



# Prediction and Art Appreciation

Ancuta Mortu<sup>1</sup> 

Accepted: 11 August 2023  
© The Author(s) 2023

## Abstract

Every art encounter requires making predictions given that art is rife with uncertainty. What is it to appreciate art while relying on predictions, and to what consequences? I argue that art appreciation involves engaging our predictive systems in such a way as to correct predictive failure at least at some levels in the processing hierarchy of information that we receive from art works. That art appreciation involves predictive processing best explains the mechanism for cognizing art works in categories, cases of appreciative failure, and why art appreciation is a form of valuing. To articulate the explanatory value of predictive processing for cognizing art works in categories, I introduce a sub-type of predictions that I call art-historical estimates – i.e., predictions that take as their object the temporal relationships between works and their place in art history – and identify their features within a broader typology of predictions and related mental structures such as schemas and scripts. I examine the way predictive processing explains the correction of predictive failure, and its consequences for the affective value that we attach to the appreciation of art.

## 1 Introduction

Every art encounter requires making predictions given that art is rife with uncertainty. Whether we make guesses with respect to the source of light in a painting or whether we anticipate the thrills of gradually figuring out a melodic line while listening to a piece of music, predictions are all-pervading in our acts of art appreciation. What is it to appreciate art while relying on predictions, and to what consequences? Are predictions necessary constituents of art appreciation?

---

✉ Ancuta Mortu  
mortu@mail.muni.cz

<sup>1</sup> Faculty of Arts, Department of Art History, Masaryk University, Veveří 470/28, Brno-Střed Brno 602 00, Czech Republic

I argue that art appreciation involves engaging our predictive systems in such a way as to correct predictive failure (Van de Cruys 2011; Ransom 2022) at least at some levels in the processing hierarchy of information that we receive from art works, for instance when we try and discern representational features in a Cubist work or its stylistic features. Making predictions and revising them at different levels in the information processing hierarchy in order to correct predictive failure helps enhance our experience, possibly through amplifying our understanding of art works. That art appreciation involves this predictive dynamic is an inference to the best explanation that best explains the mechanism for cognizing art works in categories, cases of appreciative failure, and why art appreciation is a form of valuing.

To articulate the explanatory value of predictive processing for cognizing art works in categories, I introduce a sub-type of predictions that I call art-historical estimates – i.e., predictions that take as their object the temporal relationships between works and their place in art history – and identify their features within a broader typology of predictions and related mental structures such as schemas and scripts (Gombrich 1960; Wollheim 1990). I examine the way predictive processing accounts for the correction of predictive failure, and its consequences for the affective value that we attach to the appreciation of art.

## 2 Features of Predictions

There is no single unitary account or consistent terminology regarding predictions or prediction-related phenomena. For our purposes, I will retain a general definition of predictions as hypotheses generated by our sensory and cognitive systems with respect to states of the world or internal states of the body (Hohwy 2013; Friston 2013; Barrett et al. 2015, 6).

Several features of prediction will help understand the process of correcting predictive failure in art appreciation. A first feature that helps explain this process through cognizing art works in categories is that predictions are hierarchical (Ransom 2022), meaning that they are processed at different levels by our sensory and cognitive systems. We generally distinguish between first-order and second-order predictions. Thus, first-order predictions arise at a sub-personal level of processing, which translate a property of the human visual system to automatically organize into categories the perceptual input that we receive from the environment, while second-order predictions engage higher-order processes and arise when we become aware of anticipating some external or internal stimulus (Ransom et al., 2021, 119–120). This generally happens when we face ambiguous stimuli that pose physical or mental challenges; we are more likely to notice our anticipations in such cases, for instance, when we have a feeling of gaining insight into the meaning of an intricate work (Koelsch et al. 2019, 63; Van de Cruys 2017, 10; Muth et al. 2015). The possibility of gaining ultimately an insight into the meaning of the work is a guarantee that the encounter with the work endures in the first place, although, as we shall see later in this paper (§V), predictive failure need not be ruled out entirely from episodes of appreciative response.

The process of correcting predictive failure can be explained by a further feature of predictions, which is their iterative character (Ransom et al. 2021, 120). That predictions are iterative means that there is an ongoing process of generation and revision of hypotheses at different levels in the informational processing hierarchy, with each additional level holding more specific information. There are multiple layers of information available that will help organize our predictions differently and narrow down our guesses with respect to how we can structure our environment.

A feature that helps explain cases of appreciative failure is that predictions serve different purposes. They may serve to represent the world accurately, orient selective attention or enhance the quality of one's experience (Ransom et al. 2021; Huron 2006). Predictions thus come with success conditions: they can be accurate, leading to faithful representations of the world and states of the body or lead to errors. As we shall see, when it comes to predictions in art, what counts as successful prediction or, on the contrary as predictive error (§V), will depend on a series of pre-existing states in the history of art rather than on mere perceptual knowledge.

Finally, predictions have different origins; they are formed and accessed differently, being likely to vary among individuals or to be tied to particular cultural contexts (Ransom 2022). This feature of prediction is especially relevant for understanding why art appreciation is a form of valuing and the diversity of forms of valuing art works. Two broad distinctions are in place here. We can distinguish between 1.1 predictions relying on personal and historically contingent circumstances, which are proper to subjective experience, and 1.2 predictions based on prior knowledge, which are accessible to a broader community or group. Regarding predictions organized around individual experience, 1.1, they are contingent first and foremost upon personal developmental trajectories, rather than upon features in the perceived environment. When it comes to predictions available collectively, 1.2, they are indexed either upon objective environmental properties or upon a set of knowledge shared within a group or community.

