

ASSESSING THE AESTHETIC OBLIQUE EFFECT IN PAINTING AND PLATING

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ABSTRACT

Analysis of people's preferences concerning the orientation of paintings has revealed robust evidence for what is known as the aesthetic oblique effect. That is, horizontal/vertical lines are preferred, aesthetically-speaking, over oblique lines in painting by both artists and those who view their works. At the same time, however, researchers have also demonstrated the existence of a preference for linear food elements (be they presented on the plate or on product packaging) when shown ascending to the right (rather than the left, or else when presented in any another orientation). Here, we report on three online studies, the first demonstrating that people visually prefer an edible version of one of Kandinsky's paintings when presented horizontally (while preferring either the horizontal or vertical orientation for the painting on which the dish was based; Experiment 1). In a second study, a similar preference for the horizontal/vertical alignment of a much simpler langoustine dish, with a single dominant linear element, was also documented. This preference for the canonical orientations was also reported in a third experiment with another visually-simple chef-prepared dish. Taken together, these results therefore emphasize the similarity in aesthetic preferences for the horizontal/vertical alignment when viewing either paintings or certain chef-prepared plates of food. At the same time, however, these results also raise the question of what factors determine whether the horizontal/vertical or the ascending to the right preference that dominates when plating food.

KEYWORDS: AESTHETIC OBLIQUE EFFECT; PAINTING; PLATING; GASTROPHYSICS; EXPERIMENTAL AESTHETICS.

Introduction

Coinciding with the rise of nouvelle cuisine (see Spence & Piqueras-Fiszman, 2014), both chefs and the diners they serve started to become increasingly interested in the visual plating of food (Dornenburg & Page, 1996; see Deroy, Michel, Piqueras-Fiszman, & Spence, 2014, for a review). Following on from this movement, there has been growing excitement around the possibilities of assessing the art of plating scientifically (see Spence, Piqueras-Fiszman, Michel, & Deroy, 2014, for a review) both online and in more ecologically-valid studies conducted in restaurant-/cafeteria-type settings (e.g., Rowley & Spence, 2018; Spence, 2017a, b, in press-a; Zellner, Loss, Zearfoss, & Remolina, 2014). Importantly, however, while the appeal of certain intuitive practices have been confirmed, several ‘rules of thumb’ from the kitchen regarding aesthetic plating have been brought into question by this emerging body of research. This includes largescale studies questioning the importance of plating odd rather than even numbers of elements on the plate (see Woods, Michel, & Spence, 2016) and research questioning the benefits of asymmetrical plating (see Velasco, Michel, Woods, & Spence, 2016). A separate line of empirical research has assessed whether there are certain orientations of food on the plate (or displayed on product packaging) that are preferred over others, and it is to that research that we turn now. Intriguingly, much of this work has been inspired by prior studies from the visual aesthetics of painting literature (see Lindell & Mueller, 2011).

The aesthetic oblique effect

People find it easier to perceive horizontal and vertical lines than their oblique counterparts (e.g., Appelle, 1972; Davidoff, 1974). Interestingly, Latto, Brain, and Kelly (2000) found that people prefer horizontal/vertical lines over oblique lines in a selection of Mondrian’s paintings, an artist famous for his use of high contrast horizontal and vertical lines. Relevant to any

consideration of the impact of the frame on people's preference, a number of the artist's paintings come in a lozenge, or diamond-shaped, format (that is, they have an oblique rather than a rectangular frame). In one study, each of these paintings was presented to the participants rotated in each of 8 possible orientations, separated by 45 degrees. The participants rated their liking for every one of the 64 images so created, using a 7-point hedonic scale. Intriguingly, the results revealed a small but significant preference for those pictures in which the lines were arranged horizontally and vertically (regardless of the orientation of the frame) over those where the lines in the painting were oriented obliquely instead. Subsequent analysis of the proportion of horizontal, vertical, and oblique lines in 88 20th century paintings held in the Israel Museum in Jerusalem revealed, once again, a preference amongst artists (or curators who select their work) for the horizontal and vertical over the oblique (Latto & Russell-Duff, 2002).

