Journal of the American Pomological Society 76(3): 146-157 2022

Giuseppe Arcimboldo: An Enduring Muse for The Arts, Sciences, and Pop Culture

Michele R. Warmund[1]

Additional index words: crystallography, neuroscience, paintings, perception, pomology

Abstract

Giuseppe Arcimboldo (1526-1593), an Italian Mannerist painter, is best known for his paintings composed of meticulously-depicted fruits, vegetables, flowers, animals, and other objects arranged to create whimsical human portraits. His paintings, *Spring*, *Summer*, *Fall*, and *Winter* portray fruits harvested during each of the four seasons, which were acquired or grown in the Habsburg court gardens. Arcimboldo's paintings, *The Four Seasons in One Head*, *Vertumnus*, and *Reversible Head with Basket of Fruit* also contain pomological crops with hidden allegorical meanings, witty puns, and serious jokes. Although Arcimboldo was a creative inspiration for his artistic and literary contemporaries, his work was all but forgotten from shortly after his death until his paintings were included in the exhibition, Fantastic Art, Dada, Surrealism at the Museum of Modern Art in 1936. Since then, numerous creative and scientific works have been developed and published in homage to Arcimboldo. In biology, the computer program ARCIMBOLDO has revolutionized knowledge of the structure of protein-DNA binding proteins at 2 Å resolution. In neuroscience and psychology, Arcimboldo's paintings have been used as stimuli for assessments of perception and brain activity, especially in diverse subjects with congenital disorders or neuroses. Also, Arcimboldo's oeuvre has been credited as the source of inspiration for numerous artistic endeavors, such as paintings, sculptures, poetry, fictional stories, musical compositions, films, cartoons, and computer games. Thus, Arcimboldo's Renaissance paintings, replete with pomological features, catalyzed scientific and artistic endeavors well into the 21st century.

Giuseppe Arcimboldo was a Renaissance artist who spent much of his life in service to rulers of the Holy Roman Empire. During this time, he had numerous responsibilities as a portraitist, illustrator of exotic botanical and animal specimens, and designer for extraordinary court festivities. Among Arcimboldo's renowned artwork, several tapestries and his paintings contain precise renderings of fruits and nuts acquired by the Habsburg court (Ferino-Pagden, 2007).

Early years. Arcimboldo was born in Milan, Italy in 1526. Although details of his early life are unknown, his mother was Chiara Parisi (Hultén, 1987). Arcimboldo's life's work was likely influenced by his father Biagio and uncle Ambrogio, who were Milanese painters. Living in an epicenter of culture, Arcimboldo was surrounded by art. By the time Arcimboldo was 23, he and his father were part of the workshop of the Milan Cathedral. From 1549 to 1553, Arcimboldo created designs for stained-glass windows and painted murals, banners, and other works in the Milan Cathedral (Kaufmann, 2009). In 1556, he and Juseppe Lomazzo also received a commission to paint evangelists and angels on the ceiling and the *Tree of Jesse* fresco at the Cathedral of Monza, near Milan. The center of the fresco depicts Jesus crucified on a tree bearing citron or lemon-like fruit, suggesting Arcimboldo's early experience in painting pomological features in artwork. The tapestry, *Preaching of John the Baptist*, is also attributed to Arcimboldo and currently resides in the treasury of the Cathedral of Monza. This tapestry, as well as those he designed in Como, Italy around 1560, includes elaborate festoons of fruit decorating their borders (National Gallery of Art, 2010). During this time in Italy, Arcimboldo also illustrated natural specimens of plants, birds, and

[1] Division of Plant Sciences and Technology, University of Missouri, Columbia, MO 65211.
Corresponding author. E-mail: warmundm@missouri.edu

Fig. 1. Giuseppe Arcimboldo depicted himself as a learned man of literature in *Self-Portrait As A Man of Papers* dated 1587. In this drawing, which resides at the Palazzo Bianco, Genoa, Italy, Arcimboldo is portrayed as a composite head with scrolls of paper.

animals, which were found centuries later in albums in libraries and museums in Vienna, Bologna, and Dresden.

Appointment to the court of the Holy Roman Empire. Arcimboldo moved to Vienna in 1562 after his appointment as a Habsburg court painter by the Holy Roman Emperor Ferdinand I. When Maximilian II succeeded Ferdinand I in 1564, Arcimboldo continued to serve as a portraitist and imperial pageant master, contributing to the amusements and delights of the aristocracy (Hultén,1987). Thereafter, Arcimboldo continued in service to Maximilian's son, Emperor Rudolf II. When the imperial residence was moved to Prague in 1583, Arcimboldo relocated along with the court. After petitioning Rudolf II to allow him to move back to Milan for two years, Arcimboldo's wish was granted in 1587. However, Arcimboldo remained in service to the Emperor in Italy and worked on commissions from others. In 1592, Arcimboldo was appointed a Palatine count, which was a form of ennoblement that could only be bestowed by the Emperor. Unfortunately, Arcimboldo did not get to enjoy his elevated status for long as he succumbed to kidney failure on 11 July 1593.

Artistic works for the Imperial Habsburg Court. Several portraits of family members of Ferdinand I and Maximilian II have been ascribed to Arcimboldo (Ferino-Pagden, 2007; Hultén,1987). He was also a precise illustrator of exotic flora and fauna, including specimens collected from the New World (Ferino-Pagden, 2007; Reyes, 2015). However, Arcimboldo is best known for his composite head portraits, with various plant materials, animals, or other objects configured as facial features. His *Four Seasons* series, including *Spring*, *Summer*, *Autumn*, and *Winter* (Fig. 2) are compositions of several pomological crops usually harvested during each of those periods. Three sets of *The Four Seasons* have been attributed to Arcimboldo, dated to 1563, 1572, and 1573, with minor differences in plant species (Ferino-Pagden, 2007). In 1568, Giovanni Battista Fonteo penned an interpretation of *The Four Seasons* paintings in a 308-line poem, which was dedicated to Maximilian II.