This distinction allows us to further identify two subclasses, namely perceptual learning (1.1.1), a process through which we develop a sensitivity to "prototypical categories" (Ransom 2022) based on exposure to learning samples in our environment, and the psychoanalytic mechanism of projection or projective identification (1.1.2), through which we externalize our emotions and beliefs. In the latter case, we experience the world according to our desires. This may happen, for instance, in some children's games, but many visual hallucinations can be included here. A famous movie scene from Chaplin's *The Gold Rush*, with Jim looking rapaciously at Chaplin as if he were an inviting roast chicken, is a good example of projective prediction (Gombrich 1960, 157–158; 1963, 7–8). In contrast, implicit predictions (1.2.1) – i.e., predictions we form through mere exposure to learning samples in our environment – and guided predictions (1.2.2) – i.e., predictions we form through explicit training, education etc., for instance when we learn to make hypotheses with respect to the light source in a painting – are stabilized against a perceptual, cultural or interindividual background (Wollheim 1990, 83–84, 266; 1994, 151; 1983, 94–96; Budd 2008, 241–242, 248).

The differentiation between subjective and objective factors in predictions could be a response to the lingering suspicion that predictions render art appreciation elu-

sive. While we generally accept that a work is open to completion from our experience and find pleasure in this process of filling in the gaps, we still want the work to be the primary source upon which we build our experience. But only the self-oriented projective subclass of prediction (1.1.2), would be subject to such suspicion. Some predictions are more than just biasing factors for art appreciation, that is, they impact art experience in a relevant and meaningful way. The features compiled in the taxonomy here below (Fig. 1) will serve to illuminate what those predictions might be.

I suggest that reliable predictions in art appreciation that serve to apprehend art works in categories take the form of art-historical estimates, which point to an important characteristic of our appreciative acts, namely, the fact that we don't just assess works of art in isolation, as self-contained, but we also factor in the place such works occupy in a tradition of art when forming our appreciative evaluations. To get a better grasp on art-historical estimates –i.e., predictions that take as their object the temporal relationships between works and their place in art history, we need to determine the conditions under which they are formed. A hypothesis is that such predictions may be built upon mental structures that we already have in place, namely schemas and scripts.

### 3 From Schemas to Art Scripts

The claim is that art appreciation involves engaging our predictive systems in such a way as to correct predictive failure at least at some levels in the information processing hierarchy. That art appreciation involves predictive processing best explains the mechanism for cognizing art works in categories, cases of appreciative failure, and why art appreciation is a form of valuing. Regarding the first explanandum, schema- and script-based predictions provide the framework for getting our categories right in art appreciation. In cognitive psychology, schemas and scripts are defined as mental structures that play an important role in organizing experiences occurring frequently by arranging them into conventionalized conceptual units or “knowledge-structures” (Schank and Abelson 1977; Bartlett 1995, 199–201; Clegg 1977, 22). We make hypotheses with respect to the sensory world based on these mental structures that are already in place (Gombrich 1960, 59–60; Davis 2011, 191–192; 2017, 10), then we adjust and correct our hypotheses by comparing them to the actual input that we receive from the world. In time, we also adapt our schemas and scripts as a result of cumulative processes of hypothesis-testing as we take in new information.

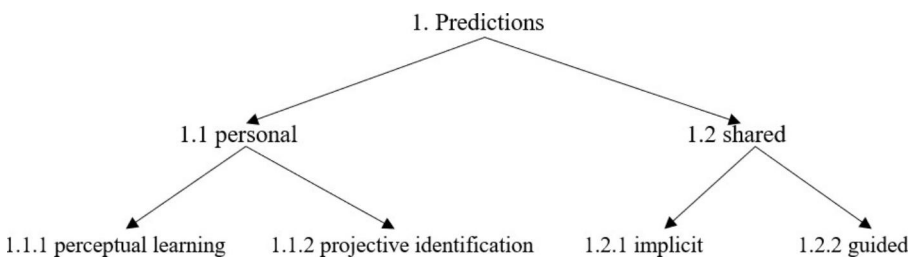


Fig. 1 Types of predictions

The two notions are closely related; what distinguishes scripts from schemas is the dynamic character of the former: scripts capture key features of standard sequences of expected events connected by causal chains (Schank and Abelson 1977, 38, 41), whereas schemas generally capture key features of broad categories of discrete objects or events. Rather than designing mental images or thought concepts of particular objects in the world, schemas are abstract mental constructs or templates (Clegg 1977, 23; Davis 2017, 331) that act as classifiers for generic categories. In this respect, schemas can serve to classify art, given that most works “cluster around recognizably distinct models or mental templates” (Wright 1977, 111). For instance, we can impose an Impressionist schema on a multitude of Impressionist paintings based on a type of brushstroke style. As for scripts, they also have varying degrees of accuracy and fineness. If we have well-formed scripts for our routine experiences (e.g., going to the supermarket), scripts may be poorly-formed for unexpected situations (e.g., coping with pandemic). Ultimately, schemas and scripts serve to build learned models of the world, and they concern a wide range of responses, from organic responses to everyday situations (e.g., crossing the street) to experiences connected to art such as museum experiences (Bartlett 1995, 201).

Generally stored in long-term memory, schemas and scripts can reach conscious reflection or be engaged automatically (Gombrich 1960, 60–61; 159–160, 180, 289–290; Ucko 1977, 17; Holly 2002, 451; Huron 2006, 235–237; Bar 2009, 1239; Jacobsen 2010, 248–249, 254). For instance, works or characteristics of works experienced frequently in the past may be absorbed unconsciously and stored in long-term memory; we can think here for example of the musical expectations we form with respect to pitch relations (Tillmann et al. 2011, 378) or of pictorial expectations regarding the illusion of recession and laws of perspective (Gombrich 1960, 289–290); genre conventions also qualify, if we move up in the hierarchy. Schemas and scripts are historically determined, being active and cumulative, which means that they can be adjusted in time (Bartlett 1995, 203; Davis 1986, 207; 2018, 786). Moreover, schemas and scripts can be perspectival, that is, they can be activated from a point of view (Schank & Abelson, 1977, 42) and are subject to cultural difference.

