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The Choreography of the Annunciation through a Computational Eye

Florentine painter Giuseppe Bezzuoli’s (1784–1855) *Annunciation*, strongly in the Tuscan tradition, represents a picturesque landscape and lofty architecture, a large bed, and a high antique desk, with a vase of lilies (fig. 1). The Quattrocento setting, however, is broken by the flying Gabriel, who performs something of an uncanonical gesture; he is pointing directly to Mary. Perhaps reacting to his gesture, she seems to point to herself.

There is in Bezzuoli’s drawing a strange tension between a scenography of the Quattrocento and a choreography that is not quite Ottocento. Painters of the Nazarene movement seem to misunderstand and misappropriate the gestural language of the late middle ages; their paintings, like Bezzuoli’s, give a strange sense of defamiliarization, a testament to the complexity of our unwritten gestural understanding. Bezzuoli’s example is, however, a little different; two peculiarities stand out. Firstly, the scribbled subtitle from Dante’s Paradiso, in which Mary is praised as Queen of Heaven—far from a direct reference to the Annunciation. More important, perhaps, are the pencil traces we can see in the background, showing a completely different gestural composition. These pentimenti draw an alternate vision: a very traditional Mary in *Conturbatio* responds to a canonical baroque angel, who points up to the sky; even the angle of the rays from heaven has been modified, to shine directly on Mary’s face. At some point in the sketch, Bezzuoli changed his mind, showing the Virgin in a completely different light; we might speculate that this change was related to the Dante quote.

Bezzuoli no longer depicts the terrified virgin and messenger-god of the Annunciation itself, but rather an apotheosis of the Virgin. Such a change of direction is Bezzuoli’s very personal *invenzione*: both a new solution to the basic iconographical formula, and an instrument of individual distinction. A very slight change to the geometry of the scene itself—Mary is moved about one head-width to the right—changes the poses, movement, gestures, and interaction radically, with completely different theological and narrative connotations. Mary’s arm, which has been lowered, demands a greater deal of modesty; such *invenzione* can lead to unfamiliar compositions, challenging both draughtsman and beholder.

The Bezzuoli drawing, with its Dante verse and plural Mary, remains an outlier in our experimental corpus of Annunciations; but it is also a reminder of the manuality, complexity and ambiguity of the compositional process itself. This article is mainly concerned with statistical, collective analyses of large groups of images—but individually, they represent a manifold of personal decisions, institutional preferences, theological bents, and the practical restrictions of physical space.

What we see in Bezzuoli’s drawing as a *correction* is, in reality, a cross-fading of *formulae*—of other images, mental and physical. Here, Michael Baxandall’s stages are overlapping, compressed, or perhaps even competing. The complexity and variety we see in our manifold of gestures is not only the product of an ambitious historical
and geographical diversity in our dataset; it is an accumulation of countless copies and innovations, of individual choices and dogmatic revisions, of theological interpretations and choreographic imaginations.

The tens of thousands of extant depictions of the Annunciation are a gift for comparative computational methods such as ours. Of course, a number of visual topoi, conventions and formulae have been developed over the centuries: the order of the scene (generally left-to-right), or the use of architecture (columns, walls, gardens). When considered in purely schematic terms, images of the Annunciation have a kind of curious stability: its compositional variations are more tightly-packed than those of less frequently-depicted scenes, such as the Presentation of Jesus at the Temple.

What of the internal narrative rhythm of the Annunciation story? Should images show a single moment—a punctum temporis—of the story; or compress time and show a synthesis of the whole event? Didier-Huberman referred to the Annunciation’s “most improbable temporality” as caught in “a knot amongst various times, distributed across time, or even disjoint in their ontological order.”