Art historians have offered several interpretations of *The Four Seasons* paintings (Kauffman, 2009; National Gallery of Art, 2010). One interpretation is that they are allegorical representations of four stages of life (Ferino-Pagden, 2007). Another interpretation is that *The Four Seasons* represent the idea that "man is a part of nature just as nature is a part of man" (Hultén, 1987). Kauffman (2009) suggested that these paintings are imperial allegories, in which the Emperor rules over the "macrocosm" of nature and "the seasons come and go, so will Habsburg rule be eternal".

In *Spring,* ornamental flowers and lettuces, which would be blooming and growing during this time, are the predominant horticultural plants in this feminine composite head. A pomegranate flower is visible at the temple and two ripe strawberries appear just below the large iris ornament on the bust. Adjacent to the shoulder, a plum or cherry-like leaf

Fig. 2. Aricimboldo's *Four Seasons* series of paintings with their dates of completion. (A) *Spring* 1563 from San Fernando Fine Art Royal Academy, Madrid, Spain; (B) *Summer* 1563, Kunsthistorisches Museum, Vienna, Austria (C) *Autumn* 1572 Denver Art Museum, Denver; United States, and (D) *Winter*, 1563, Kunsthistorisches Museum, Vienna, Austria.

may be depicted among the 80 plant species identified by Sam Segal, botanist and art historian, in the 1563 version of this painting (Ferino-Pagden, 2007). Because the flowers identified by Segal do not bloom synchronously in spring, scholars have posited that Arcimboldo made other drawings of these plants and flowers for later use in his paintings (Ferino-Pagden, 2007). Documentation from Maximilian's exquisite gardens in Vienna and Prague in 1581 lists several plant species, including fruit trees, which Arcim-

boldo could have used as specimens for his paintings (Ferino-Pagden, 2007).

Summer is a whimsical feminine bust comprised of bountiful fruits and vegetables. The face and neck are composed of peaches, cherries, an apricot, and pears, along with several vegetables. Other fruits and nuts visible on the headpiece include grapes, plums, perhaps *Rubus* or *Morus* fruit, and immature filberts in their husk. Near the intertwined grain spikes and cherries above the forehead in the 1573 version of *Summer*, there may be an immature almond in its husk.

The original *Autumn* painting from 1563 has been lost. However, the 1572 and 1573 versions of *Autumn* are a masculine form mostly comprised of pomological fruits, including apple, pear, grape, olive, medlar, pomegranate, fig, chestnut, and perhaps almond (in husk), and quince. Some of the fruits are difficult to identify. For example, a single, red and elongated fruit with *Prunus*-like foliage, which may be a plum, appears on a branch encircling the staves that compose the torso in the later versions of *Autumn*. The red-colored wart on the "nose" could be a red currant, such as *Ribes rubrum* or *R. sativum*. A dark-colored object, used as an eye in the 1572 painting resembles a sweet cherry, however, the eye in the 1573 version appears more like an aggregate *Morus* or *Rubus* fruit. It is likely a mulberry fruit since silkworms were reared on these leaves in northern Italy, beginning around the 11th century (Binnie, 2015; Ferino-Pagden, 2007). Also, in the *Allegory of Summer* painting attributed to the Arcimboldo workshop, there is a white fruit used as part of the eye that resembles mulberry (Ferino-Pagden, 2007). If the wart was intended to be a *Ribes* berry and the eye a *Morus* or *Rubus* fruit, they may be depicted in the incorrect season since they typically ripen during the summer when grown outdoors in the northern hemisphere. However, the existence of primocane fruiting or fall fruiting *Rubus* species is possible. Alternatively, these plants may have been cultivated in a protected environment or a structure, resulting in late fruiting. If this was not the case, the appearance of these fruits in the *Autumn* painting may be like the out-of-season flowers in the *Spring* paintings. Also of note are the clusters of variously-colored cylindrical and greenish-golden elongated grapes in this painting. Depictions of finger grapes in paintings during this time may be rare.

Winter is a masculine profile consisting primarily of a mass of tree shoots growing from a gnarled trunk with roots. Two of the shoots on top of the head appear to be broken in the 1563 version of this painting, while two to four of them appear to be cleanly pruned near the crown. Two *Citrus* fruit dangle from a root at the base of the neck in *Winter*. The rough, lumpy surface of the rind in the foreground resembles a citron or lemon-citron hybrid, which is produced on a shrub or small tree (Morton, 1987). Alternatively, the fruit could be lemon. However, spines are not portrayed on the citrus twigs in the painting. Citron shrubs produce spines in leaf axils and lemon trees are known to have spines on twigs, which may be an artistic omission by Arcimboldo.

Arcimboldo's painting, *Four Seasons in One Head* is an amalgamation of spring, summer, winter, and fall (Fig. 3). This painting is dated circa 1590. Like *Winter*, shoots top the head, but several stub-pruned branches form warty features on the forehead, nose, cheeks, and chin. Overwintering, small-diameter shoots are visible from the branch stubs. Indeed, Arcimboldo had a keen eye for detail and illustrated a basic principle of pruning used today to stimulate new growth from basal nodes of branches. Five-petaled white flowers resembling strawberry or other genera in the Rosaceae family represent spring and two ripe cherries and a partial rendering of a deeply sutured fruit, such as a peach or an apricot symbolize summer. The autumn season is well represented by ripe grape clusters, apple, and perhaps pear and two plums, while the dormant buds on the branches represent winter.