Several attempts have already been made in art theory to conceptualize how we apprehend art works in categories based on schema and script predictions. Thus, in *Art and Illusion*, a book that aims to explain the development of the history of Western painting, Gombrich has pointed to the importance of predictions in art, conceiving of creating and interpreting art as a grid with empty spaces that are filled in with images from one’s own experience (i.e. script-, or schema-based images); reading brushstrokes is, according to Gombrich, like playing a game of 20 Questions (Gombrich 1960, 159–160), in which we adjust and rectify our guesses with respect to the depicted representational features through what he calls a particular mechanism of trial and error or “making and matching”. The upshot of playing this game of predictions while we engage with art may be gaining a clear, accurate representation of factual features – “matching” objects and events as they unfold in the represented reality –, but it doesn’t necessarily have to be so (Gombrich 1960, 52–53; 146–147, 153, 178–179; Forge 1977, 29; Layton 1977, 34–35). What is at stake in art engagement is something more than identifying representational patterns and illuminating some causal interaction with the perceptual world. Predictions based on schemas

and scripts that organize our apprehension of art in categories are tailored for a wide range of purposes (§II) and may guide appreciation in different ways; for instance, instead of aiming at realism, such predictions might be determinant for style recognition or for the detection of stylistic change in art (Gombrich 1960, 68–69).

A way to show how predictions might lead to an accurate appreciation of art works in categories is to say that they are formed on the basis of internalized art scripts. There is a minimal sense in which we rely on scripts to form expectations about how we should act when engaging with art. For instance, when we rely on a museum experience script, we expect to follow a series of conventional actions such as going to the museum, buying an entry ticket, navigating through the exhibition space, lingering in front of artworks, avoiding touching them, paying attention to the works etc. However, the internalized sequences of acts that I'm interested in are different. What I define as art scripts are sequences of acts of art-making that we expect to be connected by particular causal relations. We expect art works to be part of an internally orchestrated art history, resulting from a set of ordered actions that are possible at a given time. My hypothesis is that such art scripts provide rules for our predictions when we appreciate art. Given that we try to answer the question of what it is to appreciate art works in categories, script-based predictions – or what I call art-historical estimates – will be my main focus here.

In the light of the distinctions established above between various types of predictions (§II), we can now draw the line and identify the main features of art-historical estimates. Thus, art-historical estimates are first-order and second-order script-based predictions, stabilized within a community or group (§II, 1.2.), that impact art appreciation in a non-arbitrary way.

## 4 Appreciation and Art-Historical Estimates

To articulate the explanatory value of predictive processing for cognizing art works in categories, we need to further elaborate on script-based, art-historical estimates, namely predictions that take as their object the temporal relationships between works and their place in art history. How exactly do we bring art-historical estimates to bear in art appreciation? If such estimates must take as their object causally linked events occurring in a specific temporal or logical order, surely it would be far-fetched to say that we appreciate artworks as causally linked in the exact order in which they were made and became part of a history of art. And yet, art-historical estimates cannot entirely be ruled out from the appreciation of art. More specifically, when we appreciate art, we compare script-based, art-historical estimates to the art works we experience to form comparative judgements based on salient similarities (e.g., when we notice Cubist tendencies in an Impressionist work and make assessments such as “Picasso is a bit like Cézanne” as opposed to assessments in terms of resemblance or representational properties, e.g., “this patch of color looks a bit like a mountain”). This is to say that in art appreciation we assess predictions for their validity against a shared, script-like (§II, 1.2), art-historical background, in which works are sorted into sequences according to their art histories, namely according to the place they occupy in a tradition of art and the way they relate to other works (Walton 1970, 334–335;

Carroll 2001, 86–87). Had the history of art been different, our appreciation of art would be different as well since we would be appreciating different works.

Art history can shape the appreciation of art if a minimal art-historical reflexivity is prevalent in an artistic culture. We live in an anthropological environment that privileges or facilitates art-historical exposure, in which we are constantly primed with art stories (through art education, guided exhibitions but also through media exposure, art billboards or subway art posters, to give just a few examples). Such exposure allows us to form a minimal internalized art-historical knowledge (Holly 2002, 451) – or art scripts – that would orient us in the space of the art world. I leave open the question whether the propensity to make predictions based on an art-historical background is a matter of historical contingency, or whether this hypothesis could be advanced with respect to different traditions of reception in different periods and cultural contexts. Given that scripts are culturally permeable, the tendency to place works in a tradition of art might be a peculiarity of our “Euro- artistic cultures” (Lopes & Ransom 2022; Davis 2010, 712; Currie 2021, 272, 275–276), built around a European developmental model of art. In any case, it is safe to say that in our artistic cultures, there is a built-in assumption that artistic value or merit is to be determined in relation to past artistic continuities and innovations. The propensity to respond to art-historical features such as artistic technique, style or execution has become internalized to a greater or lesser extent as a default mode of appreciating art. Notions such as “secondary attractors”, or a culture-specific art instinct, among others (Matthen 2015, 175, 177; 2017, 20) serve to capture this learned propensity to respond to art-related content.

There are several competing models that try and explain art appreciation in terms of categories or a minimally internalized art-historical knowledge. The question of how we cognize art works in categories and appreciate them qua art was initially addressed by Kendall Walton in his seminal paper “Categories of Art”, which has had a significant impact in philosophical aesthetics. The main thesis in Walton’s paper is that art appreciation is based on an implicit assessment at the perceptual level of the category membership of works (i.e., media, genre, style, and any other relevant category which would impact the perception of art in a significant way, e.g., paintings in the style of Cézanne, Brahmsian music etc., Walton 2020, 80).

Two psychological models push forward the question raised by Walton regarding art categoricity, namely the model of perceptual learning and the model of cognitive penetration. One way to articulate the role of art-category expectations is to say that they figure in perceptual experience as a result of perceptual learning (§II, 1.1.1). Perceptual learning is an acquired capacity, defined in terms of “structural and functional changes in the perceptual system due to repeated exposure to a stimulus that result in a change in perceptual experience. This change must make a difference to how or whether something is perceived, and it must be brought about as a result of learning” (Ransom 2022, 12). According to Ransom, perceptual learning allows us to understand our facility with art categories. We learn to perceive through exposure to art, in a social environment which is rife with learning samples (Ransom 2022, 21). This happens through the construction of perceptual prototypes (Ransom 2020, 69)– or schemas (§III) – which would allow us to detect features typical of art categories (e.g., an Impressionist brushstroke). In sum, the perceptual learning model seeks to

explain how it is that we perceive a work differently once we have assigned to it a category.