With reference to the more fundamental question of why it should be that people prefer lines that are vertical and horizontal over those that are oblique, it has been suggested that people generally prefer those shapes (and arrangements of shapes) that they find easier to process visually (see Latto, 1995; Zeki, 1999). We are exposed to more horizontal and vertical (than oblique) lines in the built environment (Switkes, Mayer, & Sloan, 1978), and so a familiarity-based account (under the premise that familiarity breeds liking) is also possible. Indeed, according to the visual neurophysiology literature, cardinal-oriented (horizontal and vertical) lines are more prevalent than oblique lines in the environment, and these statistics are then mirrored in the overrepresentation of early visual neurons that are tuned for cardinal relative to oblique orientations, as well as narrower tuning curves, the latter resulting in more precise representations (Annis & Frost, 1973; Coppola, Purves, McCoy, & Purves, 1998; Girshick, Landy, & Simoncelli, 2011; Keil & Cristobal, 2000; Li, Peterson, & Freeman, 2003; Switkes et al., 1978). This, in turn, may lead to a preference for cardinal orientations because they are more fluently processed by observers (see Reber, 2012; Reber & Schwartz, 2001; Reber,

Schwarz, & Winkielman, 2004; Reber, Winkielman, & Schwarz, 1998, on the concept of processing fluency).

However, despite this oft-documented preference for linear elements aligned horizontally or vertically (e.g., in the visual arts), several studies in experimental gastronomy (or gastrophysics; see Spence, 2017a) have also documented a preference for linear food elements on the plate when they ascend to the right rather than when they ascend to the left.

INSERT FIGURE 1 ABOUT HERE

Ascending to the right: A preference for the oblique orientation of linear elements

When there is a dominant linear element on the plate, previous research has highlighted a preference when that element ascends to the right (rather than to the left). For example, Youssef, Juravle, Youssef, Woods, and Spence (2015) presented viewers with two versions of the same dish created by chef Jozef Youssef, one more round/centred and the other presentation with a distinctive linear arrangement (see **Figure 1**). These two dishes were uploaded onto the internet and people (N = 521) were invited to rotate each of the plates into their preferred orientation. While the results revealed no clear preference as far as the round/centred presentation of the dish was concerned, there was a clear (and significant) preference for the ascending-to-the-right orientation for the linear plating arrangement. Hence, based on these results, this was the orientation in which the dish was served to diners at the chef's subsequent pop-up dining events. Based on such findings, chef-artist Charles Michel also plated a number of his innovative dishes with the linear element ascending to the right (see **Figure 2**). Along similar lines, packaging design research by Velasco, Woods, and Spence (2015) has revealed a preference for food elements (such as a pasta tube) when it was aligned ascending to the right

rather than when aligned vertically. Hence, several studies have documented a robust preference for food elements when they ascend to the right over the canonical horizontal/vertical orientations.

INSERT FIGURE 2 ABOUT HERE

But why, one might ask, should the ascending-to-the-right orientation be preferred? According to Arnheim (1974), the bottom-left to top-right diagonal appears to be ‘ascending’, while the top-left to bottom-right diagonal, appears to be ‘descending’. At the same time, marketing research has shown that product logos that ascend to the right are associated with notions of activity in the mind of the consumer (Schlosser, Rikhi, & Dagogo-Jack, 2016). However, when it comes to food, it is worth noting that our brains simulate the act of eating a plate of food even if it is seen on the internet (or on the front of product packaging). Importantly, anything that can be done to make it easier for the viewer to simulate the act of eating the plate of food tends to translate into increased liking, an effect that has been attributed to increased processing fluency (see Elder & Krishna, 2012). Hence, the ascending-to-the-right preference in plating might also be explained in terms of this presentation of the food being easier to simulate eating (at least for those who are right-handed) than when the same food is shown ascending-to-the-left instead. That said, and arguing against the food specificity of this ascending-to-the-right effect, it is worth highlighting the fact that certain of Kandinsky’s canvases (including the circular canvas shown in **Figure 3**) also exhibit something of a preponderance of linear elements ascending-to-the-right (see also Just, 2017; Kemp & Blakemore, 2006, on Kandinsky’s status as a synaesthete, and details of a recent display of his work).

INSERT FIGURE 3 ABOUT HERE

Outline of present research

In the present study, we report the results of two experiments performed using the same online task in which the participants were shown plates of food (and the painting on which one of the dishes was based) and asked to rotate the visual stimulus into the angle/orientation that they preferred visually (see Michel, Woods, Neuhaeuser, Landgraf, & Spence, 2015b; Velasco et al., 2015; Youssef et al., 2015). However, rather than giving participants only a limited number of choices from which to choose (as was the case in the earlier research with painting; e.g., Latto et al., 2000; Latto & Russell-Duff, 2002), the participants in the present study had the opportunity to orient the composition freely, in order to determine whether there were any statistically significant biases in terms of the preferred orientations that were chosen. Here it is worth noting that the online evaluation of plating preferences is becoming an increasingly common technique (see Woods, Velasco, Levitan, Wan, & Spence, 2015, for a review on online research). Note also the round frame of the plate makes it more appropriate to use a free-rotation task than when rotating a typically-rectangular canvas. In the first experiment, we presented an aesthetically-plated salad based on one of Kandinsky's paintings (Painting #201, <http://www.moma.org/collection/works/79452>), which was developed by chef-artist Charles Michel to study the impact of an art-inspired food presentation on multisensory flavour perception (see Michel, Velasco, Gatti, & Spence, 2014).