Another famous Arcimboldo painting is

Fig. 3. One of Arcimboldo's last paintings with stub cut shoots on the face and summer and autumn ripening fruits in a crown is held by a private collector. *Four Seasons in One Head* was completed around 1590 after he returned to Milan, Italy.

Vertumnus, which is believed to be a symbolic portrait of Rudolf II dated around 1590 (Burgess, 1988) (Fig. 4). Like the mythological Vertumnus, the Emperor is portrayed as the god of gardens, orchards, and seasonal change in this painting, which is a collage of horticultural and agronomic species (Ferino-Pagden, 2007). Many of the same fruits and nuts depicted in *Autumn* are also included in the *Vertumnus* portrait. However, there are two notable additions. At the corner of the left eye, there is a single gooseberry, and in the upper right portion of the crown, there is a cluster of red fruit with trilobate foliage, resembling single-seeded hawthorn (*Crataegus monogyna*). This acclaimed painting was celebrated by several poets, including Arcimboldo and his Milanese peers, in a booklet of poetry sent to Rudolf II (Kaufmann, 1993).

Other famous paintings by Arcimboldo include *Flora and The Four Elements* series, consisting of *Air*, *Fire*, *Earth*, and *Water*. Fruits are absent from these works. He also created occupational portraits, such as *The Librarian*, *The Jurist*, and *The Cook*, which are humorous compositions of tools of the trade. *The Waiter* is a composition of objects associated with a vintner, such as a wooden cask, ewers or jugs, a tasting cup, and funnels (Ferino-Pagden, 2007). Three of the occupational paintings, including *The Cook*, *The Vegetable Gardener*, and *The Reversible Head with Basket of Fruit* are also palindrome images. *The Vegetable Gardener* painting was likely done after Arcimboldo left Prague and returned to Milan. When viewed in one orientation, the painting appears to be a simple bowl comprised of mostly vegetables, but when it is inverted, a pudgy-cheeked face is apparent. Despite its title, the vegetable gardener's jowl is a chestnut bur, the left eye is a broken walnut shell containing a kernel, and the right eye consists of two husks, with one exposing an in-shell filbert.

At first glance, *The Reversible Head with*

Fig. 4. Arcimboldo's *Vertumnus* was painted around 1590 and may be a portrait representing Rudolf II. Note the elaborate use of fruits and nuts on the face and in the crown. This painting resides in Skokloster Slott Museum, Skokloster, Sweden.

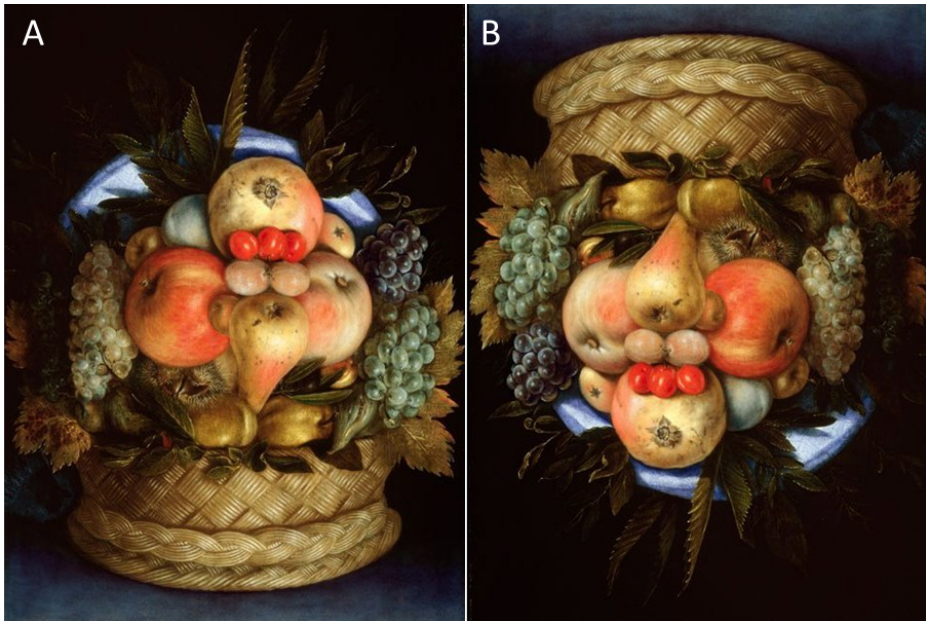

Fig. 5. (A) In one orientation the Arcimboldo's *Reversible Head with Basket of Fruit* appears as a still life painting of assorted fruit. (B) When inverted, the composition of plump fruits becomes a whimsical portrait of a gentleman. This painting completed circa 1590 is held by French & Company, New York.

Basket of Fruit is a still life painting. However, when inverted, the masculine face is composed of a fig, apple, and peach forehead, chestnut husk and olive eyes, a pear nose, apple cheeks, perhaps almond in husks (as the upper lip), cherries for the lower lip, and possibly an underripe pomegranate with six sepals for the chin. Clusters of grapes framed with their foliage appear as hair with other fruits used to fill the face. The lush arrangement of fruits in this painting, as well as the use of plump vegetables in *The Vegetable Grower*, have also been interpreted as risqué double entendres, which was common for fruit depicted in artwork from 1483 to 1610 (Calvesi, 1987; Varriano, 2005).

Arcimboldo also illustrated and described the stages of the production of silk in 13 drawings (Ferino-Pagden, 2007). By the latter 1500s, sericulture was an important enterprise for making silk cloth in this area. In the first six of these drawings the stages of silkworm growth and culture are shown, including larvae, the collection of mulberry leaves as a food source for larvae, the transfer of larvae to mulberry branches where they become pupae, and the harvesting of cocoons composed of silk filaments.

