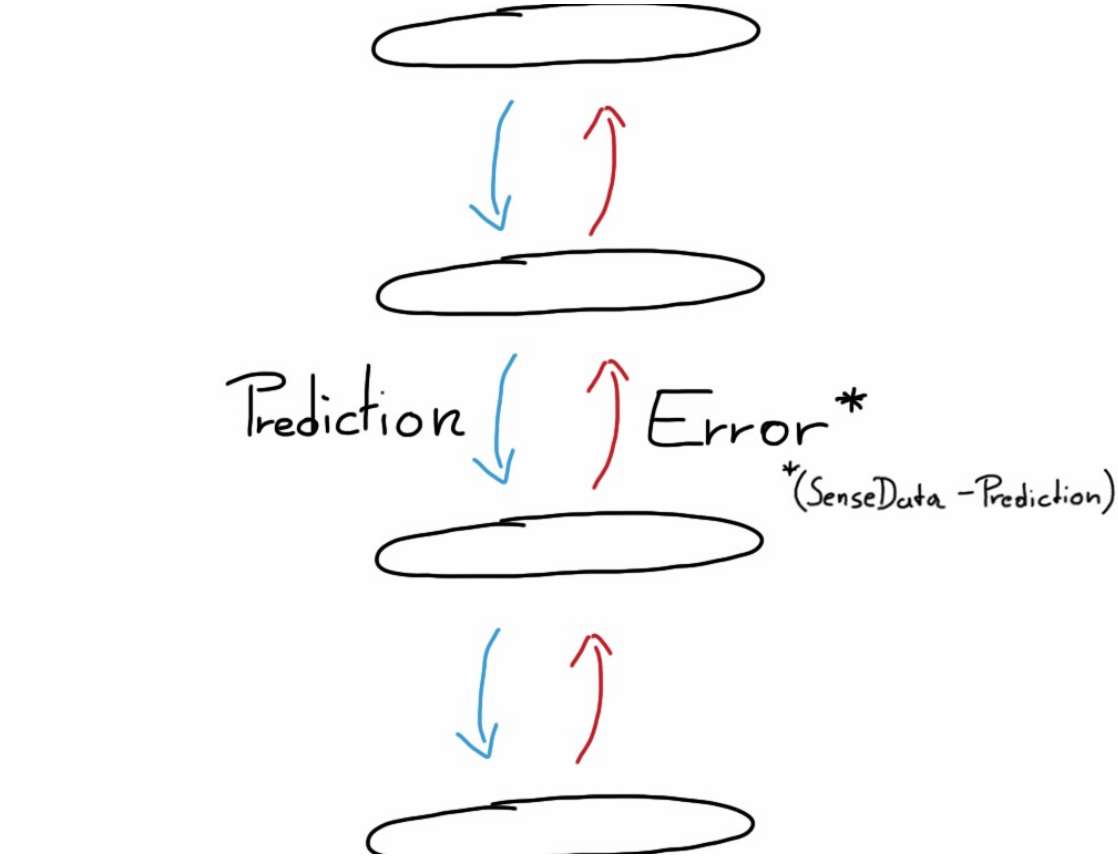


Illustration 1: Usual state of the predictive coding hierarchy. Note that for simplification reasons precision weighting gain units present at each level are not depicted here.

If the predictions are suspended, and the upward prediction errors are nevertheless compared to them, the residuals suddenly become much larger. This can be expressed in a simplified manner by the following formula:

Residuals = SenseData – Predictions

Usually, the organism wants predictions and incoming data to match as well as possible. In the best case, our model of the world is precise to such an extent that our predictions are able to explain away the entirety of the incoming data, leaving zero residuals to be passed upwards through the system. Nevertheless, even when the predictions are less well matched to our environment, they determine exactly what is

handed to the next hierarchical level above. So, no matter how good or bad our predictions are, they change incoming data and the bottom-up stream should resemble the incoming sense data less and less the further up we go in the hierarchy.

Now, if on each and every layer, predictions are suspended and thus virtually absent in the formula, the residuals become equivalent to the sense data. These large prediction errors cascade upwards through the hierarchy unfiltered and unstructured by downward predictions (compare illustration 1 on page 57 and illustration 2 on page 59). This signal resembles raw sense data substantially more than the residuals usually held at the most minimal level. As we have heard before, in the predictive coding framework the biggest part of our perception machinery are the huge amount of top-down predictions. Especially in well adapted organisms, the top-down predictions are supposed to be substantially richer in information than the bottom-up residuals that should be kept as small as possible. The sudden shift of direction in the flow of large amounts of data might tax the system exceedingly. One could metaphorically compare this to a flood of unstructured sense data that could explain the phenomenological description of taking “everything that appears into consideration”.

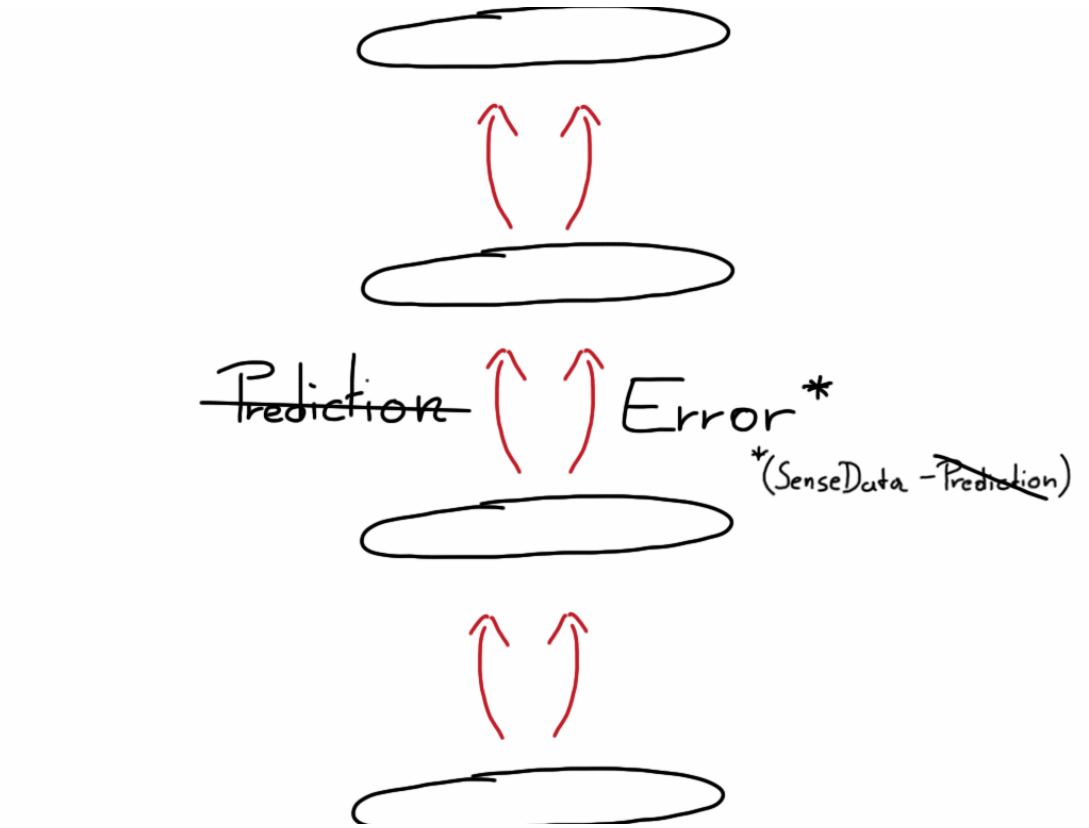


Illustration 2: State of the predictive coding hierarchy during aesthetic experiences.