Baxandall, in his discussion of the Period Eye, addresses this problem in his comparison of different Annunciations from 15th-century Florence with a contemporary sermon by Fra Roberto da Lecce. The story is divided into five stages, tracking the Virgin Mary’s emotional states—the Conditions of the Virgin. By Baxandall’s own argument—that the Quattrocento observer follows Alberti’s advice to deduce the “movements of the soul from movements of the body”—these are gestural conditions, with the movements of her body suggesting emotional reactions and interactions. And, as our previous work has shown, movements—or at least, positions—of the body make ideal units of measurement for large-scale computational study.
The Period Eye

Baxandall refers to the sermons of Fra Roberto da Lecce, who scholastically dissects the gospel text to construct five emotional and behavioral stages of Mary—clarifying the “fifteenth-century feeling for what, on the level of human emotion, happened to her in the crisis the painter had to represent”: (1) *Conturbatio* (Disquiet); (2) *Cogitatio* (Reflection); (3) *Interrogatio* (Inquiry); (4) *Humiliatio* (Submission); (5) *Meritatio* (Merit). Baxandall argues that these Marian chronological steps “very exactly fit the painted representation” of the Annunciation:

Most fifteenth-century Annunciations are identifiably Annunciations of Disquiet, or of Submission, or—these being less clearly distinguished from each other—of Reflection and/or Inquiry. The preachers coached the public in the painters’ repertory, and the painters responded within the current emotional categorization of the event. 6

Baxandall’s hypothesis is explicit: the 15th-century Florentine patron, painter and beholder saw the annunciation through these five stages (or at least through a temporal lens of which theses stages are a manifestation). In previous work, we had shown that the stages of Mary do not correspond to “clusters” in gestural-space. Fra Roberto’s stages are ostensibly emotional stages of Mary; but in reality, we had found it difficult to annotate the images with these stages using only the cropped body of Mary. A kneeling, praying Mary might—for instance—be in *humilitatio* if Gabriel is straight in front of her, or in *pre-conturbatio* (reflecting on Isiah) if a stealthier Gabriel is some distance away, not yet having been noticed. What, then, might we learn from Gabriel’s side of the picture? Meredith Gill, reflecting on Baxandall’s analysis, suggests that “Gabriel also seems to have his own meaningful choreography.”

Our first attempt was to map Gabriel’s gestures onto a new cartography (fig. 2), based on his body-pose—if we could find islands, peninsulas, constellations in this space, they might well relate to Gabriel’s gestural sequence in the story. One thing is clear: Gabriel does not just have his own choreography, he has a much more extreme vocabulary of movements than Mary. His motions explode from the center-point in every direction. If Mary’s clusters were characterized by centrality and overlap, Gabriel’s go towards the peripheral and the contour.

By plotting the individual cropped images of Gabriel onto a huge canvas, we were able to translate it to a kind of *Bilderatlas* of Gabriel’s positions. This resulted in a 200-megapixel digital image, which we annotated collaboratively online, describing a particular position for each cluster of Gabriels. Gesturally, these fell into sixteen well-definable...
categories (“both arms raised,” “standing with oratorial arm,” “presenting a scroll,” “running with arm forward,” etc.). But these distinct descriptions of a certain type of gestural prototype were not stages that—like Fra Roberto’s five conditions—might provide us with a rhythmic mesh to the story itself. (Incidentally, Fra Roberto tells the story entirely from the Virgin’s perspective—there is no hint of Gabriel’s inner intentions.) If Baxandall’s stages are about the plot of the Annunciation, where in this plot do our gestural categories fit?

Our initial hypothesis, following Baxandall, was that Gabriel should follow Mary’s stages. Cross-referencing Fra Roberto’s stages with the Gospel of Luke, we might well associate a precise action for each of the Virgin’s stages, contained in the same (or adjacent) verse of the gospel. Every action of Gabriel provokes an equal reaction from Mary: (1) Greeting (1:28)—Conturbatio (1:29); (2) Reassurance (1:30)—Cogitatio (1:30–33); (3) Proclamation (1:31–33)—Interrogatio (1:34); (4) Clarification (1:35–37)—Humiliatio (1:38).

When viewed in isolation, Baxandall’s Marys work like a storyboard of important moments. We might imagine that the scenes themselves are a kind of punctum temporis in a common Quattrocento imaginary of the Annunciation scene, equally revealed by Fra Roberto’s conditions. But what of the respective Gabriel? They have their own vocabulary of gesture, this much is clear—kneeling-offering, rushing in urgently, solemn acceptance—but unlike the film-strip Mary, we can no longer read them as a sequence. A diverse gestural vocabulary, yet not a sequence of movement—there is a clear contradiction here between Gabriel’s required sequence of actions (enter, announce, explain, leave), and the progression shown (fig. 3). Of course, there are many different possible gestural pathways—he may enter flying from above or running from the side, he may announce standing or on his knees—but the basic actions that ought to accompany Mary’s five stages are clear. Barbara Palmer, in her essay on medieval gestures of greeting, notes that Gabriel’s Annunciation is “that most simple of stage actions: a messenger. . . enters the playing place to announce his message.”10 We find another useful example from Quattrocento Florence—Feo Belcari’s sacra rappresentazione of the Annunciation, performed a number of times in the central third of the Quattrocento. An important event in the temporal structuring of Renaissance Florence, this was also the day in which churches were formally inaugurated, including—in 1436—Brunelleschi’s dome at Santa Maria del Fiore.