Other court activities. Arcimboldo was tasked with contributing objects for Rudolf's *kunstkammer*, which was a special chamber used to display collections of wondrous and exotic items, including artwork, antique objects, scientific instruments, gems, fossils, and rare animal parts. In addition to this, he was responsible for planning, designing, and organizing Maximilian's elaborate court festivities, processions, pageants, and tournaments in celebration of the Habsburg dynasty's reign (Hultén,1987). Several of Arcimboldo's illustrations for these activities reside in the Uffizi Gallery in Florence, Italy. Arcimboldo had also been credited with devising ciphers and other imaginative inventions, including means to rapidly traverse rivers in the absence of bridges or

boats (Kaufmann, 2009). He also created a musical notation system, using painted colors. Using the mathematical order of musical harmony devised by Pythagoras, Arcimboldo converted the gray scale values to color hues and then painted strips of paper, which were placed on the corresponding keys of a harpsichord (Geiger, 1954; Campen, 1999). However, Caswell (1980) interpreted Arcimboldo's contributions to color and music differently based on writings by Giovanni Lomazzo and Gregorio Comanini in the late 1500s. Caswell described Arcimboldo as a precursor of scientific experimentation on the relationships between light and sound based on his use of Pythagorean ratios for color and musical intervals.

Arcimboldo's work significantly influenced later surrealist artists, such as Salvador Dalí, Marcel Duchamp, Max Ernst, Man Ray, Rene Magritte, and Pablo Picasso (Hultén,1987; Shank, 2017). More recently, Philip Haas, created small and large (4.6 m-tall) three-dimensional fiberglass sculptures of *The Four Seasons* series, which were first exhibited in 2010 (National Gallery of Art, 2010). The facade of the Arcimboldo restaurant in the Astérix theme park in France is constructed as a humorous face composed of fruit, which resembles that of the artist's *Summer* painting (Shank, 2017).

Artistic interpretations of Arcimboldo's artwork. Many art historians have analyzed Arcimboldo's works of art and his contributions to Habsburg culture in exhibitions and scholarly works (Caloian, 2020; Cheney, 2019; Elhard, 2005; Ferino-Pagden, 2007; Kaufmann, 1976, 1978,1993, 2007, 2009; Kriegeskorte, 2000; Maiorino,1991; Moynihan, 2012; Popiel, 2015). His paintings are in the Mannerist style, representing bizarre, eccentric transformations of flora and fauna (Cheney, 2019; Kaufman, 1993; Maiorino, 1991). Although Arcimboldo's paintings are viewed as humorous images or visual puns, they are also considered more serious visual jokes by Kaufman (2009), much like political cartoons are used today to covey editorial commentary on prominent people and current events (Grootenboer, 2011). *The Jurist* and *The Librarian* may in fact be considered satirical images or caricatures of Johann Ulrich Zasius and Wolfgang Lazius, respectively (Ferino-Pagden, 2007).

Literature. Modern literary scholars have also compared the characteristics and hidden meanings of Arcimboldo's paintings with the complex visual imagery of James Joyce's novel, *Finnegans Wake* (Gandleman, 1979; Paris, 2012) and other literary works (Barthes, 1985). Cora (2005) asserted that Arcimboldo's composite head paintings, including *Autumn* and *Summer*, inspired John Donne to express metaphorical concepts in his verse letter, "To Sir Edward Herbert at Julyers". In Michèle Barrière's novel, *Natures Mortes au Vatican: Roman Noir et Gastronomique en Italie à la Renaissance* (2007), Arcimboldo and his paintings are key elements of the plot when the cunning Cardinal Granvelle has the artist kidnapped to steal his portraits. A central character in the book, *2666* is a writer who uses Arcimboldo as a pseudonym (Bolaño, 2008). The surrealistic short story, "The Coming of Vertumnus" by Ian Watson (1994) may also have been inspired by Arcimboldo's painting.

Other creative works, including Joan Steiner's picture books, *Look-Alikes*, *Look-Alikes Jr.*, and *Look-Alikes Christmas*, have emulated Arcimboldo's penchant for using edible ingredients in his paintings (Wood, 2005). In the literature on team building of personnel within corporations, Arcimboldo's *Summer* has been used to illustrate the value of combining individual talents in synergy to create something extraordinary (Chevreux et al., 2014).

Crystallography in structural biology. Archimboldo has also served as a muse for life sciences. In 2009, scientists developed and named a computer program ARICIMBOLDO to determine the three-dimensional structure of proteins at 2 Å atomic resolution (Rodríguez et al., 2009). The algorithm elucidates the structure of macromolecules by combin-

ing the search for small fragments, such as polyalanine α-helices with other programs named PHASER and SHELXE (Abendroth, 2018; Caballero et al., 2018; Pröpper et al, 2014; Sammito et al., 2013; Sammito et al., 2014; Usón, 2018). Like Arcimboldo's paintings, the protein structure resolved by this program assembles secondary-structure fragments to reveal a portrait of a protein (Rodríguez et al., 2012).

Neuroscience and psychology. Nearly all of Arcimboldo's composite head paintings have been utilized in neuroscience studies, but *Vertumnus*, *The Vegetable Gardener*, and *Reversible Head with Basket of Fruit* have been used most frequently as stimuli for developmental assessments of perception and brain activity. In experiments using the latter three paintings, scientists found that infants around 7 or 8 months-old had the ability to recognize these images as faces, which was related to the increased concentration of oxyhemoglobin in the left temporal area of the brain (Kobayashi, 2012). Beran et al. (2017) found that three-and-a-half- to five-year-old children reported seeing faces in reproductions of *Vertumnus*, *The Vegetable Gardener*, and *Autumn* more often than in scattered images of fruits, vegetables, and flowers, which indicated that young children tend to process these face-like images holistically. In contrast, monkeys processed the paintings more locally than children.

