A Mathematics of Finitude: On E. T. A. Hoffmann's "Jesuit Church in G."

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For Horst Bredekamp

I

German Romanticism—we know this since the time of German Romanticism itself—converted literature into subjectivity. This description collapses into tautology once the study of literature no longer serves as handmaiden to the philosophy of the subject. When the concept and practice of a writing subject or a subjective writing fail to offer explanation but rather require explanation, literary scholarship gets assigned the contrary task of deriving subjectivity as such from historically well-defined media technologies. The position occupied by the Romantic subject as narrator or as artist was first made possible by the history of appearance or apparition. We can find this demonstrated in a brief narrative by E. T. A. Hoffmann, which was too precise media-technically (and thus mathematically, too) to receive special attention by the interpreters.

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Among Hoffmann's *Night Pieces,* as they appeared in 1816 and 1817 in Berlin, not one does greater justice to the book's title than "The Jesuit Church in G." The story tells of a painter named Berthold and his heroic deed: the construction—at midnight, of course—of a linear perspective under technically difficult conditions. The first-person narrator, who has been detained in the Lower Silesian town G. (alias Glogau) by a mail-coach accident, gives this account:

> It must have been midnight when the sky grew clear and the thunder rumbled from a distance. The mild air, impregnated with pleasing smells, wafted through the opened windows into the gloomy room. I couldn't withstand the temptation, even as tired as I indeed was, to go for a stroll; I succeeded in waking the sullen house servant, who probably had already been snoring away for two hours, and instructed him that it was not madness to go for a walk at midnight. Soon I was on the street. As I was passing the Jesuit church I noticed the blinding light that beamed through one window. The side portal was unlocked. I entered and saw that a wax torch was burning before a niche located high above it. Closer up I noticed that a net of threads was suspended in front of the niche; behind the net a dark figure hurried up and down the ladder and appeared to be drawing something inside the niche. It was Berthold, who was carefully outlining with black paint the shadow cast by the net. Next to the ladder the drawing of an altar stood on a tall scaffold. I was amazed at the ingenious notion. If you, fortunate reader, are somewhat familiar with the noble art of painting, then you will know right away, without further explanation, what the significance of the net casting shadow lines is, and why Berthold was drawing them inside the niche. Berthold was supposed to paint an altar that appeared to project out of the niche. In order to transfer with accuracy the small drawing to the large one he had to cover both the sketch and the surface on which the sketch was to be executed with a net in accordance with the conventional technique. But it was not a flat surface, rather it was a semiround niche, onto which he was to paint; the correspondence between the squares that the curved lines of the net cast inside the niche and the straight lines of the original sketch and the correction of the architectonic relations that were supposed to be represented as projecting outward could only be accomplished by this simple brilliant method.[1]

At the center of the story stands a technical problem of painting that could be posed only under the media-historically constitutive conditions of European modernity. To say that linear perspective, as that which distinguishes this culture from all others, is the subjection of all that appears optically to the perspective of an empirically placed subject would still be underdetermined. It is rather the endeavor—beginning with Filippo Brunelleschi—to capture the three dimensions of buildings in the two dimensions of painting to such an extent that the virtuality of a subject or point of view

first emerges in the play between space and surface, orthogonality and trigonometry. Around 1520 Brunelleschi (according to the testimony of his biographer Antonio Manetti) painted a (now lost) small-format panel picture that showed the Florentine Baptistry (for which he designed the bronze doors) from the perspective of the middle door of Santa Maria del Fiore (a church that would be graced by a dome of his design).[2] Brunelleschi's painting thus brought about the first transfer of architecture into linear perspective. That is why there was a small conic hole in the middle of the canvas so that all viewers of the picture, inasmuch as they stood at the same place in the doorway of Santa Maria del Fiore, held the back of the picture directly before the eye, and made recourse to a mirror, could make the comparison between the actual and painted architecture. In other words, every subject—and that means every subject or vassal of linear perspective—could convince himself of the accuracy of the depiction because the hole in the painting had already preprogrammed the empty place of his own eye.