Fig. 3. The Marys and corresponding Gabriels, in the order Baxandall provides from Fra Roberto’s stages of the Mary, taken from Annunciations by Filippo Lippi (ca. 1440, tempera on panel, Florence, Basilica di San Lorenzo), Fra Carnevale (ca. 1445/1450, tempera on panel, Washington, D.C., National Gallery of Art), Alesso Baldovinetti (ca. 1457, tempera on panel, Florence, Galleria degli Uffizi), and Fra Angelico (ca. 1438/1445, fresco, Florence, Museo Nazionale di San Marco).
Feo Belcari’s *Festa della Annuntiatione di Nostra Donna* gives us a complete diagram of Gabriel’s motions, as imagined by the contemporaries of Fra Roberto Caracciolo da Lecce. First, Gabriel “announces the celebration” to the spectators, asking them to listen and watch honestly, politely and attentively. After a long preamble, Mary prays to God, reflecting on Isaiah’s prophecy (yet not suspecting she might be the recipient of the divine seed), immediately followed by a series of fascinating stage-directions, as follows (the speech itself has been removed):

_Hora s’apre il cielo: & Dio padre dice a Gabriello che vada ad annuntiare la vergine dicendo._
_Questa lauda si canta dalli angeli che vanno in compagnia di Gabriello: laquale dice cosi._
_Finita la lauda Gabriello dice solo questa lauda._
_Gabriel giunge innanzi alla Vergine Maria & dice […]_  
_Detto questo la vergine Maria s’inginocchia voltando gli occhi al cielo & dice._
_Et gli angeli se ne vanno in cielo seguendo di cantare questo Psalmo._

In a slightly later edition of Belcari’s annunciation play, the dialogue between Gabriel and Mary is entirely in Latin (most of the rest, including stage directions, is in Italian). The audience would know the story well—but Baxandall’s observation that Italians might follow Latin sermons by their gestures is relevant here.

If Luke’s Gabriel simply has to appear, recite, and leave, Belcari’s has a far more dramatic choreography; the sky opens, and Gabriel descends in a _mandorla_. Vasari describes precisely this contraption, designed by Brunelleschi himself—winched down from an iron structure in the Cupola, and illuminated by a blinding cacophony of oil-lamps. Unlike Fra Roberto’s stages of Mary, the dramaturgy and choreography of Gabriel—as Belcari’s stage-directions and Brunelleschi’s machines make clear—is all about a dramatic entry. The _Conturbatio_ that Fra Angelico saw in Mary will be shared by the audience. A few words of the Gospel (1:28, “he came to her”) are turned into the key spectacle of the entire Annunciation story—these are not four or five distinct emotional categories, as Fra Roberto saw in Mary, but a single axis of movement. Indeed, reflecting on the temporal alignment of image and text, depictions of a _departing_ Gabriel are conspicuously absent in our dataset. Even in those cases we find Mary’s closing sentence (“Ecce ancilla Domini”), Gabriel does not seem to be going anywhere.

**Optical Flow**

Let us turn back to the images. If the Belcari’s woodcut is our reference schema, it provides two clear prototypes for Gabriel: Arrival and Announcement. In Belcari’s play, Gabriel arrives vertically (in the candlelit _mandorla_), turns to the Virgin, kneels, and gives his announcement (“Ave Maria Gratia”). By analogy with Baxandall’s stages of Mary, what
might such an angelic sequence look like in paint? Gabriel’s movement is monotonic: a single stroke, rather than Mary’s constellation of gestures and responses. Mary’s constant changes of direction give her a temporal richness, which Baxandall’s examples illustrate like a storyboard: but Gabriel’s single motion seems much more suited to a strip of film than a storyboard; the “change of frame” rather than the “change of scene.”