In adults, Arcimboldo's paintings have been used as stimuli to examine the facial inversion effect, in which perception and recognition of faces are altered when the face-like orientation of the image is inverted (Friston, 2014; Martinez-Conde and Macknik, 2010; Nihei et al., 2018; Sheon, 1977). In other neurological studies on perception, adult subjects generally focused on the mouth and eyes when presented with Arcimboldo's paintings, activating a network of brain regions associated with facial recognition and processing (Battaglia et al., 2012; Boccia et al., 2014, 2015, 2016, 2020; Bubic et al., 2014; Cupchik et al., 2009). Also, *Vertumnus*, *The Vegetable Gardener*, and *The Librarian* have been used as visual stimuli for studying facial perception in individuals with brain injuries who struggle to identify objects (Moscovitch et al., 1997). Pavlova et al. (2015, 2016a, 2016b, 2017, 2018a, 2018b, 2021) used face-in-food images inspired by *Reversible Head with Basket of Fruit* to study social cognition and facial recognition in diverse subjects, such as those born prematurely, females versus males, and individuals with cultural differences, autism, Down syndrome, and Williams syndrome. Recently, Kubon et al. (2021) also used Arcimboldesque images to examine the impact of major depressive disorder on social cognition in the context of the COVID-19 pandemic. *The Vegetable Grower* was used to study the effect of scent on the evaluation and memory of artworks (Cirrincione et al., 2014). When Arcimboldo's painting and others were viewed in an area with a pleasant ambient scent, the evaluation and memory of the artworks were hindered.

Arcimboldo's ideas on the mathematical relationship of color and sound spawned other inventions, creative works, and research studies in psychology (Caswell, 1980). Following Arcimboldo's work, a "color organ" was constructed in 1893 and later types of this invention were used in musical performances (Campen, 1999). The Russian composer Alexander Scriabin was particularly intrigued by the psychological effects of color and music in the early 1900s, which further stimulated research in synesthesia. In one form of synesthesia, an individual involuntarily sees colors when hearing music. Research has shown that synesthesia occurs in very few individuals (1:2000), primarily females, and left-handed people (Baron-Cohen et al., 1993; Cytowic, 1995). Also, synesthetes possessed excellent memory capabilities, while their math and spatial navigation skills were poorer. Synesthesia has been associated with neural activity in the left hemisphere of the brain (Cytowic, 1995).

Computer-Generated Imaging. Inspired

by the collage of fruit and plant material in Arcimboldo's composite heads, Di Blasie et al. (2005) created a computer program named *Puzzle Image Mosaic* to create a mosaic rendering of a painting or an image. Arcimboldo's paintings also inspired others to create algorithms for a computer program to generate three-dimensional artwork (Gal et al., 2006). Huang et al. (2011) devised an algorithm to create Arcimboldo-like collages comprised of subject-related internet images retrieved with keywords. Recently, the artificial intelligence program CycleGan was used to create images from collages of fruits in an homage to Arcimboldo (Spratt, 2021).

Early education and neophobia. Arcimboldo's artwork has been used to develop new skills in early childhood education. Lesson plans, in which the painting *Vertumnus* is used as a stimulus for teaching preschool children to identify different fruits, vegetables, and flowers, have been created (Harries and Astill, 2013). In these lesson plans, *Vertumnus* also served as a source of inspiration for youngsters to create their own portraits of modern celebrities from plant materials or food products. Creating faces with fruits and vegetables in the style of Arcimboldo's composite heads has been used to study neophobia in children. Researchers found that constructing faces with fruits and vegetables is a type of sensory play that encouraged children to use all five senses. Furthermore, it has been suggested that this type of sensory education can help children overcome their fear of tasting new foods and increase the variety of their diet (Reeves, 2018).

Commercialized artwork, branding, and popular culture. In the 1930s, Arcimboldo's *Vertumnus* was used as a logo for the Bertuzzi juice company in Italy (Kauffman, 2009). The Punta delle Formiche cooperative, also located in Italy, currently uses a reproduced version of *Summer* as a logo for their Arcimboldo brand tomatoes. In New York, Oslo, Prague, Barcelona, Buenos Aires, Milan, Turin, and Venice, restaurants bear the Arcimboldo name. Arcimboldesque images have been used in films, such as Boldo in *The Tale of Despereaux* and in *Harry Potter* movies, animated cartoons (*Animaniacs*, Episode 4), video games (*Cosmic Osmo*), and on the album cover of *Bonfires on the Heath* by The Clientele (Kanter, 2018). A multitude of posters, puzzles, stationery, stickers, clothing, jewelry, cellular phone cases, tote bags, drinkware, and other merchandise, bearing copies of Arcimboldo's artwork are available online. Also, Arcimboldo-inspired artwork, including sculptures from recycled toys and imitation prints have been marketed.

Epilogue. Although Arcimboldo's oeuvre may not be revered as Renaissance masterpieces, his work is significant. Arcimboldo's meticulous pomological depictions in his composite head paintings reveal fruits and nuts acquired and cataloged in the palace gardens of the Holy Roman Emperors Maximillian II and Rudolf II. Thus, Arcimboldo's paintings composed of pomological crops provide historical insight into the diversity of crops grown in central and southern Europe or considered exotic during the 16th century. More significantly, Arcimboldo's paintings have assuredly spawned scientific discovery and innovative activity for generations.