Another way to account for art-category expectations is through cognitive penetration, which occurs when cognitive states (e.g., background beliefs with respect to art-historical facts) impact or alter perceptual experience in a causal way (Ransom 2020, 67; 2022, 5–6), by triggering a shift in the way we attend to categorial features. In other words, according to this model, art-historical knowledge would alter our perceptual experience by shifting our attention toward aspects of the work that are relevant for its art-categoricity (Ransom 2022, 9).

Perceptual learning and cognitive penetration are two models of learning that try and provide an answer to the question of how we internalize art-historical knowledge and how such knowledge affects our perception of artworks (i.e., via implicit exposure to learning perceptual samples or, respectively, via cognitive inferences and high-order representations, possibly formed through explicit training). Both models are used for explaining the perception of the categoricity of art (Waltonian categories can be understood here in terms of schemas, §III). But the models aren't fully satisfactory. Several aspects of these models can be questioned.

A first question that arises is how we come to form the categories in which we appreciate works of art in the first place. Is there, for instance, a place for temporal relationships when we establish the membership of a category (e.g., art-historical relationships, understood here in terms of scripts, that would get us from a genre or art style to another, say, from Impressionism to Cubism)? Can temporal features be diagnostic of category membership? Can we experience art histories of works or art-historical relations? According to many art theorists, art-historicity is an essential feature of art-making and art appreciation (Levinson 1979, 242–243, 249; Wollheim 1980, 95–97; Davis, 1993, 331–332; 2011, 9–10; 2013, 207). We rarely appreciate works in isolation, as self-contained; we rather appreciate the ways in which such works relate or diverge from a tradition of art (e.g., through “repetitions, amplifications, or repudiations of acknowledged artistic tendencies in the tradition”, Carroll 2001, 71). Importantly, this means that the appreciation of a work is not confined to assessing the contextual circumstances and art-historical facts that were available to the artist at the time of producing the work (Walton 2021, 403), and that subsequent developments and innovations in the tradition of art also have an important part to play. The scripts available to present-day observers will always differ from those of the audiences intended by the artist. These will generate different expectations and different strategies for establishing the category membership of works.

Another important question is how far we can go with a perceptual explanation of art categories. Art appreciation overflows perception, it is more than just a matter of detecting perceptual categorial features. We use broader cognitive strategies, not just perceptual cues, to appreciate art. Making script-based predictions is one such strategy, with scripts pointing to generalizations about developments and innovations in a tradition of art against which we make hypotheses about individual works of art. These hypotheses are the ground for comparative judgements about individual pieces of art.

The proposal based on predictive processing better explains apprehending art works in categories than the above-mentioned competing models. While the account



in terms of script-based predictions (or art-historical estimates) explores further the psychological aspects of Walton's theory, namely understanding the psychological mechanisms that are related to how we establish the category membership of art works, it departs from it in many respects. For Walton, cognizing art works in categories amounts roughly to determining the permeability of perception by the historical circumstances of a work of art (such as its origin or history of making or its relation to internalized art norms within the community to which the artist belongs, Walton 1970, 364–365; 2020, 80–81; Davies 2020, 77–78; Ransom 2020, 80). The prediction account shifts the emphasis from perception to appreciation, that is, from perceiving works of art in mere art categories (Walton 2020, 80–81) – or schemas –, to appreciating works of art by making predictions with respect art-historical categories – or scripts –, that encompass temporal or logical sequences in which such works occupy a place. The account explains appreciation in terms of prediction formation, where predictions are compatible with correct appreciation. An accuracy condition on predicting is that predictions have to be related to the art historicity of the work, to relevant art-historical facts. One significant advantage of the prediction model over its competing models is that it offers a dynamic approach to establishing category membership.

Regarding Walton's compatibility with the prediction approach, there are further notable differences. For Walton, the identification of categories amounts to detecting Gestalt-like, static configurations (Walton 1970, 340–341) through exercising our perceptual skills or sensitivity (Ransom 2020, 2022), whereas art-historical estimates are weighed in appreciation rather than in perception only. In other words, Waltonian categories are not determinable in terms of non-perceptual considerations, whereas art-historical estimates are (i.e., such estimates can be made based on extra-perceptual information, for instance based on implicit beliefs with respect to artistic continuities and innovations). The account in terms of script-based predictions suggests that one internalizes art-related scripts (i.e., works as ordered in standard sequences, however coarse), which will enable us to discern causal relations among works. What a script-based explanation best captures is appreciating the dynamics of artistic innovations and change over time and a work's position in this dynamic. Such temporal aspects are overlooked by Waltonian models.

Moreover, art-historical estimates are not cashed out in terms of art-historical expertise. This view is endorsed for instance by some recent, strong contextualist models (Bullot and Reber 2013) and is one that Walton wanted to rule out from the outset: “‘Categories of art’ does not take appreciators’ perceptual experiences to be cognitively penetrated by art-historical knowledge. And drawing inferences about a work’s categories from such knowledge would not be perceiving it in them” (Walton 2020, 81). Nevertheless, Walton does acknowledge that art-historical knowledge still can influence aesthetic judgments but the exact nature of this influence – beautifully captured by the question “how guilty is the beholder’s eye?” (Walton 2020, 84) – remains problematic. As Walton rightfully remarks, often one does not purposely seek to acquire information about the art-historical context of a work (for instance, about its specific causal history, its provenance, by whom it was commissioned, in what context it was presented etc., Walton 2020, 82). Perceiving works in categories does not seem to be a matter of voluntary cognitive achievement, of painstakingly

forming a mature art-historical judgment (Nanay 2018). The prediction approach is compatible with the idea that inferences about art-historical categories may be activated automatically in the process of appreciation; they don't necessarily have to be reflexive. It differs from strong cognitive approaches in that it allows for coarse-grained, poorly-formed art-historical inferences – namely, inferences about what a work is in virtue of the position it occupies in an art tradition – to play a meaningful role in appreciation.

On the proposed prediction account, we internalize art-historical scripts (through exposure to both perceptual and extra-perceptual information) which enable us to get a sense of coarse relationships between works, styles, or periods of art. Such scripts enable us to apprehend works in a logically ordered sequence as if in a narrative structure.