Like Eadweard Muybridge’s experiments in chronophotography, then, we might use arrangements of images to investigate movement through time. We have no way of knowing whether a particular artist or viewer imagined the Annunciation scene in a temporally and visually coherent way. But if we suppose that “previous visualizing activity” was indeed an important phenomenon in the creation and reception of religious images, an important question becomes: to what extent were such mental images shared between artists, viewers, clerics, and patrons? The gestural variety of Gabriel cannot possibly be explained by a single mental image—we might instead hypothesize a competing ecology of such mental images, deeply individual and yet—to some degree—shared amongst members of a common visual and religious culture.

A composite gesture sequence—across artists, even across geographical space and historical time—might show us the contours for these mental images. Didi-Huberman attempted something similar on Warburg’s nymph, showing a dozen example images in gradual decline, like a kind of flick-book: “A wide array of cases, from which we can delineate an extremely slow movement—as if a movie were filmed for tens of centuries, which we would like to accelerate in order to understand its logic.” Didi-Huberman’s ambition, however, is not quite aligned with our own; his concerns a kind of iconography of the longue durée, a slow historical process of a reclining Nymph, captured across centuries. We also want to work across the centuries, but through a narrative rather than historical axis of movement: delineating the motion of Gabriel in a few short moments. Historical iconography is necessary for our work, but it is not the object of study.

How might we build gesture sequences across time and space? We have far too many images to sort manually into a sequence; any in any case, we are likely to (consciously or not) repeat endlessly-explored connotations and associations—antiquity and the Quattrocento, medieval and the Nazarene. Instead, we built a mathematical graph where each body of Gabriel is a node, and the strength of the connections between two Gabriels is inversely proportional to the geometrical distance between the two skeletons. By defining such a graph, we can find the most likely paths (i.e. the most likely sequences of gestures of Gabriel) between a beginning- and end-state. By taking such paths across the graph (fig. 4), we are able to explore the full multidimensional richness of our gestural space without relying on two-dimensional cartographic analogies, on clustering into fixed categories, or on looking for “characteristic features.” We can produce a huge number of possible shortest paths by choosing different start- and end-points, many more even than the number of images: around 1.2 million. Rather than

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**Fig. 4.** Gabriel’s arrivals—a typical gesture sequence diagram (one of roughly 1,200,000) from the authors’ dataset.
attempting to capture the entire space, experimenting with different random paths through the sequence gives us a feeling for the potential imagined dynamics of Gabriel’s movement, which could never be contained in a single image.

These dynamics—the single, continuous movement of arrival—can be thought of in terms of optical flow, the optical properties of moving images that allows humans to estimate depth, geometry, and mechanical motion from a video of movement. This “flow” is the direction and velocity that takes one frame to the next: rather than being a property of an image, it is a property between images, a vector of future movement. It also has a precise optical definition, which we can calculate geometrically by comparing one pose to the next—resulting in skeletons of flow (fig. 5).

Gabriel’s initial arrival is sometimes in flight or by running, and his final annunciation can be kneeling, bowing, or standing, but our gesture sequence diagrams invariably show the same fluid movement of the Botticelli prototype. Gabriel is never leaving. Just as in Belcari’s play—where the stages of Mary occupy the penultimate half-page of an eight-page script—Gabriel’s fluid movements are a prelude to the moment of annunciation itself (not even “Ecce concepit,” but “Ave”). His first line seems to be his last action—his movements are asynchronous with Fra Roberto’s stages of Mary.

The notion of optical flow is particularly useful in considering the second half of the scene, in that it decreases significantly towards the end. During the discussion
itself (and during Baxandall’s stages), Gabriel is perfectly still (fig. 4-5). A dramatically fluid action, followed by calm; not a jagged interruption to his movement, but rather the prolongation of his opening line.

In other words, Gabriel’s spectrum of movement falls almost entirely in the first two verses of the gospel’s passage on the annunciation; that is to say, only up to *Conturbatio*. This extreme distortion—the lack of emphasis on Gabriel’s considerable dialogue later on in the story (1:30–33 and 35–37)—is reflected both in Feo Belcari’s play, and in the distribution of the physical texts found in our dataset (fig. 6). In Belcari’s play, 44 of 48 (92%) stanzas concern Gabriel’s entrance (reflecting, we must assume, the financial investment in stage machinery). Similarly, 140 of our 160 (88%) texts found in the images (scrolls, materialized speech, annotations) concern only the first three verses of the Gospel text; ignoring the significant subsequent dialogue (and Mary’s changing reactions, captured in Fra Roberto’s stages).