This state generally cannot be upheld for extended periods of time, as predictive coding itself was introduced partly to explain how the brain can handle the endless amount of information available to our senses, namely by explaining them away before we even have to deal with them. One of the motivations for this framework stems from our supposed inability to handle too much information and indeed our limits of information processing seem to be reached during aesthetic experiences. This condition is clearly far from the everyday status of the system, as large prediction errors are what the system tries to avoid and – whenever we successfully navigate the world – also succeeds in avoiding; hence, the particular *accentuation* of the exceptional aesthetic experience.

As it is assumed that we also need predictions to form motor commands, it is quite possible that a suspension of predictions fundamentally challenges our ability to move during aesthetic experiences. When top-down predictions are suspended, the system cannot determine which actions are appropriate. Pictures of people in

awe with open mouths seemingly in paralysis spring to mind. Such a state of the system would be akin to a pathology, and if occurring continuously would pose great danger to an organism. In such a state, it would be unwise to even try navigating the world, and thus preferable to withdraw into a passive attitude. This would however imply that it is impossible to move during an aesthetic experience, an implication far too restrictive to account for all aesthetic experiences. It would be impossible to undergo aesthetic experiences while hiking or biking through the woods, climbing a mountain. It would also imply that it is impossible to have aesthetic experiences while playing an instrument or dancing. Furthermore, not every aesthetic experience has to leave us motionless and trembling with the sublime. These limitations call for a slight relativization of the mechanisms proposed by the aesthetic reset.

6.1.2 From the Extreme Case to the more Probable Case

For the purpose of a clear demonstration, I decided to describe the mechanism and implications in terms of the extreme. A suspension of all predictions and on all levels might only happen very rarely, and would put the system in a precarious situation. If we were to accept only this extreme case as an example of an aesthetic experience, we would also have to admit the following limitations:

First, a suspension on all level includes a suspension of low-level predictions. If we investigate the visual domain in this regard, this would necessarily mean that all organization of the incoming sense data that does not already happen in the retina would not take place. Any predictions about how patches of color and light are linked together to shape objects and background would not reach the levels beneath, just as conceptual information on these shapes from higher levels could not reach down. As a result we should not be able to discern anything in the blurry image projected onto our retina.

Second, if we take the predictive coding framework as unifying not only

perception and cognition but also action, the suspension of predictions would appear to undermine the execution of motor plans during aesthetic experience – as described above in the case of playing an instrument. In sufficiently extreme aesthetic experiences, it probably is the case that we cannot carry out complex motor plans anymore, as they are stopped from being down-propagated from higher levels. We forget about our previous intention to cross the street, and stop to stare at the marvelous reflection of the traffic lights. However, the extreme case as it is described here would mean that any activity is excluded from putting us in the situation of an aesthetic experience. This includes for example playing an instrument. As soon as we undergo an aesthetic experience during the performance of a piece of music, the motor system would cease to function and we could not continue making music until the experience faded.

However, there is a way to conceptualize the proposed mechanism without buying into these limitations. Indeed, proclaiming the aforementioned state to be the extreme already establishes the possibility of thinking about less extreme cases. The strength of an aesthetic experience can easily thought of as being modulated along three dimensions: 1) the extent to which predictions are suspended, 2) the number of levels across which these predictions are suspended, and 3) the suspension's position in the hierarchy.

Ad 1) Recall our simplified formula:

$$\text{Residuals} = \text{SenseData} - \text{Predictions}$$

It is clear from this formula that the amount of data that is explained away lies on a range from none of the data to all of them. A suspension of predictions might only include the suspension of some predictions that are formed by our model of the world and sent downwards. The amount and nature of the suspended predictions might fundamentally modify the nature of the experience we have of the world. It

could be the case that a specific amount of predictions need to be suspended to reach the threshold for an aesthetic experience, or that very specific kinds of predictions need to be suspended.

Ad 2) Furthermore, it is unlikely that predictions on the entirety of layers in the hierarchically structured model of predictive coding are suspended. The intensity of an aesthetic experience may well be dependent on the range of the current experience. For example, it may be that the intensity of an aesthetic experience varies according to the number of levels that are subject to the aesthetic reset mechanism.

Ad 3) The first example of why a suspension of predictions on all levels seems unlikely refers to low-level processing (for example of visual data). The proposed objection renders the aesthetic reset theory more plausible if it allows for a suspension of layers at a specific location in the hierarchy; for example leaving the predictive coding mechanism on lower levels unaltered, even during aesthetic experiences.

At the moment it is hard to say how exactly each of these dimensions modulates the strength of an aesthetic experience, but the vital point here is that it is in principle possible to conceive of aesthetic experiences that happen to a different degree and instead of being an absolute state, weave themselves into our everyday perception.

> *"Aesthetic perception is a widespread form of human behavior. We exercise this form in both ordinary and extraordinary life, often without it being particularly conspicuous." (Seel 2005, p. 20)*

6.2 The Function behind the Aesthetic Reset

6.2.1 Why it is important to at least propose a function in this case

There is one aspect of the mechanism that I have proposed that makes it rather unlikely if it does not serve a function. If we assume the predictive coding framework to be correct, suspending top-down predictions and thereby facilitating a sudden flood of prediction error stands not only against the very core of the framework, but poses great danger to the organism, as its ability to successfully interact with the environment in such moments is severely impaired. This might also be an indication that aesthetic experience proposes an evolutionary advantage and is neither a by-product nor an artifact of some other mechanism.

Furthermore, through the demonstration of the supposed function of aesthetic experience in the aesthetic reset theory, the reason for introducing the term "reset" will finally become apparent.

6.2.2 Local versus Global Minimum

If we imagine a three-dimensional graph, with a plane of possible states of a two-dimensional world along the x- and y-axes, and the amount of prediction error they are causing on the z-axis, it might resemble a topographical map of mountainous terrain. Valleys connect models that result in low prediction error, whereas mountain tops mark models with particularly low success in predicting the actual state of the world.