That comparative judgments are a significant component of art appreciation is also a thought that Gombrich expressed, as one can read in the following passage:

Modern art and primitive forms are not the same as their primitive models. For that strange precinct we call art is like a hall of mirrors or a whispering gallery. Each form conjures up a thousand memories and after-images. No sooner is an image presented as art than, by this very act, a new frame of reference is created which it cannot escape. It becomes part of an institution as surely as does the toy in the nursery. If Picasso would turn from pottery to hobby horses and send the products of this whim to an exhibition, we might read them as demonstrations, as satirical symbols, as declarations of faith in humble things or as self-irony but one thing would be denied even to the greatest of contemporary artists: he could not make the hobby horse mean to us what it meant to its first creator. That way is barred by the angel with a flaming sword.” (Gombrich 1963, 11; Holly 2002, 452).

The passage seems to suggest that appreciation of art relies on something like script-based art-historical estimates. Every form of art keeps in the background a tradition of art, even if to subvert it. An objection that may arise is that the account of art appreciation in terms of art-historical estimates is only restricted to self-conscious art that explicitly keeps the art-historical tradition in the background; only works which display overtly an attitude toward art would require their audience to acknowledge the actual historical development of art. In other words, art-historical estimates would be triggered by a work only if it was the artist's intention to generate such predictions through his or her work. And we can think here of many examples from modern art, or even more eloquently of John Baldessari's *Painting for Kubler*, which consists of a text on a canvas that reads as follows:

This painting owes its existence to prior paintings. By liking this solution, you should not be blocked in your continued acceptance of prior inventions. To attain this position, ideas of former paintings had to be rethought in order to transcend former work. To like this painting, you will have to understand prior work. Ultimately this work will amalgamate with the existing body of knowledge.

While the question remains open whether there are paradigm cases or boundary cases of art appreciation in which art-historical estimates play a more prominent role than in others, we cannot exclude them from the way we appreciatively engage with artworks. The problem of serialized appreciation of modern works is just as applicable to other art forms outside the canonical space of modernism; there is no need for a special pleading for modernist art-historical estimates. Irrespective of whether specific works may succeed conspicuously in embodying art history (i.e., relevant art-historical facts, a tradition of doing things etc.) and temporal relations to cognate works, it is unlikely that we experience art configurations in complete isolation.

## 5 Predictive Failure

A further phenomenon explained by the fact that art appreciation involves predictive processing is appreciative failure. The prediction model of art appreciation accounts for the fact that in every art encounter we systematically mispredict (§II), that predictions in art are often inaccurate, leading to errors. Prediction errors appear when there is a mismatch between the hypotheses generated by our perceptual and cognitive systems and what we get when we attempt to match them to the world (Ransom et al. 2021, 120). Art exploits a variety of prediction errors and failures, disrupting our perceptual or cognitive processing habits and capitalizing on our liability to err (Spolsky 2004, 24; 2015, 35–36; Davis 2018). What are the boundaries of such failures? What systems are engaged in trial and error, to employ again Gombrich's expression, and who errs in the first place? What happens to appreciation when prediction goes wrong?

Art encounters are set more often than not in stereotypical settings such as museums, concert halls and exhibition spaces, creating conditions for minimizing prediction errors (Gombrich 1960, 162, 164). Yet, experiencing art does not generally lead to the formation of perceptual routines (although see “aesthetic fatigue”, arising when we are confronted too often to the same art forms, Kubler 1962, 73–75) since artworks do not generally display statistical formal structures or causal regularities, as ordinary stimuli in our perceptual environment do (De-Wit et al. 2010, 8702; Williams 2018, 153). On the contrary, with a specific content and their own intrinsic conditions of reception, artworks seem to be preventing the formation of perceptual habits (Spolsky 2016, 50–51; Huron 2006, 358–359) and the facilitation of perceptual predictions to the extent that ordinary stimuli do. Even where there seems to be little or no novelty, if we think, for instance, of various forms of geometric art, predictions are still violated at some level (e.g., illusions of movement as first-order prediction errors (see §II above) generated by op art).

There are distinctive ways in which prediction failure may arise in art appreciation. This is related to the fact that predictions in art are driven both by internalized scripts and patterns of works (§IV). According to the level of processing, errors may arise for instance in the sensory systems, in which case we would have a first-order prediction error. Sometimes our perceptual predictive systems may fail to categorize the perceptual content of works; here the errors concern perceptual categorization. Often, artworks are prone to prediction errors when their meanings collide with the

sensory evidence they convey or when they provide no stable perceptual references (Kesner 2014, 4). Yet, even when perceptual predictions fail systematically, some works may still trigger positive appreciation. Take for instance a still life by Braque, which fragments the perceptual space on the canvas into a myriad of scattered pieces. The more we try to integrate the various pieces into a perceived whole, the more the scene eludes our grasp. In this case, our ordinary perceptual habits to automatically categorize the depicted elements into discrete entities are turned into a handicap, but this only reinforces our appreciative response. Predictive failure at one level in the information processing hierarchy may be more important in some cases of art appreciation than predictive success. On this view, our responses to the discrepancy rather than correspondence<sup>1</sup> between what we predict and what we actually get from works (i.e., our responses to prediction failure) may be more positively valenced than in ordinary perception. Artistic success depends in many cases on eliciting predictive failure, on confounding our expectations, on entertaining curiosity, and uncertainty (Ransom 2022, 17). With many Cubist paintings, the uncertainty that is entertained is with respect to the distribution in space of elements that should normally be grouped together into a perceptual whole.

There can also occur prediction errors in appreciation when we fail to reliably categorize works and misattribute art categories. Sometimes something in the object may cause failure (for instance, something like Waltonian contrastandard properties, which hinder categorization, Ransom 2022, 17), or errors might be triggered when we base our hypotheses on the wrong scripts (§II. 1.2). Given that art-historical knowledge has a causal power on appreciation, our hypotheses might fail when guided by the wrong art-historical facts. This happens, for instance, with works in traditions we are not familiar with, upon which we impose the scripts that we already have in place. Modernist primitivism is a good example, where indigenous artefacts were seen exclusively through an aestheticizing lens, as embodying the natural expression a human creativity that eluded time.