Urgent arrival—running or even flying—and then calm, prayerlike stillness. How to characterize such a movement? In a passage concerning Bill Viola’s passion series, where videos of extreme gestural action are slowed down almost to a standstill, Giorgio Agamben tells of a spectator’s first encounter with Viola’s works:

> The spectator realises that the images had always been in movement and that it was only the extreme slow-down that, by dilating the temporal moment, had made them appear immobile. This effect explains the impression of at once familiarity and strangeness that the images stirred up. It was as if one entered the room of a museum and the old masters’ canvas miraculously started to move. 21

Agamben then notes the concept of *phantasmata*, from the treatise of Quattrocento dancing-master Domenico da Piacenza:

> I say that whoever wants to learn this art, needs to dance to phantasmata; note that phantasmata are a kind of corporal swiftness that is controlled by the understanding of the measure... This necessitates that at each tempo you appear as if you had seen Medusa’s head, as the poet says; after having performed the movement, you should appear entirely made of stone in that instant. 22
Brunelleschi’s machine, Belcari’s plot and our angelic chronophotographs show the relative weight on the arrival of Gabriel. But the conclusion of this arrival: sometimes kneeling, often a greeting hand, and the legitimation of the line “Ave (Maria), Gratia Plena,” the most reenacted line in the whole plot.

Gabriel’s phantasmata is a function of Marian worship, naturally—as Thomas Aquinas notes in his Expositio Salutationis angelicae, an Angel shows reverence to a mortal man for the first time. In Fra Roberto’s sermon too, Mary’s Conturbatio is not at the sight of angels—to which she was supposedly accustomed—but at the tone of the salutation itself. Gabriel’s phantasmata fulfills a different function, however, within the rhythmic logic of the story itself. Gabriel is not mechanically static, which would imply a sudden jolt of stillness after his fluid arrival—instead he remains frozen in that moment, his gesticulation both a pointer to Mary, and to the canonical moment of the scene itself.

**Interaction**

Our initial approach had been to choose a subset of our Annunciations which contained well-annotated metadata, and add manual annotations for the relative “stages” of Mary (via Fra Roberto’s categories) and Gabriel (according to our own schema: flying, standing, bowing, kneeling etc.). These experiments, reported in detail elsewhere, had hinted at strong shifts in the nature of the gestural interaction—and thus the temporality of the scene—over several centuries: with a general tendency for Mary to appear earlier in the story (i.e. more Conturbatio, less Humilitatio) with historical time, but especially over the period 1400–1550. Taken together with our previous argument—that Gabriel almost always appears in a phantasmata, effectively restricted to the first few verses of the story—this effectively implies a narratological contraction of the Annunciation scene.

Those experiments, however, had suffered from several major shortcomings: (a) Although our dataset covered a reasonably wide timescale (c. 1200–1800—we had earlier images, from as early as 300 AD, but without sufficient temporal density) and geographic scope (not just Italian and Flemish but Russian and Greek images), its limited size meant that our evidence for images outside the Italian Quattrocento was scarce. (b) Our annotations of Mary were based on Fra Roberto’s categories, and required heavy interpretation. When we cross-referenced our annotations, we had found significant differences in which images were considered to be in which stage, as well as several highly ambiguous images that we removed from our analysis completely. (c) Our annotations of Gabriel—based on our understanding that he does not go through stages as much as a continuous movement—meant that the two types of annotation were intrinsically

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**Fig. 7.** Bounding-boxes (in red and green) of Gabriel and Mary. Graphic by the authors.
asymmetrical (or even incommensurable): Mary’s to do with temporality, Gabriel’s to do with movement. (d) Because our annotations were categorical (standing/running/flying/kneeling) rather than continuous measurements, subtle shifts and in-between cases were difficult to spot.