The process of model formation or updating in the predictive coding

framework can be compared to an expedition in search for the lowest point of the lowest valley on our topographical map. Imagine the organism starts at the top of a mountain with a rather bad model of the world that results in relatively large prediction errors. As it adapts to its environment and continuously updates its models, it moves along the x- and y-axes to models with varying values for this world's two parameters. As the model becomes more precise, the elevation on the z-axis is reduced along a reduction of prediction error. In line with the predictive coding framework, our mechanism in this two-parameter-world is driven by the quest to minimize its prediction errors. This leads to a gradual descent along the mountain side to ever lower regions in the landscape of possible models. Eventually, if the organism is successful in reducing the prediction error of its model of the world, it reaches a point in a valley, which lies considerably lower than the mountain top it started from.

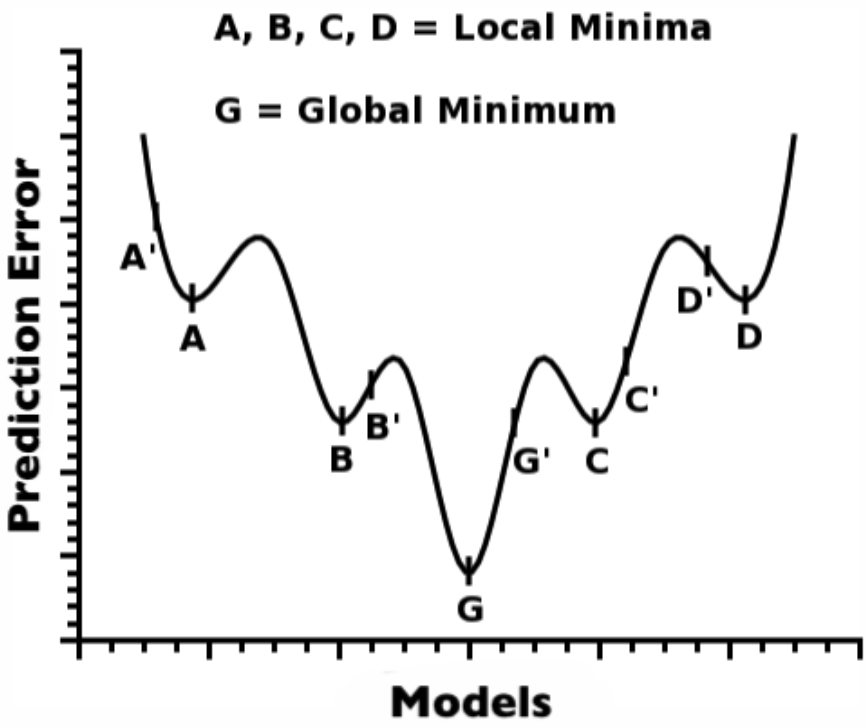
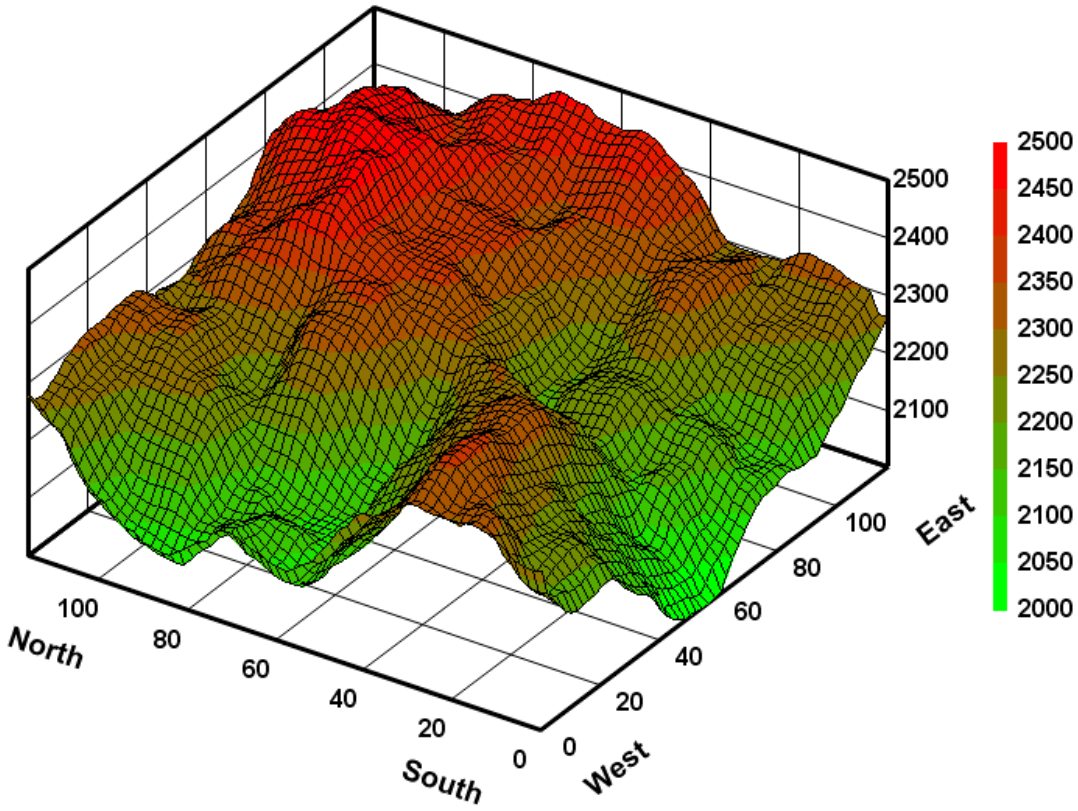


Illustration 3: Two-dimensional illustration of global and local minima.

Imagine yourself walking downhill on a quest to find the lowest point in the

vicinity on a foggy day and without further knowledge of the topography of the region. As it is of the utmost importance to you to reach the lowest point, you continuously walk downhill carefully avoiding to gain difference in altitude. Now when you reach the bottom of a valley, how can you be sure that the valley on the other side of the adjacent mountain does not lie considerably lower than this valley? Our organism faces exactly the same problem: It can be sure to have reached a local minimum, definitely lower than the maximum it started from, but it can not be certain to have reached the global minimum (for a two-dimensional version of this example see illustration 3 on page 64; for a more ellaborate three-dimensional illustration see illustration 4 on page 65).

Illustration 4: Even from a bird's eye view it is not immediately apparent where the global minimum lies. If we assume the north-south axis to be the x-axis we can locate two minima that appear to be good candidates for the global minimum: l1 at (0/55) and l2 at (80/40). The task of locating the global minimum becomes exceedingly more difficult, when we imagine ourselves at a specific spot in the graph with low visibility. Assume you find yourself in l2 with an altimeter in your hand. To investigate the minimum on the other side of the mountain at around (40/40) you would have to climb about 300 units, before you can descend into the valley with the possibly lowest point l1.