Literature Cited

Abendroth, J., Sankaran, P.J. Myler, D.D. Lorimer, and T.E. Edwards. 2018. *Ab initio* structure of a proteolytic fragment using ARCIMBOLDO. Acta Crystallographica Section F: Structural Biol. Commun. 74(9):530-535, doi:10.1107/S2053230X18010063.

Barthes, R. 1985. The responsibility of forms: critical essays on music, art, and representation. Univ. California Press, Berkeley, CA.

Baron-Cohen, S., J. Harrison, L.H. Goldstein and M. Wyke. 1993. Coloured speech perception: is synaesthesia what happens when modularity breaks down? Perception 22(4):419-426.

Barrière, M. 2007. Natures mortes au Vatican: Roman noir et gastronomique en Italie à la Renaissance. Agnès Viénot Editions, Paris.

Battaglia, D., A. Witt, F. Wolf, and T. Geisel, T. 2012. Dynamic effective connectivity of inter-areal brain circuits. PLoS Computational Biol. 8(3):1-25, doi:https://doi.org/10.1371/journal.pcbi.1002438.

Beran, M.J., B.M. Perdue, A.J. Kelly, and A.E. Parrish.

2017. What's in a face (made of foods)? Comparing children's and monkey's perception of faces in face-like images of food. Animal Behavior and Cognition 4(3):324-339.

Binnie, I. 2015. Italy's silkmakers spin a niche to revive dormant industry. Reuters. 13 June 2022. <https://www.reuters.com/article/us-italy-silk/italys-silkmakers-spin-a-niche-to-revive-dormant-industry-idUKKCN0PR0FA20150717>.

Boccia, M., S. Barbetti, R. Margiotta, C. Guariglia, F. Ferlazzo, and A.M. Giannini. 2014. Why do you like Arcimboldo's portraits? Effect of perceptual style on aesthetic appreciation of ambiguous artworks. Attention, Perception, & Psychophysics, 76(6): 1516-1521.

Boccia, M., S. Barbetti, L. Piccardi, C. Guariglia, F. Ferlazzo, A.M. Giannini, and D.W. Zaidel. 2016. Where does brain neural activation in aesthetic responses to visual art occur? Meta-analytic evidence from neuroimaging studies. Neuroscience and Biobehavioral Rev. 60:65-71, doi:http//dx.doi.org/101016/j.neubiorev.2015.09.009.

Boccia, M., P. Guariglia, L. Piccardi, G. De Martino, and A.M. Giannini. 2020. The detail is more pleasant than the whole: global and local prime affect esthetic appreciation of artworks showing whole-part ambiguity. Attention, Perception, & Psychophysics, 82(7):3266-3272, doi:https://doi.org/10.3758/s13414-020-02093-0.

Boccia, M., F. Nemmi, E. Tizzani, C. Guariglia, F. Ferlazzo, G. Galati, and A.M. Giannini. 2015. Do you like Arcimboldo's? Esthetic appreciation modulates brain activity in solving perceptual ambiguity. Behavioural Brain Res. 278:147-154, doi:https://doi.org/10.1016/j.bbr.2014.09.041.

Bolaño, R. 2008. 2066. Knopf Doubleday Publishing, New York, NY.

Bubic, A., A. Susac, and M. Palmovic. 2014. Keeping our eyes on the eyes: the case of Arcimboldo. Perception, 43(5):465-468, doi:10.1068/p7671.

Burgess, A. 1988. Guiseppe Arcimboldo-perspectives on an eccentric genius. Architectural Dig. 45:28-32.

Caballero, I., M. Sammito, C. Millán, A. Lebedev, N. Soler, and I. Usón. 2018. ARCIMBOLDO on coiled coils. Acta Crystallographica Section D: Structural Biol. 74(3):194-204, https://doi.org/19.1107/S2059798317017582.

Caloian, C.F. 2020. The hybrid character between the representations of the Middle Ages and today's art. Anastasis Res. in Medieval Cult. and Art 7(1), 125-136.

Calvesi, M. 1987. Arcimboldi and the art of wonders. Art and Dossier 11:1987:29-34.

Campen, C.V. 1999. Artistic and psychological experiments with synesthesia. Leonardo 32(1):9-14.

Caswell, A.B.1980. The Pythagoreanism of Arcimboldo. J. Aesthetics and Art Criticism 39(2):155-161.

Cheney, L.D.G. 2019. Giuseppe Arcimboldo's grilli: humor and magic in genre portraits. Cult.l and Religious Studies 7(1):1-20, doi:10.17265/2328-2177/2019.01.000.

Chevreux, L., W. Plaizier, C. Schuh, and W. Brown. 2014. Arcimboldo. Corporate plasticity: how to change, adapt, and excel. Apress Media, New York, NY.

Cirrincione, A., Z. Estes, and A. Carù. 2014. The effect of ambient scent on the experience of art: not as good as it smells. Psychology & Marketing, 31:615-627.

Cora, J. 2005. John Donne's Arcimboldesque wit in "To Sir Edward Herbert at Julyers." A partial reading, p. 61-78. In: R.C. Homem and M.F. Lambert (eds.). Writing and Seeing. Rodopi BV, Amsterdam, doi:https://doi.org/10.1163/9789401201605_005.

Cupchik, G. C., O. Vartanian, A. Crawley, and D.J. Mikulis. 2009. Viewing artworks: contributions of cognitive control and perceptual facilitation to aesthetic experience. Brain and Cognition, 70(1):84-91, doi:10.1016/j.bandc.2009.01.003.

Cytowic, R.E. 1995. Synesthesia: phenomenology and neuropsychology: a review of current knowledge. Psyche: An Interdisciplinary J. of Res. on Consciousness 2(10). <http://psyche.cs.monash.edu.au/v2/psyche-2-10cytowic.html>.