This empty place or hole is, according to a thesis advanced by Jacques Lacan, the holy or sacred. Egyptian pyramids or temples of antiquity erected masses of stone only in order to enclose an empty space that in turn enclosed the absence of the corpse or of the gods. Such architectonic celebrations of emptiness were not, however, as Lacan emphasizes with irony, exactly "economical."[3] Thousands of stones or dozens of columns built up a mass representing its opposite. It was for no other reason that European painting—to replace "the holy emptiness of architecture"[4] with a more cost-effective alternative—developed linear perspective, which builds up all that is visible around the zeros of eye and vanishing point[5] and indeed virtually exhibits its central hole in Brunelleschi's panel painting.

This transfer of the sacred from buildings to paintings, from spaces to surfaces, as Lacan does not neglect to note, had its impact in turn on the buildings themselves. There arose "an architecture that subjected itself to the perspective of painting."[6] This became evident at the latest when the Jesuit pater Andrea Pozzo adorned the church of the founder of his order, Saint Ignazio in Rome, with a painted ceiling that Jacob Burckhardt could not avoid celebrating or excoriating as the "playground of all lack of conscience."[7] For this painting not only extended the actual church architecture into the illusionary heights of the heavens but also subjected all its columns and saints, cornices, and clouds to a monstrously distorted linear perspective that depended even more on the elliptical curve of the vaulted dome than on the subaltern earthly perspective of

the churchgoers. As Gauß demonstrated in 1827, curves belong to an "inner geometry" of surfaces, which "can be developed without relation to the surrounding space"[8] and which made possible, via Bernhard Riemer and then the theory of relativity, the physics of a noninfinite universe.

Hoffmann's painter is working precisely at the media-technical level of Pozzo. Andrea Pozzo had not only provided with his painted ceiling of Saint Ignazio the greatest practical model for a linear perspective mediated no longer by the flat surface of orthogonal panel paintings but rather by the curve of architectonic vaults, niches, or blind windows; he had also provided rigorous theoretical instruction in his 1693 treatise *De perspectiva pictorum atque architectorum*. The geometric construction technique of laying a net of orthogonal and equidistant lines between the model and the pictorial surface of perspectival paintings goes back, however, to Renaissance treatises like Albrecht Dürer's *Instruction in Measurement with Ruler and Compass* [1525] and continues, without coming close to ending, in the wire frames of computer graphics. But since both model and pictorial surface remained on the same plane as the grid or net, the calculation did not extend beyond linear transformations. Pozzo's treatise on perspective was the first to ascribe to quadratic frames or "nets" the revolutionary function of serving as points of support for a nonlinear interpolation, to put it in modern terms, that mediates between surface and curve in the same way as the aforementioned computer-graphics applies it under the title of Morphing.

It is no accident, then, that the painter's first disoriented monologue—the narrator catches him in the act during the day—should commence with the words "What bother—crooked confused stuff—not to use a ruler" (415). A "surface" (*Fläche*) that, at least in everyday German, is "no flat surface at all, but rather a semicircular niche" defies the right-angle and linear constructions on which the architecture and painting of the Renaissance remained dependent. With Dürer's ruler, this straight edge without units of measurement, Euclidean geometry as a whole, to the extent that it tied the appearance of mathematics to compass and ruler, meets its limits. Hoffmann's story, however—far from transgressing this boundary—sets up a monument to it in the formulation itself:

> The correspondence [*Gleichung*] between the squares that the curved lines of the net cast in the niche and the straight lines of the sketch and the correction of the architectonic relations that were supposed to be represented as projecting outward could only be accomplished by this simple brilliant method. (415)

Contrary to its sound shape, *Gleichung*, "correspondence" or "equation," designates not any algebraic or transcendent equation, one that functions to approximate mathematically height, width, length, but rather a geometric or optically controllable "equation" or similarity between two pictures: the flat altar drawing and its semicylindrical projection. In other words, Berthold's "simple brilliant method" for solving the problem of an affine depiction consists in the avoidance of all modern—and that means analytic—geometry. Otherwise he would have had to convert the Cartesian coordinates of his altar model and net into the cylinder coordinates of the architectonic cavity; in other words, pursue trigonometry in particular and higher mathematics in general.