6.2.3 Local Minima in the Predictive Mind

In their paper on predictive coding and the mirror neuron system, Kilner et al. (2007, p. 163 f.) use the Dr. Jekyll and Mr. Hyde thought experiment introduced by Jacob and Jeannerod to demonstrate how predictive coding can be used to minimize prediction errors across all levels of a cortical hierarchy to infer causes. In the example one observes identical movements of either Dr. Jekyll or Mr. Hyde holding a scalpel and applying it to a body. The intention of Dr. Jekyll, of course, is to cure, while the intention of Mr. Hyde is to hurt. In the example, Kilner et al. describe how the context of the operating theatre is used as an additional layer in the predicting mind to increase the degree of prediction error on the intention to hurt and lower the degree of prediction error on the intention to cure. Such a multi-layered example can also be used to give an account of local minima in prediction formation. When higher levels are already set.

6.2.4 An Aesthetic Reset to Overcome Local Minima in Prediction Formation

In the aesthetic reset theory I propose that aesthetic experiences serve the function of overcoming local minima. During continuous model updating and prediction formation, we follow one particular path down the prediction error minimization mountainside. To overcome local minima, the system must allow for temporary increases of prediction error. To stick to analogy, the system must allow us to climb the adjacent hill to check whether the valley on the other side is actually lower. It is important to note that which valley we end up in is determined in part by the location at which we begin. If start on top of the mountain next to the valley with the global minimum, we have a higher chance of ending up in the global minimum than starting from a mountain top that is separated from the global minimum by a

local minimum. Note however, that it would still be impossible for the organism to determine whether the global minimum is actually the global minimum. To get a better idea of the topography it could be helpful to start the descent from different mountain tops and follow the paths of prediction error minimization down into multiple valleys. Each step the organism takes in prediction error minimization is determined, at least partially, by the step before. After having taken several steps, the organism could at least determine the global minimum among the local minima it has reached from various starting positions.

The flood of incoming data and the sudden increase in prediction error caused by the suspension of top-down predictions could reset the starting point and allow the organism to start the minimization process from a different position. To summarize, as prior beliefs about the world are continuously formed and used to generate good predictions about the world, a system might get stuck in local minima during this adjustment process. To overcome local minima, it is crucial to allow for a temporary increase in prediction error to investigate whether a minimum on the other side of the peak is actually lower. In order to achieve this, it could be functional to equip the system with a tendency occasionally to suspend all predictions and allow itself to be flooded by incoming data, leading to a resetting of models at various levels of the hierarchy. This resetting could help the organism over time to develop more accurate and precise predictions with overall lower prediction errors and might be what happens during an AE, hence the aesthetic reset.

6.2.5 The Dynamics Behind the Mechanism

The proposed function of the aesthetic reset leaves us with a dynamic process that includes 1) the suspension of top-down predictions, 2) the flood of prediction errors rising through the hierarchical structure, and 3) the resetting of the formation process with 4) a new and more precise model as a possible outcome.

Property I (describing aesthetic experience as a change in perception) is already given at the stage of suspension, which also leads immediately to the simultaneity of percepts manifest in Property II (being without relevance). Property III (being overwhelmed) and the possible link to the sublime seem to be the phenomenological counterpart of the flood of prediction error that is up-propagated. It is hard to say which part of the sequence is responsible for Property IV (the intrinsic reward). It could be possible, for example, that reward is only distributed when the process actually leads to an increase in prediction precision.

It should also be noted that it is unclear whether one flooding and resetting cycle corresponds to aesthetic experience, or whether the system is flooded and reset over and over again for how ever long an aesthetic experience lasts.

6.2.6 Is the When determined by the Where?

Seel argues that aesthetic experience is an integral part of our lives. He describes it as a possible way to engage with the world, without specific times or spaces; however listing concert halls, theaters, cinemas, parks and museums as spaces for aesthetic practice:

> *"Die Domäne des Ästhetischen ist kein abgegrenzter Bereich neben den anderen Lebensbereichen, sondern eine unter anderen Lebensmöglichkeiten, die von Zeit zu Zeit ergriffen werden kann, wie man von Zeit zur Zeit von ihr ergriffen wird. Auch die Orte in denen ein eigener Raum für ästhetische Praxis zur Verfügung steht (Konzerthallen, Theater, Kinos, Parks, Museen, Arteliers usw.), sind für die besondere Dauer der ästhetischen Wahrnehmung da. (Seel 1996, p. 24)*

Following the aesthetic reset theory, a good time to reset the system would be whenever a minimum is reached. This is because this would be a good time to test for whether the minimum that has been reached is a local minimum or the global

minimum. It is not clear how the system could know whether it is actually stuck in a local minimum. So a possible trigger algorithm could also be to randomly try to engage in an aesthetic reset from time to time. If the situation does not allow for a suspension of predictions, the attempt might be suppressed.

6.2.7 Subjective or Objective? - The Role of an Individual's Experiential History

As the aesthetic reset theory describes aesthetic experience, it is highly dependent on the individual's history of prediction formation. This circumstance adds another argument against the concept of aesthetic objects, as even if certain objects triggered aesthetic experiences, they would be different for each individual history of experiences and prediction formation.

6.2.8 Developmental Consideration of the Aesthetic Reset

Given the function of aesthetic experience that is postulated by the aesthetic reset theory, organisms with less refined models of the world would profit the most from a frequent resetting of the models. This would lead to the prediction that children undergo aesthetic resets much more often than adults, since their models of the world need a lot more refinement than adults' models. However, Seel would probably argue the other way around: in his view, it is necessary to be able to determine concepts in the environment, as the aesthetic contemplation is based on disregarding the fixation of this determination and without the determination, there is nothing to fixate and no fixation to be disregarded. This leads to the assumptions that the more pronounced the determination, the higher the change in

phenomenology when the fixation is disregarded (Seel 2005, p. 25). Thus, it is apparent that the aesthetic reset theory can be used to generate novel and surprising predictions about correlations between amount and intensity of aesthetic experiences, on the one hand, and the sophistication of world models on the other (see chapter 7.2).

6.3 The Aesthetic Reset and Art

6.3.1 The Aesthetic Reset, the Value of Art and Blurring Boundaries

The question I want to answer here is whether the aesthetic reset theory provides any possibility to attach objective value to objects of aesthetic experiences. This may be an important question to address, given that many aestheticians would likely agree with Alan Goldman that “at the heart of aesthetics lie fundamental questions about the value in art” (Alan Goldman 1995, abstract). In approaching this question, I will focus on whether a theory of aesthetic experiences can be used to assess, especially, the value of art.