With these shortcomings in mind, we decided to take a far larger dataset\(^2\) (amalgamating a number of existing repositories), and rely on a simpler, more uniform, cross-commensurable annotation: bounding-boxes, a commonly-used measurement in computer vision—the smallest rectangles that completely contain the figures in question. An additional advantage of these is that they have the potential to serve as training data for a future automation of the process, potentially allowing further work to operate on an even larger (and thus even less canonical) dataset. These bounding-boxes (fig. 7) gave us new access to the spatial dimension of interaction of the Annunciation: simply put, the distances (horizontal and vertical) between Gabriel and Mary. This allowed us to look in detail at the geometry of the transitions at the end of the Quattrocento, when kneeling Gabriel with Mary in \textit{Humilitatio} had been replaced by flying Gabriel with Mary in \textit{Conturbatio} as the most popular gestural combination.

The result of this experiment (fig. 8) shows relative horizontal and vertical distances\(^3\) between Gabriel and Mary for Annunciations in our dataset between 1450–1530. From the sizes of the circles alone (which represent the number of images in that decade from our dataset), we see particular moments of interest (the 1480s and 1510s—each with over 100 Annunciations) and disinterest (such as the 1530s, with just 41 images). Of course, the dating of many of these images is itself uncertain: our dataset included both the earliest and latest dates given (so that “third quarter of the 15th century” translates to 1450–1475), and we removed those data-points with excessively wide timespans.

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{fig8.png}
\caption{Horizontal and vertical distances between Gabriel and Mary, 1450–1530. The size of each circle shows how many images (between 41 and 115) from that decade were in our measurements. A small number of representative samples are highlighted with arrows. Graphic by the authors.}
\end{figure}
Between decades, the movement is surprisingly stable: to the left and downwards. From 1480 to 1530, the average horizontal distance between Gabriel and Mary is steadily decreasing, whilst the vertical distance widens (in this case, meaning that Gabriel is higher than Mary). Yet though the overall direction of movement seems clear, its speed changes considerably. The points of inflection are not around 1500 (as might be expected, given that some of these objects have been dated with categories that rely heavily on such things as turn-of-the-centuries); but rather, the 1490s, 1510s, and 1530s.

What might Baxandall have to say about all this? His conceptual model was, broadly speaking, a synchronic description of the ecology of forms of the Annunciation in the Florentine Quattrocento. He did, however, give a hint of diachronic development:

> [...] a number of marvelous fourteenth-century ways of registering Cogitatio and Interrogatio become blurred and decay in the fifteenth century, in spite of occasional revival by a painter like Piero della Francesca; or that around 1500 painters were experimenting particularly with more complex and restrained types of Conturbatio than of the tradition used by Botticelli.

We had seen in our previous experiments that Cogitatio and Interrogatio experience a small, but noticeable, decay at the turn of the 16th century. Baxandall describes the Conturbatio, too, gradually becoming more restrained; with reference to Leonardo da Vinci’s complaints of an Annunciation that looked like Gabriel was “trying to chase Mary out of her room [...] Mary, as if desperate, seemed to be trying to throw herself out of the window.” This view is not supported by our evidence from previous experiments, however, which showed a threefold increase in Conturbatio from the 15th to the 16th century.

One might propose an alternative explanation to Baxandall’s: that the very fact Leonardo feels the need to attack such images is a hint that the opposite tendency existed (that is, for an increase in Conturbatio). Although earlier flying Gabriel of course exist, perhaps the earliest example of a swooping-down Gabriel with Mary in Conturbatio is right at the turn of the century: from a 1490s triptych in the Louvre attributed to Carlo Braccesco in Liguria. Indeed by 1550, Vasari praises an Annunciation of Giotto (in the Badia in Florence) of being of particular beauty, noting how Mary’s fright and terror caused her almost to flee. We do not know with certainty the image Vasari is referring to, but a reasonable candidate is the image at the back of the Santa Reparata polyptych (fig. 9a).
The closing horizontal distance is perfectly consistent with our previous observations—that Mary goes from *Humilitatio* to *Conturbatio* in the period 1475–1525, and thus that the implicit narrative gap between the two figures is reduced. As the figures become closer together in narrative time, they also physically close. The widening vertical distance, on the other hand, is an indication of the popularity of the flying-*Conturbatio* motif. Both these shifts, of course, are interlaced by significant changes in format: predellas, lunettes, and polyptychs do not lend themselves to strong vertical distances between figures. In some cases—albeit more rarely—they also enforce a degree of horizontal distance.33

Baxandall had limited his diachronic observations to the 15th century, and especially to how it ended. In our previous experiments—annotating more recent images, from places very distant from Florence, with Fra Roberto’s categories—we had been aware of an extreme methodological anachronicity, a self-contradiction of Baxandall’s *œil du Quattrocento*. Our bounding-boxes, on the other hand, are a far more temporally and geographically flexible metric—and the results of their application on a much wider time-scale (fig. 10) astonished us.