EXPERIMENT 1

Methods

All of the participants provided informed consent prior to taking part in the study. This study was approved by Oxford's University Medical Sciences Inter-Divisional Research Ethics

Committee (approval # MS-IDREC-C1-2015-007). A total of 294 participants took part in the study. However, the data from nine of the participants was excluded from the final analysis as they confirmed that they had recognised the original Kandinsky painting.

INSERT FIGURE 4 ABOUT HERE

Kandinsky's Painting #201 was used as one of the visual stimuli, and a picture of the "Salad with a taste of Kandinsky", the edible representation of the canvas with the background digitally-removed, and then superimposed onto a round white plate was used as the other (see **Figure 4**). For the rotation task, the participants were instructed to rotate the food by moving the cursor around the centre of the image until they landed on the orientation that they thought looked most appealing. Note, however, that the initial orientation of the visual stimuli was selected randomly for each participant in order to avoid any kind of anchoring effect that might have been observed if all of the participants had seen the image of the food at the same initial orientation (e.g., Kahneman & Tversky, 1973; Stewart, 2009). Once they were satisfied with the orientation of the dish/painting, the participants were instructed to tap the Space bar on the keyboard in order to enter their response. Participants were recruited online via Amazon's Mechanical Turk (see Woods et al., 2015, for an overview of online research; and see Michel et al., 2015b, for further details concerning the design of this orientation task, and the statistical analyses performed). The same procedure was used for all three of the experiments reported here.

While the apparatus varied by participant, the study was conducted 'full screen', using the entirety of the participant's monitor. Note that the study took place within a 1024x768-pixel box in the centre of screen, irrespective of the size of the monitor. The experiment was conducted on the Internet using the Adobe Flash based version of the Xperiment software package (version 1; Woods et al., 2015). The experiment lasted for no more than a few minutes.

185

186 *Results and discussion*

187 The orientation data from Experiment 1 was analysed by means of simulation (see the
 188 Appendix for details). The orientation data was binned into 20 equally-sized groups (offset
 189 from the vertical by 360/28/2 degrees). Bins, (coloured red), exceeding 43 orientations, did so
 190 at a level greater than expected by chance ($p < .001$; via a distribution that was based on the
 191 maximum number of consistent ‘by-chance’ orientations by 285 virtual participants in one of
 192 20 orientations per experiment simulation, over 10,000 simulations). In contrast to the findings
 193 reported in the Introduction (showing that viewers tend to prefer the orientation in which the
 194 painter chose to display their work), Kandinsky’s painting was not preferred in any one
 195 orientation over the other three canonical orientations (left, up, right, down were selected by
 196 83, 54, 54, and 47 participants, respectively, see **Figure 4**, top). It should, though, be noted that
 197 participants clearly exhibited a preference for a balanced/stable orientation. Perhaps, though,
 198 this result should not come as such a surprise given that Kandinsky (1977) himself was clear
 199 in defining his artwork as a ‘nonobjective painting’, a landscape of colour free of descriptive
 200 devices. As such, the only preferences as far as orientation of the work is concerned would
 201 appear to be given by the outline (or frame) of the painting (and not by the content) needing to
 202 look balanced/stable.

203 Intriguingly, however, the ‘Salad with a taste of Kandinsky’, originally created by Michel et
 204 al. (2014), which was plated on (or rather superimposed over) a round plate was clearly
 205 preferred when aligned horizontally rather than vertically (see **Figure 4**, bottom; 53
 206 participants orientated the dish rightward, 50 leftward). Here it is interesting to note that when
 207 Charles Michel originally plated the Kandinsky-inspired salad, it was presented in the opposite
 208 orientation to that of the original painting. The chef’s intuition, in this case, being that it would

look nicer and/or be more natural to have the slice of mushroom plated so as to look as it was standing up rather than inverted (i.e., upside down). However, the evidence from the 285 participants tested in Experiment 1 suggests this intuitive approach seems not to have been preferred by viewers. This, then, yet one more example of a situation in which the intuitions of the aesthetically-minded chef do not necessarily carry through to predict the preferences of the average viewer/diner.