The short answer to this question is simply: no. This is the case if what we are concerned with are objective values that are true across subjective preferences. Researchers in Stephen Palmer's lab, for example, attempt to find aesthetic principles of spatial composition, and have so far discovered several biases, such as the center bias and the inward bias, which describe people's preference for objects in the center of a frame and facing inwards rather than outwards (Palmer et al. 2008). At the heart of the aesthetic reset, however, lies the experiential history of each

individual. Whether something triggers an aesthetic experience depends solely on the state of the perceiver's model of the world.

The long story is more complex as it would require us to be able to pinpoint the circumstances under which the system is more prone to execute such a reset. This could be dependent on a specific frequency of resets, without any influence of the environment. As mentioned above, though, it is more likely that the system assesses the danger of resetting in the current state of the world and only allows such a reset if it is not crucial in this situation to determine the environment. Another possibility could be that it forces such a reset, if the model at hand has difficulties determining the situation and a reset is hoped to crucially refine the model.

7 TESTING THE AESTHETIC RESET

This chapter is meant to be read as an outlook on future research on the topic of the aesthetic reset. It gathers one idea on how to operationalize aesthetic experience together with two empirically testable predictions, derived from the aesthetic reset theory, which should shed light both on aesthetic experience and on predictive coding itself.

7.1 Predictive Coding in the Brain

7.1.1 Induction of Aesthetic Experience

One of the main problems with experimental research on aesthetic experience is the unreliable induction of aesthetic experiences. As I pointed out earlier, in neuroaesthetic research on aesthetic experience, experimenters assume that experiences of art induce aesthetic experiences. In a new wave of experiments in the field of empirical aesthetics, participants are confronted with art as well, but increasingly in the setting of a museum. However, even in these cases, it is unclear whether aesthetic experiences were indeed induced or measured. The inclusion of predictive coding in empirical aesthetics might open up a way to use a TMS setup to induce aesthetic experiences.

When it comes to the neurobiological basis of predictive coding the prediction propagation is assumed to happen in deep pyramidal cells and the forward propagation of prediction error in superficial pyramidal cells of the cortex. If these deep pyramidal cells could be exhausted through continuous TMS bursts on the right level of the hierarchy, the result might be a temporal suspension of top-down

prediction and a potentially reliable method to induce aesthetic experiences.

7.2 Predictions Generated by the Aesthetic Reset

7.2.1 Prediction 1 – Binocular Rivalry

The case of binocular rivalry, as described in chapter 5.3.3, in conjunction with the predictive coding framework and the aesthetic reset theory, could provide us with testable predictions about aesthetic experiences. If one were to use TMS as described above to induce aesthetic experiences in a setting of binocular rivalry, patients should report phenomenological features like those that I have been describing. In addition, if we assume that Hohwy's theory is correct, and indeed what happens in a binocular rivalry setting is that top-down predictions explain away conflicting components, the suspension of predictions should break the pattern of flipping back and forth between the house and the face, and instead a merged house-face may emerge as a percept, because the predictions that would explain away either one or the other are suspended.

7.2.2 Prediction 2 – Developmental Course of Aesthetic Experience

Linking back to chapter 6.2.8, in which I describe a possible developmental

pattern for aesthetic experiences in humans, the following predictions could be drawn: If we take age as a proxy for how refined the participant's model of the world is, the aesthetic reset theory predicts that with increasing age (up until an age where improvements to the world model are less dramatic) the amount of aesthetic experiences declines, the intensity however increases. If one superimposes the curves for intensity and amount of aesthetic experiences, I suspect a “sweet spot”, where these experiences are already of noticeably intensity, but we undergo them still relatively frequent.

8 REFERENCES

“ARKEN Forside”, http://www.arken.dk/, accessed July 1st, 2014

Augustin, M Dorothee, Claus-Christian Carbon, and Johan Wagemans. "Empirical Aesthetics, the Beautiful Challenge: An Introduction to the Special Issue on Art & Perception." *i-Perception* 3, no. 5 (2012): doi:10.1068/i0511aap.

“Austrian composer Peter Ablinger's opus Weiss/Weisslich: 'Weiss / Weisslich 1980 – 1999'”. http://ablinger.mur.at/werke.html#a2, accessed July 23rd.

Berleant, Arnold, and Ronald Hepburn. “An Exchange on Disinterestedness.” *Contemporary Aesthetics* 1 (2003).

Brown, Steven, and Ellen Dissanayake. “The Arts Are More Than Aesthetics: Neuroaesthetics As Narrow Aesthetics.” *Neuroaesthetics* (2009): 43-57.

Brown, Steven, Xiaoqing Gao, Loren Tisdelle, Simon B Eickhoff, and Mario Liotti. "Naturalizing Aesthetics: Brain Areas for Aesthetic Appraisal Across Sensory Modalities." *NeuroImage* 58, no. 1 (2011): doi:10.1016/j.neuroimage.2011.06.012.

Burke, Edmund. *A Philosophical Enquiry Into the Origin of Our Ideas of the Sublime and Beautiful.* Translated by Adam Phillips. Oxford: OUP Oxford, 1990. http://www.msvu.ca:2048/login?url=http://www.msvu.eblib.com/patron/FullRecord.aspx?p=784741.

Clark, Andy. "Whatever Next? Predictive Brains, Situated Agents, and the Future of Cognitive Science." *The Behavioral and brain sciences* 36, no. 3 (2013): doi:10.1017/S0140525X12000477.

“Damien Hirst – ARKEN Museum of Modern Art”, http://www.arken.dk/content/us/art/exhibitions/damien_hirst, accessed July 1st, 2014.

Eskine, Kendall J, Natalie A Kacinik, and Jesse J Prinz. "Stirring Images: Fear, Not Happiness or Arousal, Makes Art More Sublime." *Emotion (Washington, D.C.)* 12, no. 5 (2012): doi:10.1037/a0027200.

Friston, Karl. "The Free-energy Principle: A Unified Brain Theory?" *Nature reviews. Neuroscience* 11, no. 2 (2010): doi:10.1038/nrn2787.

Friston, Karl. "Life As We Know It." *Journal of the Royal Society, Interface / the Royal Society* 10, no. 86 (2013): doi:10.1098/rsif.2013.0475.

Fuhr, Michael. *Populäre Musik Und Ästhetik: Die Historisch-philosophische Rekonstruktion Einer Geringschätzung.* transcript Verlag, 2007.

Guay, R. "Aesthetics of Appearing." *The British Journal of Aesthetics* 47, no. 4 (2007): doi:10.1093/aesthj/aym031.

Hobson, J A, and K J Friston. "Waking and Dreaming Consciousness: Neurobiological and Functional Considerations." *Progress in neurobiology* 98, no. 1 (2012): doi:10.1016/j.pneurobio.2012.05.003.

Hohwy, Jakob. "Attention and Conscious Perception in the Hypothesis Testing Brain." *Frontiers in psychology* 3 (2012)doi:10.3389/fpsyg.2012.00096.

Hohwy, Jakob. *The Predictive Mind.* Oxford University Press, 2013.