The shifts in the geometry of the Annunciation across three and a half centuries—between 1400 and 1750—are practically indistinguishable from those that happened in the period 1480–1530. It is as if Gabriel is on an excruciatingly slow crawl towards Mary, getting around one-hundredth-of-a-body-length closer every fifty years; whilst also rising vertically above her, at about twice the same rate. A small detail of this historical curve (fig. 8) is of the same shape as the overall curve itself (fig. 10); at a push, we might call it self-similar (as a coastline). This does not mean the turn of the 16th century is any kind of turning point—as the concept of *Hochrenaissance* heavily implies. Quite the opposite: the changes around 1500 are anticipated by those at the beginning of the *Quattrocento*, and are continued in the 16th, 17th, and even 18th centuries.
If the historical progress of the distance between Mary and Gabriel were perfectly smooth, it would be self-similar at all points in time. But that is not what happens: for most of our wide date-range, we see evenly alternating “progressive” decades (solely in the sense that they are in the same direction as the general longue-durée), and “regressive” decades (that point in the opposite direction; against the longue-durée shift). The later 15th century is very much exceptional in its smooth, uncontroversial, unoscillating progress (fig. 11).

We are not implying that nothing is notable about the locations of Mary and Gabriel in the decades around 1500; but rather, that it is notable precisely for being hyper-typical of longer-term changes. Partly, we may speculate that this could be the result of the development—through the foundation throughout Europe of artistic academies, for instance, on the Florentine model—of an artistic canon that glorified Italian art around 1500 (in which Baxandall’s book itself has an important, if relatively recent, role). Later developments, in other words, are a kind of extension ad absurdum of changes already implicit in the later Quattrocento. The Quattrocento becomes not so much a turning point, then, as an ideal-type of wider historical shifts: the period in which change is most monotonic, smooth, one-directional—least self-contradictory. All of this is valid, of course, for the relative positions of Gabriel and Mary in images of the Annunciation (and, though we do not show full results here, for their relative sizes and aspect ratios).

This methodological experiment confirms old truths—and we can take these, at least in part, as a confirmation of the validity of the method (or at least, its consistency with previous methods). But it also allows us to explore new ideas, especially in the development of an iconography of the longue durée that does not resort to historical sparsity (such as extrapolating from a small canon) or temporal simplifications (e.g. by using gross periodizations).

Yet our 4,806 geometric annotations clearly represent a very small number of the extant Annunciations—around one-tenth of our current working corpus of 23,018 images. Even these, however, present complex, interlocking biases: in what has survived; in what kinds of images have found their way into institutions wealthy enough to conserve, digitize, and publish them. Four points of further work become necessary for this kind of quantitative study. First, the continued digitization of these images. Second, more accurate historical estimates of what has been lost (materially or through non-digitization)—in other

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**Fig. 11.** Cumulative self-similarity (similarity between decade-level and long-term changes) in the relative positions of Gabriel and Mary, 1300–1750. Graphic by the authors.
words, of what shape of subset our datasets form. Third, more sophisticated measurements—beyond gestures or body-positions—which give us a more nuanced view into the large-scale, *longue durée* development of the ecology of iconography. Fourth, if our annotations are to become more complex and the datasets they are applied on are to be wider, developments in computer vision will become necessary to automate these annotations. Nonetheless, these four developments—in combination—map a pathway to a genuinely new kind of art history, which can act outside the canon, on far wider temporal and geographical scales, whilst embracing—rather than avoiding—the “noise” of art-historical data.

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NOTES

Preliminary results of the first part of this study have previously been published in Peter Bell and Leonardo Impett, “Iconographie und Interaktion. Computergestützte Analyse von Posen in Bildern der Heilsgeschichte,” Das Mittelalter, 29/1, 2019, pp. 31–53. Thanks to Jacqueline Klusik for her feedback on a draft of this article; and to Katharina Hefele, Cristian Orthega Singerk, and Mehredad Tabrizi for the significant work in producing the annotations on which this article is based.