When it comes to art-historical estimates (§IV), what counts as successful prediction or, on the contrary as representational error, will depend on a series of pre-existing states in the history of art. Disconcerting art forms that do not give rise to perceptual discrimination or categorization, start to make sense when placed in a relevant art context: thus, what counts as predictive error in the perceptual world may count as predictive success in the art environment. This view is compatible with the idea that there may be more than one correct scripts written in the objective art history itself. Art-historical narratives change continuously, helping us conceive art differently, and allowing us to play fast and loose with our art scripts, but even then, we have to be selective with respect to the scripts we summon in appreciation. Following this line of thought, in a sense, art-historical estimates help overturn the trope of strangeness associated with art. What counts as striking or strange in visual terms, can become predictable when considered in a script-like, organized setting (see §II. 1.2 above). Thus, art-historical estimates help strike a balance between contradictory cognitive and perceptual states. Moreover, art-historical estimates may reach aware-

<sup>1</sup> For an analytic account of the correspondence between predictions, emotional processes and pictorial stimulation, see (Wollheim 1990, 82–83; 1994, 151; 1983, 94–96; Budd 2008, 241–242, 248–249).

ness precisely because of perceptual predictive failure, that is, when one's perceptual predictions are confounded. For instance, Braque's *Violin and Palette* (1909), which initially allows coarse perceptual discrimination, starts making sense as soon as it summons latent assumptions about what a Cubist painting is. In appreciating this work, we rely on script-based predictions to resolve perceptual prediction-errors: the violin looks malformed until we process the painting as a Cubist work.

Another particularity is that in the art environment, we are more likely to cope with enduring states of uncertainty before correcting prediction error to reach perceptual categorization. The limits put by art on our expectations may be less constraining than those of the perceptual world, since there are no pressing real-world consequences, which would explain error-tolerant behavior and the delay in error correction. This delay would be driven more specifically by affective anticipations (e.g., the pleasure we anticipate experiencing after an active attempt at making sense of something) (Huron 2006, 7–8, 11; Van de Cruys 2011, 1035–1036). For instance, we may patiently linger in front of a Cubist painting until we start discerning meaningful patterns.

Arguably, script-based predictions can create a space for affective illusions (Hohwy 2013, 243; Van de Cruys 2017, 7–8), for instance a bias of confirmation with respect to the anticipated affective states likely to accompany a museum experience (etc. pleasure, surprise, expecting the unexpected etc.). We can think of many situations in which we mistakenly attribute our affective states to specific artworks whereas it is the art context which essentially orients our responses. The museum display induces specific expectations by framing our experience: features that would otherwise be unremarkable gain in significance when appreciated qua artistic, when framed as part of an artwork (Pelowski and Specker 2020; Leder and Pelowski 2021).

In the light of the distinctions established above, I propose that art appreciation involves engaging our predictive systems in such a way as to correct predictive failure at least at some levels in the information processing hierarchy. With script-based predictions generally counterbalancing or helping us revise predictive errors at various information processing levels while apprehending art works in categories. Making predictions and revising them at different levels in the processing hierarchy helps enhance our experience, possibly through amplifying our understanding of artworks. It remains to determine the affective consequences of making predictions in art appreciation, that is, the effect that obtains at the experiential level when engaging in a prediction dynamics.

## 6 Affective Valence and Prediction

That art appreciation involves predictive processing also explains why art appreciation is a form of valuing. Several questions arise here: to what extent does the implicit engagement with the art-historical tradition have an affective impact on art appreciation (Hopkins 2006, 20, 24, 33)? What is the role that script-based predictions or predictions tout court play in eliciting affective responses?

It is generally accepted that affect serves as feedback for predictions, signaling value. More specifically, affective experience provides information about the pre-

diction error dynamics (i.e., the change in prediction error over time) that is, about whether we progress or regress in predicting incoming stimulations. For instance, in a peek-a-boo game (Van de Cruys 2011, 1056), surprise and excitement come at the end of a process of uncovering thrilling evidence about the presence of a loved one nearby. It can be argued that it is precisely in this dynamic of correcting prediction errors that we find the affective value that we attribute to our engagement with art (Van de Cruys 2011, 1039, 1058). According to recent studies in cognitive psychology, in interacting with art, we make the best of this prediction error dynamics (Van de Cruys 2011; Van de Cruys 2017, 7–8; Huron 2006, 39), which may include, as we have seen, both first-order and second-order predictions (§II).

On a phenomenological account, second-order, experiential prediction errors reach affective awareness as they register contrasts that result from the transition between successive psychological states (for instance when we go from higher uncertainty to lesser uncertainty while trying to identify a movement in a musical composition). We can lively experience prediction errors and moments of introspective surprise (Van de Cruys 2011, 1038; Hohwy 2013, 245–246) when there is an increase and then a decrease over time in prediction errors. We experience thus a transition from a negative response to a positive response (e.g., the so-called Aha moments). When all prediction error is removed, the capacity for pleasure also seems to be diminished (Huron 2006, 39, 364–365, 373–374). This is likely to happen with works that have an obvious compositional structure, which eventually lead to boredom.

Moreover, apart from the dynamic of prediction error, the effect a work has on us depends also on which type of predictions are engaged. A tentative proposition formulated here is that script-based predictions, or art-historical estimates, shared within a community or group, play an important part in experiencing and cognizing art works in categories, which will equally impact our affective response. For instance, appreciating the qualities of the pictorial composition of a Picasso masterpiece in the development of early 20th century European painting has an affective impact at least just as significant as the pleasure generated by identifying mildly representational qualities of such a painting. Finally, introducing the notion of script-based predictions (§§III, IV) is a step toward reconciling affective states and a minimal sense of normativity of the appreciative response.

## 7 Conclusion

Prediction impacts art appreciation in a meaningful and non-arbitrary way. The account proposed here in terms of a prediction dynamic which fine-tunes our response to art through a continuous process of correction of predictive failure at various levels in the information processing hierarchy best explains the way we understand art appreciation as involving cognizing art works in categories, cases of appreciative failure, and why art appreciation is a form of valuing. The account equally outlines a more inclusive conceptual framework for predictions by considering art-historical estimates, a subclass of script-based predictions pointing to an internalized disposition to make inferences with respect to the position a work occupies in a tradition of

art, which help articulate the explanatory value of predictive processing for cognizing art works in categories.