Hohwy, Jakob. "Elusive Phenomenology, Counterfactual Awareness, and Presence Without Mastery." *Cognitive neuroscience* 5, no. 2 (2014): doi:10.1080/17588928.2014.906399.

Iseminger, Gary. "Aesthetic Experience."(2003).

Kilner, James M, Karl J Friston, and Chris D Frith. "Predictive Coding: An Account of the Mirror Neuron System." *Cogn Process* 8, no. 3 (2007): doi:10.1007/s10339-007-0170-2.

Kruschke, John. *Doing Bayesian Data Analysis : A Tutorial with R and BUGS.* Burlington, MA, 2010.

Leder, Helmut, B Belke, A Oeberst, and D Augustin. "A Model of Aesthetic Appreciation and Aesthetic Judgments." *British Journal of Psychology* 95, no. 4 (2004): 489-508.

'Missionshaus St. Gabriel', Wikipedia, http://de.wikipedia.org/w/index.php?title=Missionshaus_St._Gabriel&oldid=131765852, accessed July 1st, 2014

Munro, Thomas and Roger Scruton. "aesthetics". *Encyclopaedia Britannica. Encyclopaedia Britannica Online Academic Edition*. Encyclopædia Britannica Inc., 2014. Web. 02 Oct. 2014.

Nadal, Marcos, and Marcus T Pearce. "The Copenhagen Neuroaesthetics Conference: Prospects and Pitfalls for An Emerging Field." *Brain Cogn* 76, no. 1 (2011): doi:10.1016/j.bandc.2011.01.009.

"New Olafur Eliasson Installation at ARKEN – ARKEN Museum of Modern Art", http://www.arken.dk/content/us/press/news/new_olafur_eliasson_installation_at_arken, accessed July 1st, 2014

Online Etymology Dictionary, http://www.etymonline.com/index.php?

term=aesthetic&allowed_in_frame=0, retrieved Sept. 28th, 2014.)

Palmer, Stephen E, Jonathan S Gardner, and Thomas D Wickens. "Aesthetic Issues in Spatial Composition: Effects of Position and Direction on Framing Single Objects." Spatial Vision 21, no. 3-5 (2008): 3-5.

"Past Exhibitions – ARKEN Museum of Modern Art", http://www.arken.dk/content/us/art/exhibitions/past_exhibitions/2011, accessed July 1st, 2014

Ramachandran, Vilayanur S, and William Hirstein. "The Science of Art: A Neurological Theory of Aesthetic Experience." *Journal of consciousness Studies* 6, no. 6-7 (1999): 6-7.

Seel, Martin. *Eine Ästhetik Der Natur.* Suhrkamp Frankfurt, 1996.

Seel, Martin. *Ästhetik Des Erscheinens.* [Frankfurt am Main]: Suhrkamp, 2003.

Seel, Martin. "The Aesthetics of Appearing." *Radical Philosophy* 118 (2003).

Seel, Martin. *Aesthetics of Appearing.* Stanford University Press, 2005.

Shelley, James. "The Concept of the Aesthetic."(2009).

Shimamura, Arthur P. "Toward a Science of AestheticsIssues and Ideas." In *Aesthetic ScienceConnecting Minds, Brains, and Experience.* Oxford University Press, 2012.

Vessel, Edward A, Gabrielle Starr, and Nava Rubin. "The Brain on Art: Intense Aesthetic Experience Activates the Default Mode Network." *Frontiers in human neuroscience* 6 (2012): doi:10.3389/fnhum.2012.00066.

Von Appen, Ralf. "On the Aesthetics of Popular Music." *Music Ther. Today* 8 (2007 a): 5-25.

Von Appen, Ralf. *Der Wert Der Musik: Zur Ästhetik Des PopulärenVolume 4 of Texte Zur Populären Musik.* transcript Verlag, (2007 b).

9 APPENDIX

9.1 English Abstract

The Theory of the Aesthetic Reset, which this thesis aims to establish, combines the phenomenology of aesthetic experience, as for example described by Martin Seel [1], with the predictive coding framework [2, 3, 4]. If we view predictive coding as a means of data-compression in the predictive mind [3], according to the Aesthetic Reset, aesthetic experiences are triggered when the compression is suspended and raw sense-data is processed. The aesthetic reset proposes a partial suspension of top-down predictions without a down-weighting of precision, as the mechanism behind such occurrences. This partial suspension entails a reset of current models, by which local minima happening during prediction formation might be overcome.

Aesthetic Experience is an elusive phenomenon. Following Martin Seel's *Aesthetic of Appearing* [1], it corresponds to a mode of perception that is without relevance, rich in sensation, overwhelming, accompanied by the feeling of reward, momentary, rare and not deliberately inducible. In the aesthetic reset these descriptive features are accounted for by a mechanism and function in accordance with the predictive coding framework. Predictive coding describes the mind as a hypotheses-testing machine, which spans multiple hierarchically structured levels. Prediction error minimization lies at the heart of predictive coding. Our minds constantly try to minimize the prediction error between our top-down predictions about the world and the bottom-up, incoming sense data, on all levels of the hierarchy, either through a revision of our predictions or through action.

A partial suspension of top-down predictions without a reduction in precision weighting is the principle mechanism of aesthetic experience as proposed by the theory of the aesthetic reset. This mechanism entails implications for the organism that could cause the phenomenology of aesthetic experiences, as exemplified with

the following three properties: 1) Mode of Perception: As predictive coding describes top-down predictions to be a fundamental part of perception, it is likely that their suspension would lead to changes in the way we perceive. 2) Data-Rich Experience: If the predictions are suspended, and the upward prediction errors are nevertheless compared to them, data-compression ceases to function and the residuals suddenly become much larger. These large prediction errors are rich in data and cascade upwards through the hierarchy unfiltered and unstructured by downward predictions. 3) Rare: The suspension of predictions is clearly far from the everyday status of the system, since large prediction errors are exactly what the system usually needs to avoid in order to survive. This not only means that aesthetic experiences are remarkably different from the everyday status, but also that regular, ongoing aesthetic experiences would be harmful. This calls for a functional advantage to explain the yet rewarding nature of aesthetic experience.

As according to predictive coding prior beliefs about the world are continuously formed and used to generate good predictions about the world, a system might get stuck in local minima during this adjustment process. To overcome local minima it is crucial to allow for a temporary increase in prediction error to investigate whether a minimum on the other side of the peak is actually lower. In order to achieve this, it could be functional to equip the system with a tendency occasionally to suspend all predictions and allow itself to be flooded by incoming data, leading to a resetting of models at various levels of the hierarchy. This resetting could help the organism over time to develop more accurate and precise predictions with overall lower prediction errors and might be what happens during an AE, hence the aesthetic reset.

[1] M. Seel, *Aesthetics of Appearing.* Stanford University Press, 2005.

[2] K. Friston, "Life As We Know It." *Journal of the Royal Society,* 2013, 86.