Di Blasi, G., G. Gallo, and M.P. Petralia. 2005. Fast techniques for mosaic rendering. Computational Aesthetics. 1 June 2022. <http://citeseerx.ist.psu.edu/viewdoc/ download?doi=10.1.1.100.9033&rep=rep1&type=pdf>.

Elhard, K. C. 2005. Reopening the book on Arcimboldo's *Librarian*. Libraries & Cult. 40(2):115-127.

Ferino-Pagden, S. 2007. Arcimboldo: 1526-1593. Skira Editore, Milan, Italy.

Friston, K.J., K.E. Stephan, R. Montague, R.J. Dolan. 2014. Computational psychiatry; the brain as a phantastic organ. Lancet Psychiatry 1(2):148-158.

Gal, R. O.Sorkine, T. Popa, A. Sheffer, and D. Cohen-Or. 2006. Non-realistic expressive modeling. Proc. 5th Intl. Symp. Non-photorealistic animation and rendering. 22 May 2022. <https://dl.acm.org/doi/abs/10.1145/1179849.1179975>.

Gandleman, C.1979. "Finnegans wake" and the anthropomorphic landscape. J. Modern Literature 7(1):39-50, doi: https://www.jstor.org/stable/3831111.

Geiger. B. 1954. The ghiribozzosi paintings by Giuseppe Arcimboldi. Illusionist painter of the sixteenth century (1527-1593). Firenze Vallecchi, Florence, Italy.

Grootenboer, H. 2011. The paradox of still life. Oxford

Art J. 34(3):486-489.
Harries, J. and M. Astill. 2013. Fruits of the imagination. Early Years Educator 15(3):12-13.
Huang, H., L. Zhang, and H.C. Zhang. 2011. Assoc. for Computing Machinery Trans. on Graphics 30(6):1-7, doi:http://doi.acm.org/10.1145/2024156.2024189.
Hultén, P. 1987.The Arcimboldo effect: transformations of the face from the 16th to the 20th century. Abbeville Press, New York, NY.
Kanter, D. 2018. Giuseppe Arcimboldo artist overview and analysis. The Art Story. 22 May 2022. <https://www.theartstory.org/artist/arcimboldo-giuseppe/>.
Kaufmann, T. D. 1976. Arcimboldo's imperial allegories. Zeitschrift für Kunstgeschichte 39:275-296.
Kaufmann, T.D. 1978. Remarks on the collections of Rudolf II: the kunstkammer as a form of representatio. Art J. 38(1): 22-28. 22 May 2022. <https://www.jstor.org/stable/pdf/776251.pdf>.
Kaufmann, T.D. 1993. The mastery of nature: aspects of art, science, and humanism in the Renaissance. Princeton Univ. Press, Princeton, NJ.
Kaufmann, T.D. 2007. The artificial and the natural: Arcimboldo and the origins of still life, p.149-184. In: B. Bensaude-Vincent and W.R. Newman (eds.). The artificial and the natural: an evolving polarity, 149. Mass. Inst. Technol. Press, Cambridge, MA.
Kaufmann, T.D. 2009. Arcimboldo: visual jokes, natural history, and still-life painting. University of Chicago Press, Chicago.
Kobayashi, M., Y. Otsuka, E. Nakato, S. Kanazawa, M.K. Yamaguchi, and R. Kakigi. 2012. Do infants recognize the Arcimboldo images as faces? Behavioral and near-infrared spectroscopic study. J. Expt. Child Psychology 111(1):22-36, doi:10.1016/ j.jecp.2011.07.008.
Kriegeskorte, W. 2000. Arcimboldo. Taschen, Cologne, Germany.
Kubon, J., A.N. Sokolov, R. Popp, A.J., Fallgatter, and M.A. Pavlova. 2021. Face tuning in depression. Cerebral Cortex 31(5):2574-2585, doi:10.1093/cercor/bhaa375.
Maiorino, G. 1991. The portrait of eccentricity: Arcimboldo and the Mannerist grotesque. Penn. State Press, University Park, PA.
Martinez-Conde, S. and S.L. Macknik. 2010. Hungry for Meaning. Scientific Amer. Mind 21(5): 18-20.
Morton, J. 1987. Citron, p. 179–182. In: C.F. Dowling, Jr (ed.). Fruits of warm climates. Media, Inc., Greensboro, N.C.
Moscovitch, M., G. Winocur, and M. Behrmann. 1997. What is special about face recognition? Nineteen experiments on a person with visual object agnosia and dyslexia but normal face recognition. J. Cognitive Neuroscience 9(5):555-604, doi:https//doi.org/10.1162/jocn.1997.9.5.555.
Moynihan, K.L.T. 2012. Comedy, science, and the reform of description in Lombard painting of the late Renaissance: Arcimboldo, Vincenzo Campi, and Bartolomeo Passerotti. PhD. Diss., Columbia Univ., New York, NY.
National Gallery of Art. 2010. Arcimboldo 1526-1593 Nature and Fantasy. National Gallery of Art, Washington, D.C. 19 May 2022. <https://www.nga.gov/content/dam/gaweb/exhibitions/pdfs/arcimboldo_brochure.pdf>.
Nihei, Y., T. Minami, and S. Nakauchi. 2018. Brain activity related to the judgment of face-likeness: correlation between EEG and face-like evaluation. Frontiers in Human Neuroscience 12 (56):1-12, doi:10/3389/fnhum.2018.00056.
Paris, V. 2012. Picturing the wake: Arcimboldo, Joyce, and his "monster". James Joyce Qrtly.49(2):235-259.
Pavlova, M.A., J. Galli, F. Pagani, S. Micheletti, M. Guerreschi, A.N. Sokolov, A.J. Fallgatter, and E.M. Fazzi. 2018a. Social cognition in Down syndrome: face tuning in face-like non-face images. Frontiers in Psychology 9:1-9, doi:10.3389/fpsyg.2018.02583.
Pavlova, M.A., J. Galli, F. Zanetti, F. Pagani, S. Micheletti, A. Rossi, A.N. Sokolov, A.J. Fallgatter, and E.M. Fazzi. 2021.Social cognition in individuals born preterm. Scientific Rpt. 11(1):1-11, doi:https://doi.org/10.1038/s41598-021-93709-4.
Pavlova, M.A., M. Guerreschi, L. Tagliavento, F. Gitti, A.N. Sokolov, A.J. Fallgatter, and E. Fazzi. 2017. Social cognition in autism: face tuning. Scientific Rpt. 7(1):1-9, doi:https://doi.org/10.1038/s41598-017-02790-1.
Pavlova, M.A., J. Heiz, A.N. Sokolov, and K. Barisnikov. 2016a. Social cognition in Williams syndrome: face tuning. Frontiers in Psychology 7(1131):1-8, doi:https:// doi.org/10.3389/fpsyg.2016.01131.
Pavlova, M.A., J. Heiz, A.N. Sokolov, A.J. Fallgatter, and K. Barisnikov. 2018b. Even subtle cultural differences affect face tuning. PLoS One 13(6), e0198299.https://doi.org/10.1371/journal.pone.0198299.
Pavlova, M.A., A. Mayer, F. Hösl, F., and A.N. Sokolov. 2016b. Faces on her and his mind: female and likable. PLoS One, 11(6), e0157636, doi:https://10.1371/Journal.pone.0157636.
Pavlova, M.A., K. Scheffler, and A.N. Sokolov. 2015. Face-n-food: gender differences in tuning to faces. PLoS One, 10(7), e0130363, doi:https://doi.org/10.1371/ journal.pone.0130363.
Popiel, M. 2015. The aesthetics of caprice: in the circle of visualization. Teksty Drugie 2:200-211, doi:10.1831/td.2015.en.2.13.