2. With important exceptions; see e.g. Don Denny, The Annunciation from the Right, New York, Garland, 1977.
11. 1528, Maestro Francesco di Giovanni Benvenuto. The two versions of the play differ in their precise wording: in Quando la nostra vergine Maria fu annunciata dall’angelo Gabriello, the prologue is told by “an angel,” whereas in La festa della Annuntiatione it is explicitly the Angel, though Newbigin doubts the attribution of the second text: Nerida Newbigin, Feste d’Ottobre: Plays in Churches in Fifteenth-Century Florence, Florence, L. S. Olschki, 1996, p. 27. As the plot and stage directions are extremely similar (and the two texts seem to come from roughly the same place and time), these doubts do not affect our argument.
12. The speech follows the Vulgate translation of Luke’s account precisely (1:28–38), with two important differences. The very first lines of the Annunciation are slightly altered: Luke’s text (“Ave Gratia Plena”) becomes the prayer of Angelic Salutation (“Ave Maria Gratia Plena”). The end is radically different too; after Mary accepts her task (“Ecce ancilla domini”), she proceeds straightaway with the Magnificat (which is supposed to happen much later), before the angels—including Gabriel—sing a conclusionary psalm.
13. Baxandall, Painting and Experience, p. 64.
14. There are obvious questions of accuracy in Vasari’s accounts: but even if fictitious, they embody 18th-century Florentine view of the Annunciation, which for our purposes is just as useful.
15. A contemporary—if partially misremembered—account is provided by the Russian Bishop of Suzdal, who describes the drama of Gabriel’s descent to the church floor, in Kristin Phillips-Court, The Perfect Genre, Farnham, Ashgate, 2011, p. 37.
16. “Gabriel Leaving Mary” is apparently a frequent enough iconography to be included in the ICONCLASS schema (code 73A54). We found no instances of it in our dataset; the only example we could find in ICONCLASS-labelled datasets was a 13th-century fresco at the Monastery of Panagia Mavriotissa, Kastoria.
17. This contrasts with the opening lines, which unambiguously show Gabriel in the act of first announcing.
18. Baxandall, Painting and Experience, p. 44.
20. More specifically: to encourage smaller steps between skeletons, it is actually proportional to the square of the Euclidean distance of size-normalised skeletons.
22. Domenico da Piacenza, as quoted in ibid., p. 11.
23. Impett and Bell, “Reverse Engineering Michael Baxandall’s Pictorial Plot.”
24. Our dataset was collated from a range of image sources: the Fondazione Cini, the French Ministry of Culture’s Joconde database, the Réunion des Musées Nationaux, the Web Gallery of Art, the Rijksbureau voor Kunsthistorische Documentatie, the Sächsische Landesbibliothek – Staats- und Universitätsbibliothek Dresden, the National Gallery of Art (Washington, D. C.), the Städel Museum (Frankfurt), Artstor, the Pinacoteca Ambrosiana (Milan), and the Ashmolean Museum (Oxford). We had 4,908 bounding boxes on 2,403 images of the Annunciation.
25. Distances are calculated between the midpoints of Gabriel and Mary’s bounding boxes; horizontal distance is normalized (to include Annunciations from the right), whereas vertical distance is not.
26. There seems to be a regular oscillation between periods of swift change and of relative conservatism; but there is not nearly enough evidence here to take this point further.
27. Baxandall, Painting and Experience, p. 55.
28. From our previous experiments, proportionally from the 15th to the 16th century, there is a decay from 23% to 21% for Cogitatio, and from 19% to 15% for Interrogatio.
29. Baxandall, Painting and Experience, p. 56.
30. Conturbatio appears in 40% of images in the 16th century, but only 15% in the 15th century.
31. The attack was made in the posthumously published Trattato.
32. Vasari, Vite de piu’ eccellentissimi, etc, 1550 edition: “nella quale contrafece lo spavento e la paura, che nel salutarla Gabriello la fe mettere con grandissimo timore quasi in fuga.” This reference...
was made by Salvatore Settis, *Iconografia dell’arte italiana 1110-1500: una linea*, Torino, Einaudi, 1979, p. 121.

33. Though it’s far more common for Gabriel and Mary to be on the same (or adjacent) panels in winged altarpieces, there are plenty of notable exceptions (e.g. Van Eyck’s in Ghent).