

Scientific Paper

On the importance of balance to aesthetic plating

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Abstract

Traditionally, the visual composition of food on a plate, or plating, has often taken place in an intuitive manner. In restaurants, plating is refined through an iterative process until the composition 'just feels right', often driven by the experienced whim of the chefs working at the 'pass'. Increasingly, though, science is starting to deliver insights that could explain, or disconfirm, the chefs' intuitions and 'rules-of-thumb'. Recently, researchers interested in the aesthetics of food have started to assess people's overall preferences when it comes to the visual composition of food on the plate, and the impact that this may have on the consumption experience. The research shows that principles borrowed from the visual arts can, to a certain extent, be applied to plating. In experimental aesthetics, one assertion that is often made is that people prefer balanced over unbalanced visual compositions. Here, we report on a series of citizen science experiments conducted at the Science Museum, in London, that demonstrate a clear preference for balanced over unbalanced presentations of exactly the same ingredients over all compositions. This preference for balanced plating is considered in light of the recent trend by many modernist chefs toward asymmetric plating (i.e., when all of the edible elements are crowded onto just one side of the dish).

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Introduction

Traditionally, decisions concerning the plating of food in a fine dining restaurant have been based on the intuitions of the chef, who was guided, if at all, by a series of rules of thumb. One such rule, for example, is that odd rather than even numbers of items should be served on the plate (refuted in Woods et al., 2016). Another is that angular shapes should not be pointed toward the dinner. Beyond this, the composition depends mostly on the ingredients making up the flavour of the dish, and the style of the chef, or restaurant.

In a way, such styles have been guided by fashions and trends, very much like what occurs in the world of art: Ranging from architecture-inspired vertical assemblages of

food back in Carême's day, through to the current trends toward asymmetrical plating (see Fig. 1) to the balanced compositions on 32 cm white plates with personalised monograms used by most of the chefs during the *nouvelle-cuisine* (still a 'mark' of that style of cooking), and indeed through to the use of serving food on bricks, stones and such so typical of the modern casual dining scene (see Abrams, 2013; Deroy et al., 2014; Spence and Piqueras-Fiszman, 2014; Spence et al., 2014; Styler and Lazarus, 2006; Yang, 2011, for reviews).

Over the last few years or so, a number of psychologists and sensory scientists have started to take an interest in systematically assessing people's preferences when it comes to different plating arrangements, giving us a hint that the *art of plating* might soon be informed by a more scientific approach (cf. Abrams, 2013). And while the intuitions of the chef often do turn out to be preferred by the public at large, this might not always be the case. Unbalanced plating, for instance, is not always preferred over more balanced compositions, and people seem to be willing to pay more for the

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Fig. 1. Examples of the contemporary trend toward asymmetrical plating, uploaded to @TheArtOfPlating on instagram by users @ivan_medina93, @one_restaurant, Rodolfo Guzmán and Curtis Duffy.

centred compositions (Michel et al., 2015a). Note, however, that context may be a critical factor when it comes to visual aesthetics of food (e.g., an asymmetrical arrangement at an experimental restaurant may not mean the same as the same arrangement in a standardized fast food restaurant, e.g., Edwards et al., 2003).

Decades of research on experimental aesthetics have highlighted a clear preference for visual balance (Arnheim, 1974; Banich et al., 1989; Gordon and Gardner, 1974; Locher, 1996; McManus et al., 1993). Indeed, research on the topic of visual aesthetics has consistently shown that those items occupying central locations tend to be preferred (see Palmer et al., 2013), and that preference decreases symmetrically the further away the item is moved from the centre (Palmer et al., 2008). Whilst this has been studied in visual objects at large, it seems that it could also apply to plating. This bias in spatial composition—one that seems to influence a viewer's appreciation of two-dimensional compositions—is known as the 'Power of the Centre' (Arnheim, 1986; Palmer et al., 2008). It might explain, at least to a certain extent, why people appear to prefer their food to be presented in the centre of the plate (e.g., Michel et al., 2015b).