Having demonstrated a preference for the horizontal orientation of the rectangular-shaped plating of the Kandinsky salad (over the vertical)¹ we went on, in Experiment 2, to investigate whether a dish with a much simpler visual presentation and with a singular dominant linear element would also be preferred in the horizontal/vertical orientation, or whether instead the dish would be preferred when ascending to the right (as reported by Youssef et al., 2015; see also Velasco et al., 2015).

EXPERIMENT 2

Stimuli

The dish used as the visual stimulus in Experiment 2 was a Langoustine dish created by chef Jozef Youssef. This dish was served as one of the courses at Kitchen Theory's culinary dining concepts accompanied with a soup in a teapot (see **Figure 5**). The dish, titled 'The Sight & Sound of Flavour', featured as an intermediate course on a nine-course tasting menu inspired by the neurological phenomenon of synaesthesia.² The dominant taste notes in the dish focused

¹ In future research, it might be interesting to investigate whether people's preferences for the horizontal vs. vertical alignment of the Kandinsky dish would change if it were to be presented on a rectangular plate rather than the round plate used in Experiment 1.

² Each of the courses on the menu offered insights into the world of crossmodal correspondences, which often underpin our interpretation and enjoyment of eating and dining (see Saluja & Stevenson, 2018), this particular dish was focused on sound and flavour correlations. A carefully selected piece of music

on umami and sweetness. The dish consisted of a white miso velouté, a single Scottish langoustine lightly poached in beurre noisette (toasted butter), sweetcorn fluid gel, tofu cream, and chilli oil.

INSERT FIGURE 5 ABOUT HERE

In this case, the plating preferences of 401 participants were ascertained using the same experimental design as reported in Experiment 1. 227 participants were shown the dish without the teapot, and a further 174 were shown the dish with the teapot (group allocation was determined randomly). However, given that the results of the two visual presentations were similar, the data from all participants is presented together here for ease of exposition.

Results and discussion

The results of Experiment 2 are summarised in **Figure 6**. The experiment was again simulated 10,000 times, with 401 rotations per simulation. Orientations exceeding 56 selections were greater than that expected by chance ($p < .001$; 62 participants orientated the dish rightward, 62 upward). Visual inspection of the figure once again reveal clear evidence for a preference for the horizontal/linear presentation. Interestingly, the participants clearly did not like the claws of the langoustine pointing downward (i.e., in some sense effectively toward the diner). This was the least preferred of the four canonical orientations (one person selected this orientation; 30 selected leftward). The results of our second study therefore suggests a preference for the horizontal/vertical alignment of the linear element in the dish (the langoustine). As to why the participants should have preferred the claws not to point downward (in some sense directly at

(https://www.youtube.com/watch?v=bznD_ySyw8M) and the accompanying fMRI visualisation was used as inspiration by the Kitchen Theory chefs to design both a flavour profile and visual presentation. The final dish was developed on the basis of both the existing literature related to the relationship between audio and flavour perception as well as ‘culinary intuition’.

them), this may link to the literature on people showing a fear response when pointy shapes are oriented toward them (perhaps reflecting a primitive fear response triggered by a potentially dangerous stimulus/situation; see Larson, Aronoff, Sarinopoulos, & Zhu, 2009; see Michel et al., 2015b).

INSERT FIGURE 6 ABOUT HERE

EXPERIMENT 3

In Experiment 3 (N=302 participants), we went on to test a dish that had been created by a Brazilian chef Xavier Gamez (see **Figure 7**). The results of Experiment 4 are summarised in **Figure 7**. The experiment was again simulated 10,000 times, with 302 rotations per simulation. Orientations that were selected in excess of 45 times were greater than that expected by chance ($p < .001$; 50 participants orientated the dish downward, 47 upward). Visual inspection of the figure once again reveal clear evidence for a preference for the horizontal/linear presentation. Notice how, with a very simple linear presentation, the vertical (and to a lesser extent, the horizontal) orientation is once again preferred, thus supporting the idea that balanced and linear plating is preferred when plated in a canonical orientation.