[3] A. Clark, “Whatever next? Predictive brains, situated agents, and the future of cognitive science.”, in The Behavioral and Brain Sciences, 2013, 36.

[4] J. Hohwy, *The Predictive Mind.* Oxford University Press, 2013.

9.2 German Abstract

Die Theorie des Ästhetischen Resets, um die es in dieser Masterarbeit geht, verbindet die Phänomenologie der ästhetischen Erfahrung, wie sie zum Beispiel von Martin Seel [1] beschrieben wird, mit dem Predictive Coding Framework [2, 3, 4]. Wenn man Predictive Coding als Datenkompressionsmethode versteht [3], beschreibt die Theorie des Ästhetischen Resets den Mechanismus ästhetischer Erfahrungen wie folgt: Die Kompression von Daten wird aufgehoben und rohe Sinnesdaten werden verarbeitet. Die Theorie des Ästhetischen Resets nimmt eine teilweise Aufhebung der top-down Vorhersagen an, ohne dass dabei die Gewichtung entlang der Prezision aufgehoben wird. Dies führt zu einem Reset des gerade aktuellen Models der Welt und unterstützt den Organismus dabei lokale Minima zu überwinden.

Das Phänomen der ästhetischen Erfahrung ist schwer zu fassen. Nach Martin Seels *Ästhetik des Erscheinens* [1] ist es gleichzusetzen mit einer Art der Wahrnehmung. Diese spezifische Art der Wahrnehmung wird dargestellt als relevanzlos, reich in Sinnesdaten, überwältigend, belohnend, kurzzeitig, selten und nicht willentlich herbeiführbar. Diese Eigenschaften werden in der Theorie des Ästhetischen Resets durch bestimmte Mechanismen und Funktionen in Zusammenhang mit Predictive Coding erklärt. Predictive Coding beschreibt den Geist als eine Hypothesen-testende Maschine, die sich über mehrere hierarchisch organisierte Ebenen spannt. Im Zentrum befindet sich der Prediction-Error-Minimization-Mechanismus. Es wird versucht die Diskrepanz zwischen den top-down Vorhersagen über die Welt und die einströmenden, bottom-up Sinnesdaten vortlaufend zu minimieren. Dies geschieht über alle Ebenen der Hierarchie hinweg, entweder durch eine Anpassung des Weltmodels und somit auch der Vorhersagen, oder über Bewegungen, die den Zustand der Welt verändern.

Der Hauptmechanismus, der der Theorie des Ästhetischen Resets zugrunde liegt, ist die teilweise Aufhebung der Vorhersagen. Dieser Mechanismus zieht unter anderem folgende Konsequenzen in der Phänomenologie nach sich: 1) Art der

Wahrnehmung: Es sind die top-down Vorhersagen, die im predictive coding framework für Wahrnehmung stehen. Setzen diese aus, kommt es daher sehr wahrscheinlich zu einer erfahrbaren Veränderung der Wahrnehmung. 2) Erfahrung reich an Sinnesdaten: Sobald die Vorhersagen aussetzen, aber die aufsteigenden Prediction-Errors weiterhin damit verglichen werden, kann die Datenkompression nicht mehr funktionieren und Prediction-Errors werden bedeutend größer. Diese ausgeweiteten Prediction-Errors sind reich an Sinnesdaten und steigen durch die hierarchischen Ebenen auf, ohne dabei von Vorhersagen gefiltert oder umstrukturiert zu werden. 3) Seltenheit: Das Aufheben der Vorhersagen kann laut Predictive Coding Framework nur ein Ausnahmezustand sein, da es für das System wichtig ist, Prediction Errors so gering wie möglich zuhalten um zu überleben. Das bedeutet nicht nur, dass sich ästhetische Erfahrungen grundlegend vom alltäglichen Zustand des Systems unterscheiden, sondern auch, dass andauernde ästhetische Erfahrung eine Gefahr darstellen. Um diese Gefahr zu rechtfertigen, verlangt es in der Theorie des Ästhetischen Resets nach einem funktionalen Vorteil kurzzeitiger, ästhetischer Erfahrungen.

Während das System sein Model der Welt kontinuierlich verbessert, kann es passieren, dass es sich in lokalen Minima festsetzt. Um diese Minima zu überwinden ist es notwendig einen kurzen Anstieg der Prediction-Errors zu erlauben. Um dies zu erreichen, könnte es von Vorteil sein, dass System mit einem Mechanismus auszustatten, der Vorhersagen kurzzeitig aussetzen lässt um das System mit Sinnesdaten zu fluten. Auf diese Weise kann es zu einem Reset aktueller Modele kommen; und zwar auf mehreren Ebenen der Hierarchie. Solch ein Reset könnte dem Organismus helfen, längerfristig präzisere Vorhersagen zu treffen und verkörpert eventuell die Funktion der ästhetischen Erfahrung. Daher soll es die Theorie des Ästhetischen Resets gennant werden.

[1] M. Seel, *Ästhetik des Erscheinens.* Suhrkamp, 2003.
[2] K. Friston, "Life As We Know It." *Journal of the Royal Society,* 2013.
[3] A. Clark, “Whatever next? Predictive brains, situated agents, and the future of cognitive science.”, in The Behavioral and Brain Sciences, 2013.
[4] J. Hohwy, The Predictive Mind. Oxford University Press, 2013.

9.3 Curriculum Vitae

Thomas WOLF

Date of Birth:	April 18th, 1986
Place of Birth:	Neunkirchen, Austria
Citizenship:	Austrian
Address:	Triester Bundesstr. 93
	2640 Enzenreith, Austria
Phone:	+43 650 451 50 20
E-Mail:	thomaswolf.cogsci@gmail.com
Website:	https://univie.academia.edu/ThomasWolf

EDUCATION

Since 2012	Student at the Middle European Interdisciplinary Master Programme in Cognitive Science (MEi:CogSci) at the University of Vienna and the Medical University of Vienna
2013	Erasmus Student at the Budapest Semester of Cognitive Science Program at Eötvös Loránd University, Budapest
2011 – 2012	Fellow at the program for Phenomenology and Philosophy of Mind at the University of Copenhagen Supported by a grant of 55.000 kr. (7.400 €) from the Danish Government Scholarship under the Cultural Agreements
2006 – 2011	Mag.phil. awarded on the 18th of July, 2011 Institute for Musicology at the University of Vienna Major Subject: Musicology / Minor Subject: Philosophy
2006	Civilian Service
2004 – 2005	*Berlitz four-language-diploma* (English, French, Italian and Russian), at Berlitz Austria, Vienna in combination with business courses in Communications, Marketing, Distribution Policy etc.at Karriere Club Wien, Vienna
1996 – 2004	*Matura* at Bundes Realgymnasium Gröhrmühlgasse Wr. Neustadt, an Austrian High School with focus on the Natural Sciences and Mathematics

RESEARCH EXPERIENCE

2013 – 2014	Research Internship at the Cognitive Science Department of

	the Central European University in Budapest, Hungary Supervised by: Günther Knoblich and Natalie Sebanz
2013	Research Internship at the Haidlhof Research Facility, Department of Cognitive Biology, University of Vienna, Austria. Supervised by: Thomas Bugnyar and Jorg Massen

TEACHING EXPERIENCE

2013 – 2014	"Tools in Cognitive Science I: Introduction to Programming for Cognitive Scientists", Tutor, University of Vienna, Austria

PUBLICATIONS

"The Aesthetic Reset – Mechanism and Function of the Aesthetic Experience in the Predictive Mind." Wolf, T., In *Proceedings of the MEi: CogSci Conference 2014*, edited by Hochenauer, P., Schreiber, C., Zimmermann, E. and I. Farkas. Bratislava: Comenius University, 2014.