This 'centre bias' could also mirror the tendency for people to prefer balanced over unbalanced food compositions. Zellner et al. (2010) had their participants evaluate the visual attractiveness and taste of a plate of food in either a balanced or unbalanced arrangement. The food consisted of slices of water chestnut and tahini (that was either coloured or naturally-uncoloured). The participants in this study rated the balanced presentation as more visually attractive, though no more 'tasty', than the unbalanced arrangement. Thereafter, Zellner et al. (2011; Experiment 1) assessed the attractiveness of a red pepper hummus placed on top of a romaine leaf with three baby carrots, three cherry tomatoes, and four pita chips. Somewhat surprisingly, the balanced presentation of this food was not judged as any more attractive, though it was rated as tasting better when compared to the ratings obtained for the unbalanced presentation. In other words, the taste of the food was liked when presented in a balanced manner, but neither strongly liked nor disliked when presented in an unbalanced manner. Zellner et al. (2011; Experiment 2) went on to show that it might have been the neatness of the presentation, rather than its balance, that affected the taste of food in their studies. In this experiment, a chicken 'salad' was served atop a leaf of

lettuce, with the balance held constant, but the messiness/neatness varied (the chicken was placed in either a neat mound in the centre of the leaf, or spread out in a messy but balanced manner). The neat presentation was not judged as any more attractive than the messy presentation, though the taste of the food in the neat presentation was rated higher.

Zellner (2015, p. 166) suggested, on the basis on earlier studies, that *“although balance might be an important visual contributor to the attractiveness of visual art, it is less important than neatness when it comes to food presentation”*. Note, however, that this contrast with Michel et al.'s (2014) findings, where a more complex food presentation was liked more than a neat presentation,² and an equally neat but balanced presentation was substantially preferred to a non-balanced one in a realistic dining setup (Michel et al., 2015a; Main dish, where the same composition of food elements were just moved to one side of the plate). That said, while the visual aspects of the food and the subsequent eating experience are undoubtedly made up of a complex interaction of factors, each of which merits attention, it is currently somewhat uncertain as to what is the most appropriate interpretation for the few studies that have been published to date on the topic of balanced versus unbalanced plating. Hence, we decided to test this as part of a series of citizen science experiments at London's Science Museum, both online³ and in an interactive digital platform at the 'Antenna Gallery', during an exhibition on the science of eating called 'Cravings'. Online, the participants were invited to access this experiment via the information page of the 'Cravings' exhibition, and from the Science Museum's home webpage. At the museum's gallery, the digital platform was one of the attractions offered to the visitors to the exhibition.

We hereby report the results of an experiment focused on just one compositional aspect of plating. We tested people's preference for different images of food that varied in terms of the spatial arrangement of the edible elements on the plate while keeping the amount and type of food constant, in order to better understand the importance of balance to people's plating preferences.

Methods

Participants

The dataset reported here consists of the opinions of 7495 participants (65% females), 7169 of whom took part in only one of the four comparisons tasks, while a further 326 took part in two or more of the four comparisons (see below). 88.2% of the participants took part in the experiment at the gallery's digital platform, and the remaining at the Science

Museum website. The participants specified whether their age was < 16, 16–34, 35–54, 55–74 or 75+ years; the respective percentages in each group were 32.46, 46.00, 15.84, 4.98, and .72. The geographical area of origin of the participants was as follows: 56.06% from the UK, 25.14% from other countries in Europe, 6.17% from North America, 5.29% from Asia, 3.92% from Oceania, 2.08% from South America, 1.30% from Africa, and .04% did not report their place of origin. 85.60% of the participants were right-handed and 14.40% left-handed. All of the participants who took part in the gallery's experiment were informed about the nature of the study through a printed information sheet, and provided informed consent prior to taking part in the study. This study has been approved by Oxford University's Medical Sciences Inter-Divisional Research Ethics Committee (approval MSD-IDREC-C1-2015-004).