INSERT FIGURE 7 ABOUT HERE

Conclusions

The results of Experiment 1 unequivocally demonstrated a preference for Kandinsky's painting (Number 201) and the chef-prepared Kandinsky salad (originally described by Michel et al., 2014) when they were oriented either horizontally or vertically. Intriguingly, there was no

preference for a specific canonical painting orientation (this finding, note, contrasting with the results of previous studies of preferred orientations of more representational paintings). Meanwhile, the results of our second study revealed a preference for the langoustine dish when it was in one of three canonical orientations. A similar preference for a canonical orientation was also reported in Experiment 3. Taken together, the results of the three experiments reported here (assessing the plating preferences of a total of around 1000 individuals) demonstrate that the preference for balanced/stable canonical orientations, first demonstrated in the world of painting, also seems to apply to the world of plating too, at least under certain conditions. This was true for both the Kandinsky salad dish by the chef-artist Charles Michel and chef Jozef Youssef's langoustine dish, as well as for chef Xavier Gamez's leek dish.

More generally, it is interesting to see how online testing methodology (specifically involving the orientation task) can be used to assess people's plating preferences and the similarities/differences between the painting and plating preferences. At the same time, however, these results also raise a number of follow-up questions. For instance, what factors determine whether it is the horizontal/vertical preference, or the ascending to the right preference, that dominates when viewing plates of food. And, of course, whenever research is conducted over the internet there must always remain a question about the 'external validity' of the findings. With regard to the former question, the preference for the ascending-to-the-right orientation may emerge when the viewer's attention is drawn to the 'figure' in the centre of the plate, whereas the canonical orientations may be preferred when the viewer considers the entirety of the plate, or when focusing on the frame of the work/dish. Such an explanation, while admittedly post-hoc, would certainly explain the difference in results between Youssef et al.'s (2015) previous results and those of Experiment 1, reported here. However, this suggestion doesn't really feel like it does justice to the canonical orientations preferred in the present Experiments 2 and 3. As such, we can only speculate that the difference may reflect

some other, as yet unidentified difference, such as perhaps the way in which the viewer is introduced to the dish (e.g., as a work of art vs. as a modernist restaurant dish), or perhaps some effect of the context in which the viewer's judgments are made (see Spence, 2019). It is worth noting at this point that there was some suggestion of individual differences in orientation preference amongst the participants tested in the three experiments reported here. Intriguingly, previously researchers have investigated the existence of orientation anisotropy differences between Caucasian and Chinese participants (see Timney & Muir, 1976).

With regard to the second of the two questions raised above, while we have no formal data from the restaurant setting that is relevant to the dishes described here, it is perhaps worth noting that elsewhere in our previously-published research we have found broad agreement between the results of online plating assessment, and the preferred presentations documented for dishes when served in the restaurant context (e.g., see Michel, Velasco, Fraemohs, & Spence, 2015a; Rowley & Spence, 2018). To the extent that such results can be generalized to the present study, we would predict a similar preference for canonically-oriented (i.e., horizontal or vertical) should diners be quizzed about their preferences in a restaurant setting though see also Jiminez, Rodriguez, Greene, Zellner, Cardello, & Nestrud, 2015).

Relevant to the themes of the present research, there have been a number of examples of works of art that have been turned into edible form. While many such examples consist of paintings that have served as inspiration for the dishes that chefs have copied, famous examples of sculpture have also been rendered in edible form. This a seemingly popular approach amongst restaurants that are connected to museums/art galleries. A couple of fabulous examples are served at the Silks restaurant that is attached to the Taiwan National Palace Museum (e.g., Shu, 2008). Two of the most famous pieces in the museum's collection are the *Jadeite Cabbage with Insects* and the *Meat-Shaped Stone*. Both of these chef-friendly works of art have been

rendered edible in the restaurant.³ Such dishes feed in to the thorny issue of whether chefs can be considered artists and whether the dishes that they prepare, since they are consumed, can be evaluated in a disinterested manner, as some commentators have deemed necessary (see Carey, 2005; Spence, 2017b, in press-b).

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³

See

<https://www.atlasobscura.com/foods/jade-cabbage;>
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FIGURE LEGENDS

Figure 1. Circular data plots and purple rose diagrams of the preferred plate orientations for each dish selected by participants in Youssef et al. (2015; Experiment 3). The results clearly highlight a preference when the linear element ascends to the right (see left panel). For clarity and ease of interpretation, the food has been added to the figure and oriented by the mean orientation in which the food was placed by participants. [Figure courtesy of Youssef et al. (2015).]

Figure 2. Two of the dishes awarded “best dish of the night” on Netflix’s “The Final Table” culinary competition, created by chefs Charles Michel and Rodrigo Pacheco. Dish A. is “Golden taco with grasshoppers, cactus, cactus fruit, aloe vera and mezcal emulsion”. Dish B. is “Lobster Paella “A la Miró””. Note the main linear element ascending to the right.