In 1816, while Hoffmann was writing "Jesuit Church in G.," an engineer and lieutenant in Napoleon's Grand Army sat in the Saratov prison on the Volga. Jean-Victor Poncelet, polytechnical student of Bonaparte's friend Gaspard Monge, ended up a prisoner of war during the Russian campaign "robbed of all books and comforts," but "above all" "devastated by the misfortune that had befallen his country and him" (*Treatise on the Projective Properties of Figures*).[9] He therefore conceived a geometry that, because it had to forgo ruler and compass, was that much more general. In principle, this projective—that is to say, perspectival—geometry concerned all possible images that cast all possible figures onto all possible surfaces; for simplicity's sake, Poncelet, too, adhered, first, to flat figures and surfaces and, second, to nonalgebraic proofs.[10] In this way, while Hoffmann's Berthold was conducting his midnight experiments, a modern geometry was just the same founded—one that still finds invariants where before it could only complain of "crooked confused stuff." Under computer conditions nothing is easier than to project baroque altars in linear perspective onto equally baroque surfaces. Every play console by Sega, Sony, or Nintendo calculates so-called environment mappings in fractions of milliseconds.

The precise point at which mathematics takes place (following Monge and Poncelet) is represented or replaced in Hoffmann's story by a media-technical apparatus. "The Jesuit Church in G." is a "night piece" not because Berthold, like so many pathological genius-artist figures of Romanticism, paints through the night, sleeps during the day, and moreover is suspected of having vampirized his wife. What makes the story qualify is an optical projection trick for which the story must guarantee maximum effectiveness. The "blinding light" without which the narrator would never have been drawn into the nave of the church at night emanates from a wax torch that, like a simplified magic lantern, casts the distorted

shadow of a quadratic net onto Berthold's semicylindrical painting surface, thereby enabling him to draw an equally black copy. This torch, then, takes the same place that the hole marked as origin of projection in Brunelleschi's Baptistry picture in order to preprogram media-technically an artificial or virtual eye. When Berthold runs up and down the ladder as a "dark shape" in front of the niche, he is merely carrying out and embodying this program. The painter is in the picture—not like the Far Eastern painter who in all humility could enter his own painting after ten long years of labor, but rather like a robot following media-technical algorithms.

These algorithms, however, simply coincide with linear perspective. Ever since Giambattista della Porta it is possible to produce perspectival projections even without undergoing the handiwork toil of ruler and compass; henceforward it suffices completely—at least until the advent of photography—to draw a copy of the picture projected by a camera obscura. Ever since Thomas Walgenstein and Athanasius Kircher, it is possible to cast perspectival projections, that is, thoughts and mental images of a subject (in the strict sense of Heidegger), onto other subjects: it suffices to insert a painted mental image into a magic lantern that projects its light onto flat or (for a Gothic Romantic setting) curved or vanishing surfaces. Thus the passive camera obscura of the Renaissance and its active baroque counterpart, the laterna magica, first mechanized imagining and then the imagining of imagining. The modern subject is, at least in the optical field, a media effect.

It is hardly gratuitous that a Florentine chronicle celebrated Leone Barrista Alberti, the first theorist of linear perspective, as having developed his invention at the same time as Gutenberg's invention of movable type. Without the camera obscura and magic lantern it would scarcely have been possible to add to Gutenberg's liberation of texts from the individuality of copyists the deliverance of technical drawings from all painterly individuality. This linkup between book printing and science, the script religion of the Reformation and aesthetic-technical reproducibility, can also be turned against their inventors. No Catholic order subverted Luther's *sola scriptura* more successfully than the Jesuits, who with Loyola introduced multisensory hallucination, with Kircher the laterna magica, and with Pozzo the linear perspectival ellipsis of the heavens.