Apparatus and materials

The original image consisted of four seared scallops placed in a straight line on a flat white surface. The picture was taken from a zenithal angle, and the light used was also placed immediately above the food to avoid any shadows. The picture was taken on a white background. The scallops were isolated from the background using graphics software, and then edited to fit on a plate which was photographed separately, using the same characteristics in terms of light and angle. Careful attention was paid to ensuring that any shading around the food was removed. The image was then superimposed onto a photo of a round white plate.

Design and procedure

Participants taking part in the citizen science study were randomly assigned 5 tasks corresponding to the 7 different experiments being tested. The order of the tasks and the different conditions that they involved was randomised. Note that although it was possible that the same participant would have to respond to the same preference task twice, different foods would have been presented on the different occasions.

At the start of each trial, the two images of food appeared side-by-side for three seconds, then, the question 'Which plate of food do you like more?' was displayed. Participants had to choose between one of the two plates to continue the experiment. The side of the screen on which each of the stimuli appeared was randomised (see Fig. 2, for an example of the on-screen layout of the experiment).

The number of scallops on the two plates was held constant (4) while the position of the line of scallops was varied on each plate. We compared a vertically centred display versus an offset display (the line of scallops was either placed on the far left or the far right of the plate). A horizontally centred display was compared to an offset display (the line of scallops was either placed on the upper side, or the lower side, of the plate; see Figure 2B and Table 1).

²And, although the perception of visual balance was not experimentally assessed, the food presentations in Michel et al.'s study were all equally centred on the plate, even though the different compositions occupied a different surface area.

³Note that this experiment is being conducted from the 20th of February 2015, until January 2016, see <http://bit.ly/1MwGh35> to access the experiments online.

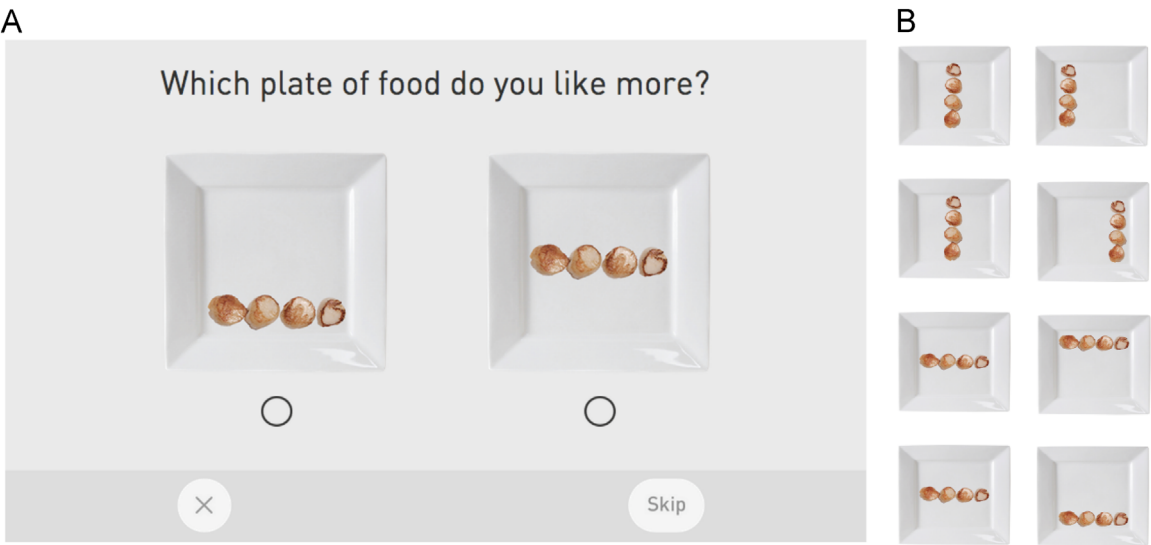










Fig. 2. A screenshot of the preference-task performed by participants in the study conducted in the London Science Museum, is presented in Panel A. Note that the order of appearance (left-right) of each pair of comparisons (Panel B) was randomised. The plates are presented with different displays of the food, four aligned scallops.