**Acknowledgements** For useful suggestions and stimulating discussion, I am grateful to Dom Lopes, Jakub Stejskal, Mark Windsor, and the audience of the Czech Society for Aesthetics. I also thank an anonymous referee for very helpful comments. This work was supported by the Grant Agency of Masaryk University, MASH JUNIOR - MUNI Award in Science and Humanities, MUNI/J/0006/2021.

**Funding** Open access publishing supported by the National Technical Library in Prague.

## Declarations

**Conflict of Interest** None.

**Open Access** This article is licensed under a Creative Commons Attribution 4.0 International License, which permits use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons licence, and indicate if changes were made. The images or other third party material in this article are included in the article's Creative Commons licence, unless indicated otherwise in a credit line to the material. If material is not included in the article's Creative Commons licence and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder. To view a copy of this licence, visit <http://creativecommons.org/licenses/by/4.0/>.

## References

- Bar, Moshe. 2009. The proactive brain: memory for predictions. *Phil Trans R Soc B* 364: 1235–1243.
- Barrett, Lisa, W. Feldman, Simmons, and Kyle. 2015. Interoceptive predictions in the brain. *Nature Reviews Neuroscience* 16: 1–11.
- Bartlett, Frederic C. 1995. *Remembering: a study in experimental and social psychology*. Cambridge: Cambridge University Press.
- Budd, Malcolm. 2008. Wollheim on Correspondence, Projective Properties, and expressive perception. In *Aesthetic essays*, ed. Malcolm Budd. 239–251. Oxford, New York: Oxford University Press.
- Bullo, Nicholas, and Rolf. Reber. 2013. The artful mind meets art history: toward a psycho-historical Framework for the Science of Art Appreciation. *Behavioral and Brain Sciences* 36(2): 123–137.
- Carroll, Noël. 2001. Art, Practice, and Narrative. In *Beyond Aesthetics: Philosophical Essays*, ed. Noël Carroll, 63–75. Cambridge: Cambridge U.P.
- Clegg, J. K. 1977. The Meanings of 'Schematisation'. In *Form in Indigenous Art: Schematisation in the art of Aboriginal Australia and prehistoric Europe*, ed. Peter J. Ucko. 21–27. New Jersey: Humanities Press.
- Currie, Gregory. 2021. Style and the Agency in Art. In *Art, representation and Make-Believe: essays on the philosophy of Kendall L. Walton*, ed. Sonya Sedivy. 265–283. New York, London: Routledge.
- Davies, David. 2020. 'Categories of Art' for Contextualists. *Journal of Aesthetics and Art Criticism* 78, no. 1, Symposium: "Categories of Art" at 50: 75–79.
- Davis, Whitney. 1986. The origins of image making. *Current Anthropology* 27: 193–215.
- Davis, Whitney. 1993. Beginning the history of art. *The Journal of Aesthetics and Art Criticism* 51(3): 328–350.
- Davis, Whitney. 2010. World without Art: a commentary on World Art Studies. *Art History* 33(4): 710–716.
- Davis, Whitney. 2011. *A General Theory of Visual Culture*. Princeton: Princeton University Press.
- Davis, Whitney. 2013. Radical WAS: the sense of history in world art studies. *World Art* 3: 201–210.
- Davis, Whitney. 2017. *Visuality and Virtuality: images and pictures from Prehistory to Perspective*. Princeton: Princeton University Press.