The sacred as trompe l'oeil, the optical majesty of which entices obdurate believers in letters back into the only church that can confer salvation, is of course "of this" and not "of the other world" (414). Everything that Hoffmann's painter Berthold invents, paints, and says, he invents, paints, and says in the name of the Jesuit order

that, beginning in 1796, modernized his Glogau church. Aloysius Walther, "professor in the Jesuit college" (413), explains to a narrator whose Romantic yearning for the Middle Ages much prefers the "spirituality" of Gothic buildings to "Italian" (and thus sensual) Jesuit baroque: "Our homeland is indeed up there; but as long as we dwell here, our empire is also of this world" (414). The narrator dismisses this, albeit only silently, with the sarcastic observation that the Jesuits had "demonstrated through all their activities that their empire was of this world, indeed only of this world" (414).

Dwelling in this world determines all the alterations Berthold introduces into the house of God. What the painter refers to as "building artfully" (418) remains, in the strict sense of mathematical topology, superficial, without holes, and thus uninhabitable. Since "the marble" in Lower Silesia is too expensive, the Jesuits make recourse, "in keeping with the latest fashion," to all sorts of "surrogates." As Professor Walther enlightens or disillusions his visitor, "More often than not the painter produces the different types of marble as is happening right now in our church" (414). Replacement of three-dimensional blocks of stone by two-dimensional marble gloss observes thus the same economy that leads, inside the wall niche, to the simulation of an altar, the centerpiece of all church interior architecture, in two dimensions but in linear perspective. In the Here and Now of the Jesuits, even and especially the Beyond, in strict accordance with Lacan, is subordinate to an economy of cost cutting.

II

All economies, however, are in turn subordinate to mathematics. It is precisely because Berthold's nightly activity comes down to saving by a "simple brilliant method" the cumbersome equation systems of affine depictions that mathematics advances to the center of the story. Hoffmann—who in a letter to Hippel dated 20 July 1796 announced his "eccentric notion" to "help" with the "new" painting of the Glogau "Jesuit church," and later in Bamberg had good financial reasons for testing all the illusionist tricks of theater set painting—knows, as always, of what he speaks. The narrator, who by the end unmasks himself as author, deals in the fiction on a completely professional basis with the trompe l'oeil painter Berthold. Since he is "accustomed to such things from an earlier period in his life," the narrator offers the painter praise that is as professional as it is ambiguous:

> You may indeed be the most accomplished architecture painter there is. But I believe you are qualified for something better than decorating church walls with marble columns. Architecture painting will always remain something subordinate; the history painter, the landscape painter enjoy without question a higher standing. Even the one fantastic element in your painting, the perspective that deceives the senses, depends on careful calculation, and thus the effect is the result not of brilliant conception but only of mathematical speculation. (418)

The Romantic narrator picks up the old European distinctions of history painting, landscape painting, and architecture painting, the same distinctions that are just then imploding in the chronologically coordinated museums of his epoch. He turns to these distinctions once more to attribute to them a ranking that in turn coincides with the hierarchy obtaining between fantasy and calculation, Romanticism and architecture, brilliant conception and mathematical speculation. The subject constituted through linear perspective throws away the very ladder that, beginning with Brunelleschi, first enabled his ascent.

In an unconditional manner that practically quotes Hegel's subordination of mathematics or the quantitative to the concept as subjectivity and quality, the effect celebrates itself as cause. At the precise point where once perspectival peepholes took over and architectonic cavities left off, the "phantom of our own ego"[11] leads the parade as historically new figure of the sacred. And because this subjectivity exists only as narrative perspective—as we will see in considering the second part of Hoffmann's story—the illusion has reached its goal at the end of a long passage through architecture and painting: it becomes, again strictly following Lacan, the play of signifiers named literature (169).[12]

But first it should be underscored that Berthold does not let his narrator's criticism pass without contradiction. According to him, it is not only in general heresy to wish to "arrange the different brands of art according to a hierarchy" but even an as much specific as special presumption of subjects to want to be "creators" like Prometheus and "animate" their "dead figures" (418). The reception strategy of Hoffmann, who in "The Sandman" wants to "articulate with all glowing colors and shadows and lights" "inner images" "like an enterprising painter" (343) and in *The Devil's Elixirs*[13] explicitly equates his narrative technique with the image projection of a camera obscura, encounters a resistance that originates in painting, the art that, for effect, this literature regularly summons as model. Berthold, as though already on the track of Wagner's definition of effect,[14] can demonstrate with linear perspective that it is indeed effect without cause, black box without interior:

> And what would we make of this dry tiresome life if the Lord in heaven had not given us a good number of colorful toys!—Whoever is good does not, like the curious knave, aim to break the box that emits the barrel organ sound when he turns the external crank.—One says it is quite natural that it resounds inside; I am after all turning the screw!—Because I recorded this framework correctly from a fixed point of view, I know for certain that it will appear fully formed to the viewer. . . . Now I finish painting it in the correct coordinated colors[15]—it appears to recede four yards. I know all that for certain; oh! one is surprisingly clever—how is it that objects at a distance grow smaller? The single dumb question of the Chinese gentleman could discomfit even Professor Eytelwein; yet he could help himself out with the barrel organ and answer that he had turned the screw on a number of occasions and always experienced the same effect. . . . The ideal is an insolent lying dream created out of fermenting blood. . . . The Devil fools us with dolls on which he has pasted angel wings. (420)

Berthold's discourse, the "literal" "repetition" of which proves nearly "impossible" for a Romantic narrator (420), traverses or raves deliriously throughout the entire space between God and Devil, angelic toys and satanic automata. But its "cuttingly ironic" (420) theology only delivers the technical proof that the illusional effect of linear perspective on its "viewers" or subjects is as strictly calculable as it is impossible to comprehend.[16] Despite all Hegelian concepts of the concept, not even an engineer like Hoffmann's Berlin colleague Johann Albert Eytelwein is able (in his two-volume *Handbook of Perspective* of 1810) to explain the effect of perspective other than tautologically or illusionally. For the "I" or ego that takes its certainty that it turns the crank to signify that it is the very cause of the thereby reproduced automatic music simply confuses, in the terms of Julius Robert Mayer, cause and release (*Auslöser*). The creator subject outside the black box is therefore illusion, whereas inside the black box, in contrast, there is only the algorithm of illusion.

This algorithm bears, nonetheless, historical traits. That "the single dumb question of the Chinese gentleman could discomfit even Professor Eytelwein" says nothing less than that linear perspective has become possible and effective only under the conditions of modern Europe. It is not gratuitous that the "dumb question" that otherwise only Berthold raises is Chinese. When Catholic missionaries (who, once again, were Jesuit fathers) made the attempt around 1630 to export to China technical scientific books with equally technical—in other words, linear perspectival—illustrations, the reproduction of these treatises (and thus the modernization of an empire) regularly foundered on the linear perspective: in the absence of ruler and compass, the Chinese calligraphers and

painters, to whom the Jesuit fathers entrusted the copying by hand of all the reproduced mills, cranes, magic lanterns, etc., fell short of the precision necessary for the translation of technical illustrations into new mills, cranes, or lanterns.[17] Fortunately for Ming emperors, Tokugawa shoguns, and the arts, there were no "subjects" in the Far East in 1630. In "Chinese pictures," which Hoffmann elsewhere described as "without harmony and without perspective,"[18] lines in two dimensions simply did not "recede four yards."[19]

It necessarily follows from this that linear perspective cannot be derived from the singularity of a foundational subject nor from the generality of the human species. It is at once deterministic and contingent, mechanical and without basis. That is why perspective just the same eludes the grasp of theology or philosophy (in spite of the admirable start Schelling made in regard to ellipsis in his *Philosophy of Art*).[20] Only in mathematics can regularity and contingency, the unequivocal and the singular, coexist. With a turn that knocks out two centuries of Western mathematical philosophy, Berthold explains to his narrator:

> How glorious is the rule!—the lines join together for a specific purpose, for a specific explicitly conceived effect. Only the measured is purely human; what goes beyond that is evil. The superhuman must be God or Devil; have not both been surpassed by man in mathematics? Is it not conceivable that God created us for the express purpose of furnishing his household with whatever can be represented according to measured recognizable rules, in short, that which is commensurable, just as we for our part construct sawmills and spinning machines as mechanical master builders of our supplies. Professor Walther claimed recently that certain animals were created only in order to be eaten by other animals, and that this would serve our purposes in the end, just as cats, for example, would have the inborn instinct to devour mice so that these mice will not gnaw away at the sugar that has been put out for breakfast. The professor is ultimately right—animals and we ourselves are well-organized machines for processing certain materials and molding them for the table of the unknown king. (419–20)