Table 1
Summary of the number of participants choosing between each pair of visual compositions of the food, frequencies of preference for each type of composition, and McNemar tests.

Pair	n	Stimuli	Frequencies	%	Chi-squared	Significance (2-tailed)
1	1938		1529	78.90%	646.11	< .001
			409	21.10%		
2	1922		1525	79.34%	660.84	< .001
			397	20.66%		
3	1966		1683	85.61%	995.52	< .001
			283	14.39%		
4	2002		1788	89.31%	1235.93	< .001
			214	10.69%		

Results

McNemar tests were used in order to assess any differences on the frequencies of the participants' dish selections in the four pairs of dishes presented. A summary of the results is presented in [Table 1](#).

The results of all four comparisons revealed a very strong preference for balanced over unbalanced plating of the scallops.⁴ Such a preference for balanced presentation is consistent with studies on visual aesthetics (e.g. [Palmer et al., 2008](#)), and with recent evidence from a naturalistic dining study ([Michel et al., 2015a](#)).

Discussion

Plating and the power of the centre

In the present research, the exact same composition of food elements (four scallops) were placed in different locations of the frame (plate). Hence, it could be argued that the neatness of the various presentations was controlled for in a way that had not always been possible previously (e.g., [Zellner et al., 2010, 2011](#)). Unless, of course, balance would be a variable that would affect neatness perception, or the other way round. In our previous research, we have been able to demonstrate that diners are willing to pay significantly more for centred (or balanced) versus asymmetric (or unbalanced) presentation of the same elements, in a dish that was served as part of a three course experimental lunch held in the dining room of an Oxford College, for 150 guests ([Michel et al., 2015a](#)). That said, no significant effect of varying the balance of the plating of a dish was obtained in another study conducted at a hotel restaurant in Scotland last year ([Michel et al., 2015c](#)). There, a starter was served to 62 diners in a relatively balanced presentation versus to a further 59 diners in an unbalanced presentation (see [Michel et al. 2015b](#); [Figs. 1a and b](#)). However, no significant differences were observed, probably due to the fact that although one presentation was clearly more unbalanced, both presentations were asymmetrical (cf. [Velasco et al., 2016](#)).

While balance may be essential in shaping our opinion of a seen landscape (be it a painting, garden, or a plate of food), it is important to bear in mind that the ultimate aesthetic appreciation can be modelled by several cognitive factors (e.g., [Van der Laan et al., 2011](#)). For instance, unbalanced plating could be perceived as being more creative than balanced plating. This latter could therefore be associated with more traditional values. Hence, it is highly likely that plating preferences will vary according to the expectations that the diner has, and the context in which the food is consumed ([García-Segovia et al., 2015](#); [Zellner et al., 2014](#)).

Interestingly, [Zellner et al. \(2011\)](#) had their participants look at pictures from different plating experiments, and rate the

amount of care taken by whoever had prepared the dish. The perceived 'care' or effort was judged higher in neat as opposed to messy presentations. People also said that they would have been willing to pay more for the neat than for the messy presentation, and thought any restaurant preparing such food to be of higher quality. Hence, perceived neatness could suggest higher quality, and maybe even better taste, at least according to the diner's expectations. This is supported by [Michel et al.'s](#) findings (2014), where participants liked the taste more and were willing to pay significantly more for complex presentation of a salad dish (inspired by a painting of Kandinsky), suggesting that the 'effort' involved in preparing a dish is appreciated by the diner and, thus, could be the determining factor in changing the perceived value of the dish. An aesthetically pleasant neat but complex composition might be what people are ready to pay more for, as it naturally would be a sign of both skill and effort. As advanced by [Denis Dutton](#), philosopher of aesthetics, the value of an *artistic* piece could be rooted in the assumption of the human effort underlying its creation ([Dutton, 2009](#), p. 156).