Figure 3. One of Kandinsky’s circular paintings. Note that this painting which bears more than a passing resemblance to a round white plate, contains the striking oblique lines ascending to the right.

Figure 4. Participants rotated “Painting #201” by W. Kandinsky (top), and the “Salad with a taste of Kandinsky” (bottom) to their preferred orientation. Bins, coloured red, exceeding than

expected by chance, $p < .001$. The surrounding line shows a kernel density estimate (bandwidth of 40); this is a non-parametric estimate of the underlying density of the data (each data-point is, in effect, 'blurred', and so contributes to a range of points that make up the line; so, the larger the number of data-points at a given orientation, the greater the bulge in the line).

Figure 5. 'The Sight & Sound of Flavour'. The dish featured as an intermediate course on a nine-course tasting menu (delivered by Kitchen Theory) inspired by the neurological phenomenon of synaesthesia. The dish consists of white miso velouté, Scottish langoustine poached in beurre noisette, sweetcorn fluid gel, tofu cream, and chilli oil.

Figure 6. Circular data plot highlighting the results of a study showing the preferred orientation for chef Jozef Youssef's langoustine dish. Orientations that were selected by participants more frequently than expected by chance have been highlighted by means of an asterisk. For clarity and ease of interpretation, a composite of all 401 plate orientations (i.e., one for each participant) has been added to the figure. The original dish is shown in the bottom right of the above figure. [Picture copyright the authors.]

Figure 7. Simple leek dish illustrating a preference for canonical orientations.

483

484 Figure 1.



485

486

487

488 Figure 2.



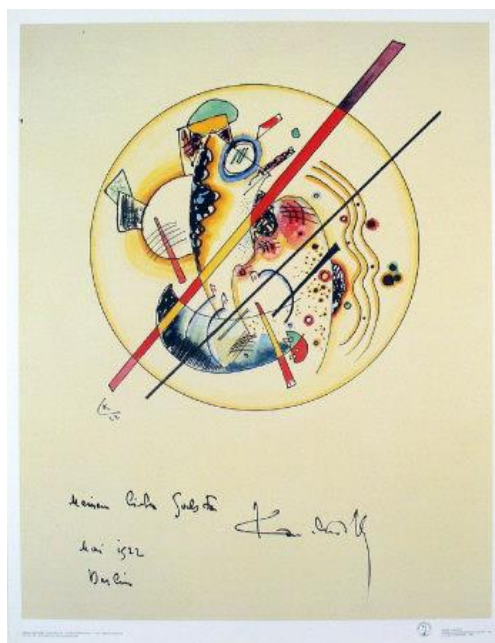
a.



b.

493

494 Figure 3.



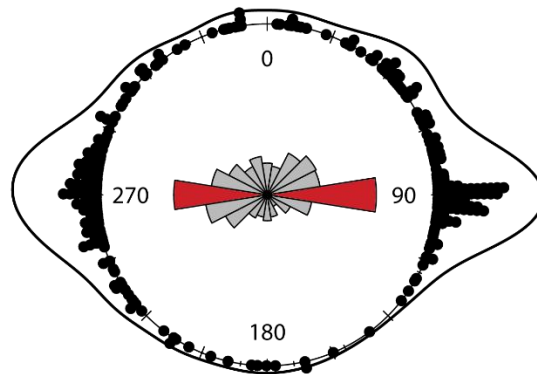
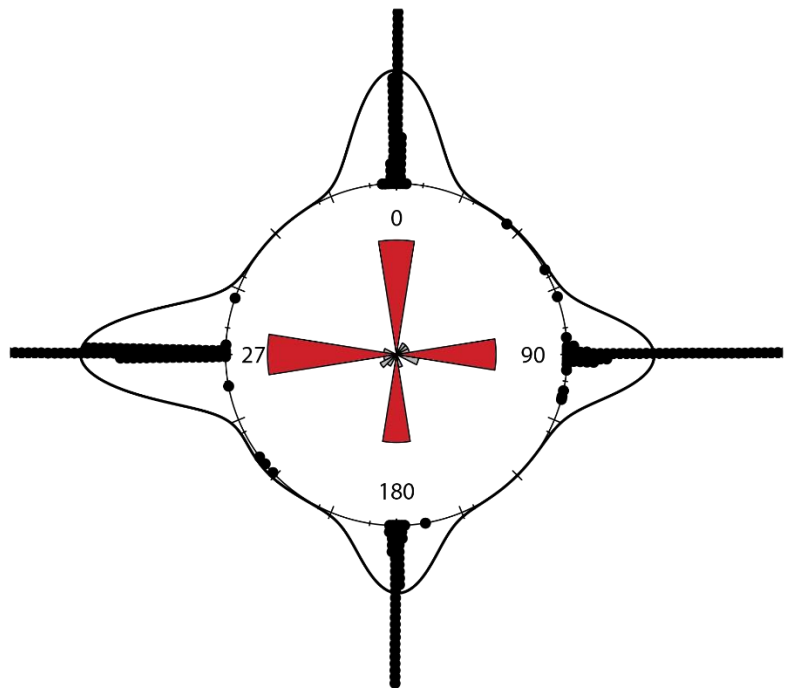
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499 Figure 4.