Pröpper, K., K. Meindl, M. Sammito, B. Dittrich, G.M. Sheldrick, E. Pohl , and I. Usón. 2014. Structure solution of DNA-binding proteins and complexes with ARCIMBOLDO libraries. Acta Crystallography 70(6):1743-1757, doi:https://doi.org/10.1107/S1399004714007603.

Reeves, S. 2018. The art of playing with food. Hektoen Intl. J. 27 May 2022. < https://hekint.org/2018/08/23/the-art-of-playing-with-food/>.

Reyes, R.A.G. 2015. Glimpsing Southeast Asian naturalia in global trade, c. 300 BCE–1600 CE, p. 96-119. In: D. Henley and J.S. Nordholt (eds.). Environment, trade and society in Southeast Asia. Brill, Leiden, The Netherlands.

Rodríguez, D.D., C. Grosse, S. Himmel, C. González, I. M de Ilarduya, S. Becker, G.M. Sheldrick, and I. Usón. 2009. Crystallographic *ab initio* protein structure solution below atomic resolution. Nature Methods 6:651-653, doi:10.1107/ S2053230X18010063.

Rodríguez, D.D., M. Sammito, K. Meindl, I. M de Ilarduya, M. Portratz, G.M. Sheldrick,and I. Usón, I. 2012. Practical structure solution with ARCIMBOLDO. Acta Crystallography 68(4):336-343, doi: https://doi.org/10.1107/ S0907444911056071.

Sammito, M., K. Meindl, I. M de Ilarduya, C. Millán, C, Artola-Recolons, J.A. Hermoso, and I. Usón. 2014. Structure solution with ARCIMBOLDO using fragments derived from distant homology models. FEBS J. 281:4029-4045, doi: 10111/febs.12897.

Sammito, M., C. Millán, D.D. Rodríguez, I. M de Ilarduya,, K. Meindl, I. De Marino, G. Petrillo, R.M. Buey, J. M de Pereda, K. Zeth, G.M. Sheldrick, and I. Usón. 2013. Exploiting tertiary structure through local folds for crystallographic phasing. Nature Methods 10(11)1099-1101, doi:101038/nmeth.2644.

Shank, I. 2017. The Renaissance artist whose fruit-faced portraits inspired the Surrealists. 31 May 2022. <https://www.artsy.net/article/artsy-editorial-renaissance-artist-fruit-faced-portraits-inspired-surrealists#:~:text=The%20Renaissance%20Artist%20Whose%20Fruit%2DFaced%20Portraits%20Inspired%20the%20Surrealists,- Basket%2C%2016th%20Century>.

Sheon, A. 1977. Multistable perception in romantic caricatures. Studies in Romanticism 16(3):331-335, https://doi.org/10.2307/25600088.

Spratt, E.L. 2021. Gastronomic algorithms: artistic and sensory exploration of Alain Passard's Michelin plates in the manner of Giuseppe Arcimboldo with GANs. Leonardo 54(6):631-637.

Usón, I. and C. Millán. 2018. The eyes of chemistry. Biofisica. 1 June 2022. < https://www.uv.es/biophys/sbe/11/PDFsite/EyesOfChemistry.pdf>.

Varriano, J. 2005. Fruits and vegetables as sexual metaphor in late renaissance Rome. Gastronomica 5(4):8-14.

Watson, I. 1994. The coming of Vertumnus: and other stories. Gollancz Publishing, London.

Wood, D. 2005. The art of Joan Steiner. Gastronomica 5(1):9-12, doi: https://doi.org/10.1525/gfc.2005.5.1.9.