Conclusions, limitations, and future research

In conclusion, we are very much in agreement with [Palmer et al. \(2013, p. 77\)](#) who have suggested that the "*aesthetic response can be studied rigorously and meaningfully within the framework of scientific psychology*" (see also [Jacobsen, 2006](#)). We also believe that this approach can be extended to aesthetics on the plate. The scientific approach outlined in this and our related research can be seen as extending [Palmer et al.'s \(2013, p. 82\)](#) suggestion regarding aesthetic appreciation of the visual arts: With the science of aesthetic plating, one is not trying to decide whether some plate of food is "*objectively beautiful*", "*but rather to determine whether (or to what degree) some representative set of individuals judge or experience it as beautiful (or ugly)*". Ultimately, then, the scientific approach outlined here can be thought of as part of the interdisciplinary aesthetic science advocated by [Shimamura and Palmer \(2012\)](#). In the case of plating, guidelines for optimal plating could emerge giving place to more mindful food presentations, probably affecting consumption behaviours in a positive manner.

It is worth noting that the preference judgments that were obtained in the present study were based solely on visual comparisons of pairs of dishes that were seen on a monitor but which the participants knew that they would not get to eat/taste. However, the data gathered from the large number of participants taking part in this experiment highlights a clear visual aesthetic preference. Given that people were aware that the images that they were rating consisted of food, we may assume that these preferences would be translated into preference for real plates of food. In addition, it would be interesting to investigate whether there are any cross-cultural differences in people's preference for different visual arrangements of the elements on the plate (e.g., see [Martindale et al., 1988](#); [Zampollo et al., 2012](#)), but also to consider whether an individual's level of expertise affects their appreciation for

⁴In fact, over the 22 plating tasks that we tested at the Science Museum, the preference for balanced over unbalanced plating was the strongest result that we have obtained by quite some margin.

different styles of plating (Hekkert and van Wieringen, 1996; see also Jacobsen and Höfel, 2002; Palmer and Griscom, 2013, on individual differences in aesthetic judgements).

One limitation to take into account is the use of squared plates, and the fact that aesthetic appreciation might change according to the frame in which the composition is presented, with a potential interaction between the display/shape of the food, and the shape of the plate. Given that round plates are more common than square ones, and the fact that most research on visual aesthetics has been performed on quadrilateral frames (canvas), there is an exciting potential for future research on visual aesthetics on a round frame (the plate).

Here, we would like to highlight that, in theory, the rapid growth of online testing platforms offers the chef the exciting opportunity to do quick tests of their dishes. For example, it is now possible to upload a picture of one's culinary creations onto the internet one evening, and have the opinion of several hundred potential diners concerning how they would like the dish to be plated fed back to the kitchen the next morning, ready for that day's service (Michel et al., 2015b). It is now increasingly easy to collect data online (Woods et al., 2015), as well as in citizen science experiments, and there is a growing public interest in the topic of food aesthetics (see Spence et al., 2015). The sense is that the science of plating, or rather the scientific approach to aesthetic plating, will continue to grow in the years to come.

To conclude, people seem to have a clear preference for balanced over unbalanced presentations of exactly the same ingredients. It would seem that how 'unbalanced' a dish is, which could potentially be measured in terms of the distance of the food composition from the central point of the frame (plate), would be an essential component in terms of modelling visual preferences in plating. We believe that although visual preference for food might be modelled by a myriad of factors, many of the principles put forward by experimental aesthetics on visual art perception could actually become guidelines for optimal plating. In this case, we suggest that the recent trend by many modernist chefs toward asymmetric plating might not be the optimal way of presenting food on a plate, but rather a tendency to separate modernist practices from more traditional ones.

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