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503 Figure 5.

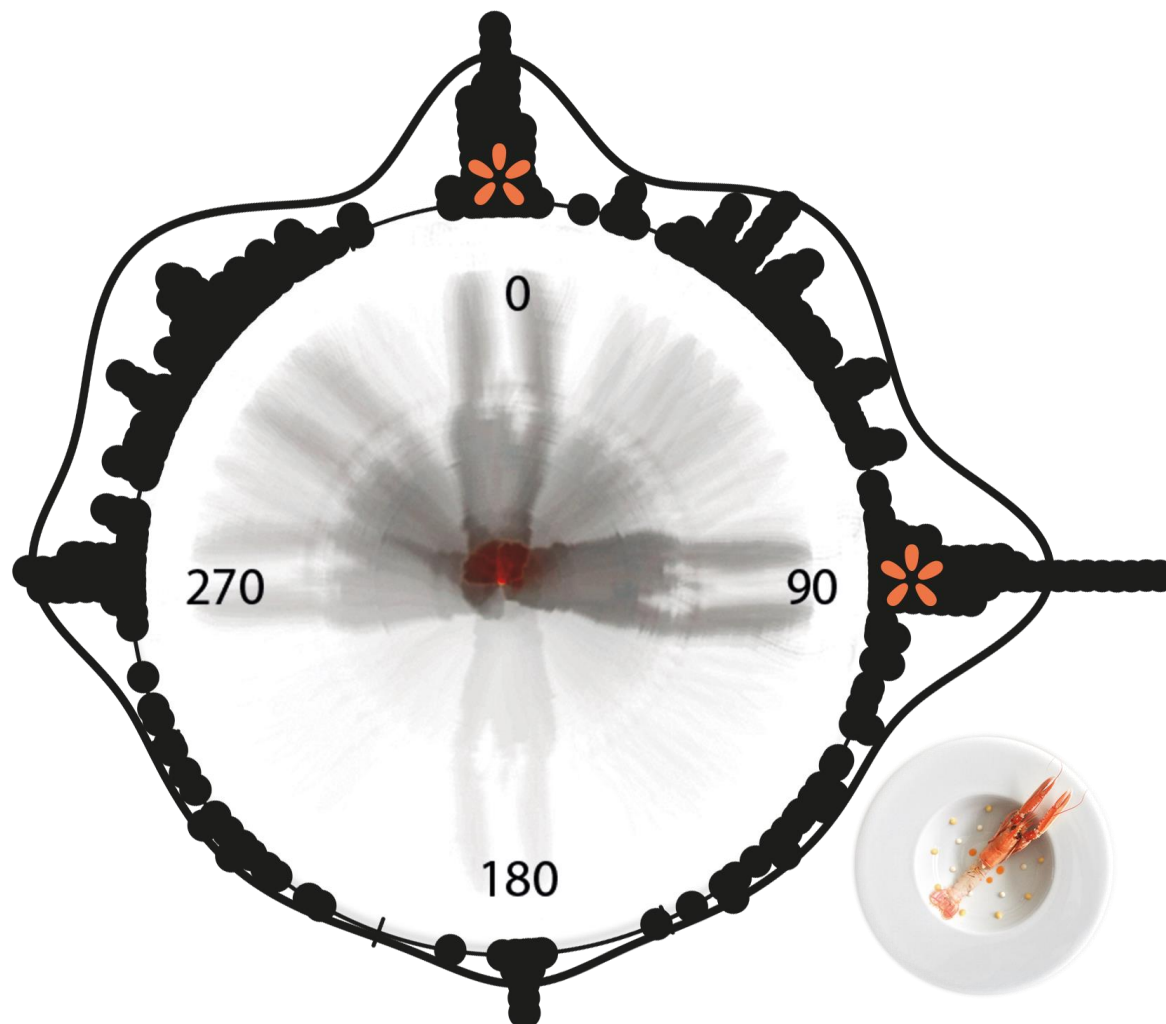
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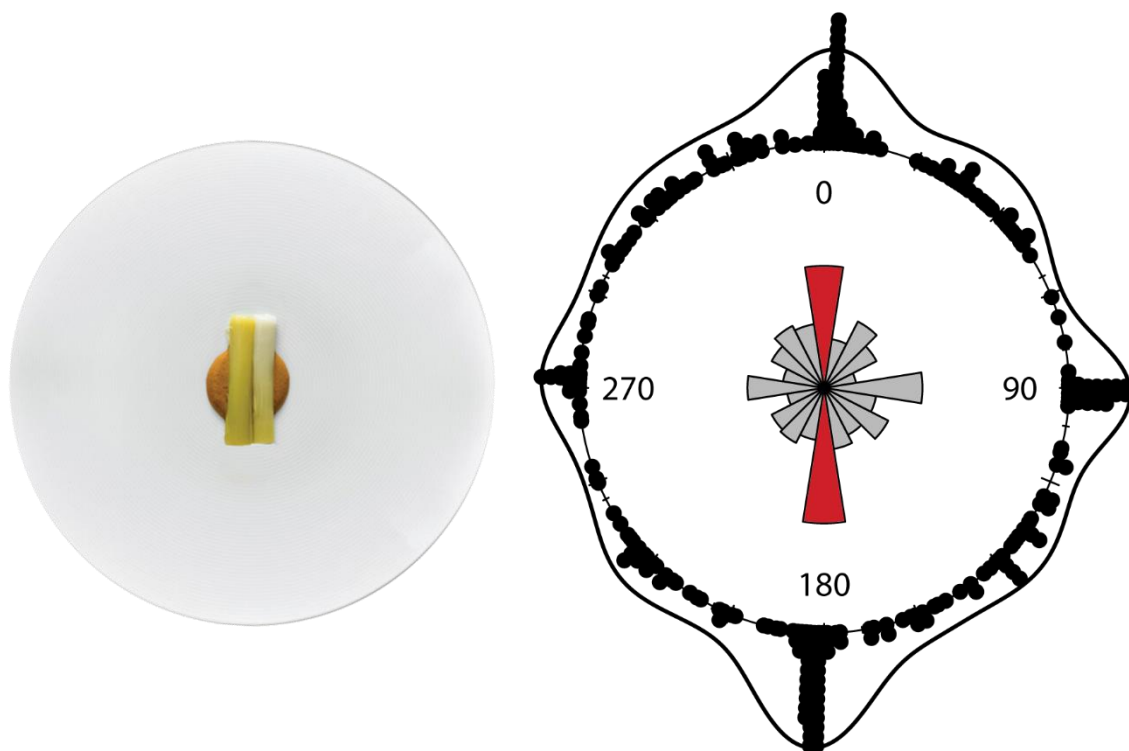
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Figure 6.