- Davis, Whitney. 2018. Reading-In': Franz Boas's theory of the beholder's share. *Representations* 144(1): 1–33.
- De-Wit, Lee, and Bart Machilsen, Tom Putzeys. 2010. Predictive coding and the neural response to predictable stimuli. *The Journal of Neuroscience* 30: 8702–8703.
- Forge, Anthony. 1977. Schematisation and meaning. In *Form in Indigenous Art: Schematisation in the art of Aboriginal Australia and prehistoric Europe*, ed. Peter J. Ucko. 28–32. New Jersey: Humanities Press.
- Friston, Karl. 2013. The fantastic organ. *Brain* 136: 1328–1332.
- Gombrich, Ernst Hans. 1960. *Art and illusion: a study in the psychology of pictorial representation*. London: Phaidon Press.
- Gombrich, Ernst Hans. 1963. *Meditations of a Hobby Horse*. London: Phaidon.
- Hohwy, Jakob. 2013. *The predictive mind*. New York: Oxford University Press.
- Holly, Michael Ann. 2002. Reciprocity and reception theory. In *A companion to Art Theory*, eds. Paul Smith, and Carolyn Wilde. 448–457. Oxford: Blackwell.
- Hopkins, Robert. 2006. Painting, history and experience. *Philosophical Studies* 127: 19–35.
- Huron, David. 2006. *Sweet Anticipation. Music and the psychology of Expectation*. Cambridge, Massachusetts: The MIT Press.
- Jacobsen, Thomas. 2010. On the psychophysiology of Aesthetics. Automatic and controlled processes of aesthetic appreciation. In *Unconscious memory representations in perception*, eds. Isvan Czigler, and Istvan Winkler. 245–257. Amsterdam: John Benjamins.
- Kesner, Ladislav. 2014. The Predictive Mind and the Experience of Visual Art Work. *Frontiers in Psychology* 5: art. 1417, doi: <https://doi.org/10.3389/fpsyg.2014.01417>.
- Koelsch, Stefan, and Peter Vuust, Karl Friston. 2019. Predictive processes and the Peculiar Case of Music. *Trends in Cognitive Sciences* 23(1): 63–77.
- Kubler, George. 1962. *The shape of Time. Remarks on the history of things*. New Haven: Yale University Press.
- Layton, Robert. 1977. Naturalism and Cultural Relativity in Art. In *Form in Indigenous Art: Schematisation in the art of Aboriginal Australia and prehistoric Europe*, ed. Peter J. Ucko. 33–43. New Jersey: Humanities Press.
- Leder, Helmut, and Matthew Pelowski. 2021. Empirical Aesthetics: Context, Extra Information, and Framing. In *The Oxford Handbook of Empirical Aesthetics*, ed. Marcos Nadal, Oshin Vartanian, Oxford Handbooks Online, doi: <https://doi.org/10.1093/oxfordhb/9780198824350.013.43>.
- Levinson, Jerrold. 1979. Defining art historically. *British Journal of Aesthetics* 19(3): 232–250.
- Lopes, Dominic, and Madeleine Ransom. 2023. Perception in practice. *Review of Philosophy and Psychology* 14: 387–400.
- Matthen, Mohan. 2015. Play, skills and the Origins of Perceptual Art. *British Journal of Aesthetics* 55(2): 173–197.
- Matthen, Mohan. 2017. The pleasure of art. *Australasian Philosophical Review* 1(1): 6–28.
- Muth, Claudia, Vera M. Hesslinger, and Claus-Christian Carbon. 2015. The appeal of challenge in the perception of art: how ambiguity, solvability of ambiguity, and the opportunity for insight affect appreciation. *Psychology of Aesthetics Creativity and the Arts* 9(3): 206–216.
- Nanay, Bence. 2018. Against aesthetic judgments. In *Social Aesthetics and Moral Judgment: pleasure, reflection and accountability*, ed. Jennifer A. McMahon. 52–65. New York: Routledge.
- Pelowski, Matthew, and Eva Specker. 2020. The General Impact of Context on Aesthetic Experience. In *The Oxford Handbook of Empirical Aesthetics*, ed. Marcos Nadal, Oshin Vartanian, Oxford Handbooks Online, doi: <https://doi.org/10.1093/oxfordhb/9780198824350.013.42>.
- Ransom, Madeleine. 2020. Waltonian Perceptualism. *Journal of Aesthetics and Art Criticism* 78, no. 1, Symposium: “Categories of Art” at 50: 66–70.
- Ransom, Madeleine, Sina Fazelpour. 2021. The many faces of attention: why Precision optimization is not attention. In *The Philosophy and Science of Predictive Processing*, eds. Dina Mendonça, Manuel Curado, and Steven S. Gouveia. 119–139. London: Bloomsbury Academic.
- Ransom, Madeleine. 2022. Aesthetic Perception and the Puzzle of Training. *Synthese* 200, no.127: 1–25.
- Schank, Roger C., and Robert P. Abelson. 1977. *Scripts, plans, goals and understanding. An Inquiry into Human Knowledge Structures*. Hillsdale, New Jersey: Lawrence Erlbaum.
- Spolsky, Ellen. 2004. Introduction: Iconotropism or Turning Toward Pictures. In *Iconotropism: Turning Toward Pictures*, edited by Ellen Spolsky, 11–22. Cranbury: Bucknell University Press.
- Spolsky, Ellen. 2015. Distributed Misunderstanding. In *The Contracts of Fiction: Cognition, Culture, Community*, edited by Ellen Spolsky, 130–154. Oxford: Oxford University Press.



- Spolsky, Ellen. 2016. Women's work is Chastity: Lucretia, *Cymbeline*, and cognitive impenetrability. In *The work of fiction: Cognition, Culture and Complexity*, eds. Alan Richardson, and Ellen Spolsky. 50–84. New York: Routledge.
- Tillmann, Barbara, Isabelle Peretz, and Séverine Samson. 2011. Neurocognitive approaches to memory in music: music is memory. In *The memory process: neuroscientific and humanistic perspectives*, eds. Suzanne Nalbantian, Paul M. Matthews, and James L. McClelland. 377–394. Cambridge, Massachusetts: The MIT Press.
- Ucko, Peter J. 1977. *Form in Indigenous Art: Schematisation in the art of Aboriginal Australia and pre-historic Europe*. New Jersey: Humanities Press.
- Van de Cruys, Sander, Johan Wagemans. 2011. Putting reward in art: a tentative prediction Error Account of Visual Art. *i-Perception* 2: 1035–1062.
- Van de Cruys, Sander. 2017. Affective Value in the Predictive Mind. In *Philosophy and Predictive Processing*, ed. T. Metzinger, W. Wiese, Frankfurt am Main, MIND Group, DOI: <https://doi.org/10.15502/9783958573253>.
- Walton, Kendall L. 1970. Categories of art. *The Philosophical Review* 79(3): 334–367.
- Walton, Kendall L. 2020. Aesthetic Properties: Context Dependent and Perceptual. *Journal of Aesthetics and Art Criticism* 78, no. 1, Symposium: "Categories of Art" at 50: 79–84.
- Walton, Kendall L. 2021. Walton in Conversation. In *Art, Representation and Make-Believe: Essays on the Philosophy of Kendall L. Walton*, ed. Sonya Sedivy, 403–412. New York, London: Routledge, 2021.
- Williams, Daniel. 2018. Predictive Processing and the Representational Wars. *Minds and Machines* 28: 141–172.
- Wollheim, Richard. 1980. *Art and its objects*. Cambridge, New York: Cambridge University Press.
- Wollheim, Richard. 1983. Expression. In *On Art and the Mind*, edited by Richard Wollheim, 82–100. Cambridge MA: Harvard University Press.
- Wollheim, Richard. 1990. *Painting as an art*. Princeton, New Jersey: Princeton University Press.
- Wollheim, Richard. 1994. Correspondence, Projective Properties, and expression. In *The mind and its depths*, ed. Richard Wollheim. 144–158. Cambridge, MA: Harvard University Press.
- Wright, B. J. 1977. Schematisation in the Rock Engravings of North-Western Australia. In *Form in Indigenous Art: Schematisation in the art of Aboriginal Australia and prehistoric Europe*, ed. Peter J. Ucko. 110–116. New Jersey: Humanities Press.

**Publisher's Note** Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

Springer Nature or its licensor (e.g. a society or other partner) holds exclusive rights to this article under a publishing agreement with the author(s) or other rightsholder(s); author self-archiving of the accepted manuscript version of this article is solely governed by the terms of such publishing agreement and applicable law.