"TMS (cTBS) demonstrates a causal role of premotor homunculus in action interpretation." Michael, J., Sandberg, K., Skewes, J., Wolf, T., Blicher, J., Overgaard, M. and C. Frith, In *Psychological Science*, 2014, DOI: 10.1177/0956797613520608.

"Friend or Foe – Cooperation and Relationship Quality in Ravens." Wolf, T., Hadschieff, V. and J. Massen, In *Proceedings of the MEi: CogSci Conference 2013*, edited by Khosravipour, S., Roemmer-Nossek, B., Zimmermann, E. and I. Farkas. Bratislava: Comenius University, 2013.

GRANTS AND FELLOWSHIPS

2014	Full CEU Doctoral Fellowship for the academic year 2014 – 2015, 21.573 €

2014	ERASMUS Stipend, European Union, 1.572 €
2013	Academic Excellence Scholarship, University of Vienna, 744.95 €
2012	Danish Government Scholarship under the Cultural Agreements, 55.000 kr. (7.400 €)

PRESENTATIONS AND POSTERS

2014

October 1st	"Do you Believe in Mozart? - The Influence of Beliefs on Representing Joint Action Outcomes", Poster at KogWis2014, Tübingen, Germany
August 23rd	"The Aesthetic Reset – Aesthetic Experience in the Predictive Mind", Poster at VSAC 2014, Belgrade, Serbia
June 14th	"The Aesthetic Reset – Mechanism and Function of the Aesthetic Experience in the Predictive Mind", Presentation at the MEi:CogSci Student Conference 2014, Krakow, Poland
May 16th	"The Aesthetic Reset – Aesthetic Experience in the Predictive Mind", Poster at the Perspectives on Human Probabilistic Inference Workshop, Leiden, Netherlands
March 16th	"Do you Believe in Mozart? - The Influence of Beliefs on Representing Joint Action Outcomes", Poster at the Interdisciplinary College 2014, Günne/Möhn, Germany

2013

June 22nd	"Friend or Foe – Cooperation and Relationship Quality in Ravens.", Poster, at the MEi:CogSci Student Conference 2013, Budapest, Hungary
June 11th	"Building a Bridge between Aesthetic Experience and Computational Modeling", Presentation at the CogSci-PhD-Breakfast, Cognitive Science Research Platform, Vienna, Austria

CONFERENCES AND SUMMERSCHOOLS

2014

September 29th – October 2nd	KogWis2014, 12th Biannual Conference of the German Cognitive Science Society, Tübingen, Germany
August 23rd – 24th	2nd Visual Science of Art Conference, Belgrade, Serbia
June 12th – 14th	MEi:CogSci Student Conference 2014, Krakow, Poland
May 12th – 16th	Perspectives on Human Probabilistic Inference Workshop, Leiden, The Netherlands
April 17th – 10th	SOMACCA, The Syntax of Mind. Language, Music, Art. Vienna, Austria
March 14th – 21st	Interdisciplinary College 2014, Günne at Lake Möhn, Germany
January 9th – 11th	BCCCD14, CEU Conference on Cognitive Development, Budapest, Hungary

2013

September 19th – 20th	CogSci-Autumn School 2013: MATLAB, Vienna, Austria,
August 11th – 17th	36th International Wittgenstein Symposium 2013, Kirchberg/Wechsel, Austria
July 31st – August 3rd	COGSCI 2013, The Annual Meeting of the Cognitive Science Society, Berlin, Germany
July 27th – 29th	5th Joint Action Meeting (JAM), Berlin, Germany
July 10th – 12th	Visual Attention Meeting 2013, Vienna, Austria
June 25th – 26th	Minds in Common, 2nd Aarhus-Paris Conference on Coordination and Common Ground, Paris, France
June 20th – 22nd	MEi:CogSci Student Conference 2013, ELTE, Budapest, Hungary
May 16th – 18th	Perception and Concepts, 9th International Symposium of Cognition, Logic and Communication, Riga, Latvia
April 8th – 9th	CFP Conference “Cooperation: Why, How and With Whom?”, Aarhus, Denmark
April 4th – 5th	Workshop “Predictions, Bodies and Ecologies: new directions for the cognitive sciences?”, Aarhus, Denmark

2012

September 14th – 16th	Tufts Cognitive Science Conference on "Language and Representation", Medford, USA
June 25th – 26th	Objects in Mind, 1st Aarhus-Paris Conference in Social Ontology and Cognition, Aarhus, Denmark

2011

August 8th – 12th	Copenhagen Summer School in Phenomenology and Philosophy of Mind, Copenhagen, Denmark

PROFESSIONAL MEMBERSHIPS

since 2014	Gesellschaft für Kognitionswissenschaft
since 2013	Cognitive Science Society

WORK EXPERIENCE

2008 – Present	Musician and Actor at *SOG.Theater, Zentrum für Theaterpädagogik und strategische Inszenierung*, Wr. Neustadt – www.sog-theater.com
2013 – 2014	Tutor at *University of Vienna*, Vienna
2010 – 2012	Production Assistant at *KAIROS Music Production,* Vienna www.kairos-music.com

LANGUAGES

German	Native
English	Professional-level Studies conducted in English since 2011
Danish	Studieskolen – Dansk for Udlændinge Modul 5.1 (equates to CEF Level B2 - 2012)
French, Italian, Russian	Berlitz Level 4 (equates to CEF Level A2) - Grade: Excellent (2005)

PROGRAMMING SKILLS

Working Knowledge	Python (including PsychoPy2, matplotlib), Max 6 MSP

ADDITIONAL SKILLS AND ACTIVITIES

Music	Musician (Cello, Violin, Piano, Voice) and Composer, in various ensembles, bands and orchestras, since 2006
Boy Scouting	Boy Scout Leader since 2000
Soft-Skills	*Perfact training* - Diplomas in Team- and Conflict Management, Presentation Techniques, Argumentation and Body Language