512

513 Figure 7.



514

Appendix:

Python 3 code for simulation.

```

from random import randint

def simulate_study(orientations, participants):
    '''
    returns the maximum number of participants who selected one (or more) bins
    '''
    bins = []

    for _ in range(orientations):
        bins.append(0)

    for _ in range(participants):
        selected = randint(0,orientations)
        bins[selected-1]+=1

    return max(bins)

def simulations(sim_count, orientations, participants):
    '''
    returns a distribution of high scores for 'simulate study'
    '''
    max_times = {}
    for _ in range(sim_count):
        max_bin = simulate_study(orientations, participants)
        if max_bin not in max_times:
            max_times[max_bin] = 1
        else:
            max_times[max_bin] += 1

    return max_times

orientations = 20
participants = 401
sim_count = 10000
distribution = simulations(sim_count,orientations, participants)

```

```
554 # let's double check we get the correct count
555 count = 0
556 ordered = []
557 for max_count, freq in distribution.items():
558     count += freq
559     ordered.append({'max_count': max_count, 'freq': freq})
560 ordered = sorted(ordered, key=lambda k: k['max_count'])
561
562 assert(count == sim_count)
563
564 # lets calc expected by chance vals and output table
565 for item in ordered:
566     item['p'] = item['freq']/count
567     if item['p'] < .1: # no need to output boring vals
568         print(item)
569
```