To a superficial or philosophical reading, Berthold's teleology of God and man, cat and mouse, appears at first to be a parody of vulgar materialist instructors or, closer to home, Jesuit fathers—a parody that Hoffmann, according to evidence presented by Ellinger, lifted almost verbatim from Gotthilf Heinrich Schubert's *Dream Symbolism* [1814]. Such a reading overlooks, however, that in place of the trinity of God, man, animal that Schubert addresses (as does therefore Professor Walther, too), Berthold, Walther's erudite mouthpiece, introduces instead a trinity comprised of God, man, machine, within which the machine ultimately subsumes both animals and humans. Thus Schubert's eternal circulation between

eating and being eaten becomes a theorem of universal division of labor. God, because he is the inferior mathematician, requires humans to do the math just as these humans, since they lay claim to machine abilities but, as evident in the case of the barrel organ, do not in fact possess such abilities, in turn need sawmills and spinning machines. It all comes down to this thesis that humans, precisely because they are not creators like the Greek Prometheus or the Judeo-Christian God, were explicitly created in order to surpass God and his adversary in mathematics.

Mathematics, however, is the realm that two-thousand-year-old traditions have reserved for God's omniscience and/or omnipotence. The Greeks honored in geometry and in the harmony of the spheres laws of the heavens that men on this earth could always imitate only as dim or fading away. The Jews honored in the universe a God who set up everything according to measure, number, and weight. Leibniz finally, because he recognized that measure and weight were redundant circumlocutions for number, brought all the mathematics of God or infinity together in the inimitable sentence that the world only is insofar and as long as God does his math.

The despairing architecture painter in Hoffmann's story parts with this tradition. If God or infinity is surpassed in mathematics by mankind, then a mathematics of finitude is proclaimed instead[21]—a mathematics that the twentieth century (from David Hilbert to Alan Turing) could not establish or substantiate but could just the same implement in universal digital machines. Computers as "the dominion of the rule"[22] make Berthold's exclamation, "How glorious is the rule," literally true. And indeed: from linear perspective, which the exclamation addresses, there folds out a direct technical-historical line to sawmills and spinning machines, on the one hand, and to computers, on the other hand. Wind or water mills as the fundamental innovations of the European Middle Ages first made possible the introduction of a paper economy before they also served the processing of grain, wood, and ore. It is not surprising that mills figure among those technical book illustrations that were not reproducible in imperial Peking in the absence of knowledge of geometry. In exact accordance, the spinning machine, the fundamental innovation of the eighteenth century (if only because it ran twenty times faster than the spinning wheel turned by hand),[23] rang in the transition from manufacturing to industry and thus forced the development of weaver's looms, which, because they were programmable, inspired Charles Babbage's protocomputers.

Hoffmann's story, written less than ten years before Babbage's Differential Engine [which he began building in 1822], is at the highest technical level of its time. Mathematics and the machine

cease to be earthly imitations of heavenly principles; they become processes of a "processing" that, so as not to founder on Turing's holding problem, fundamentally come to an end and, accordingly, must be finite. This finitude is so radical that ultimately it loses the very name of infinity. The nonmathematician, whom Berthold at first called "God," is referred to at the end only as "unknown king," in whose service—as if in anticipation of Büchner's Danton[24]—men, "as well organized machines," manufacture "certain," namely mathematical-mechanical, "materials." "The Jesuit Church in G." does not therefore introduce any subject into literature, but rather brings literature into the industrial age.

Hoffmann's interpreters, however, tend to this day (with the laudable exceptions of Leonard Wawrzyns and Wolfgang Coys) to read the omnipresent motif of automata in his writing poetologically or aesthetically. They concern themselves with dolls (who in the fantasy life of subjects represent women or angels), not with a machine mathematics that first makes possible the dolls and angels, camera obscuras and magic lanterns, sawmills and spinning machines. For that reason alone, Hoffmann's "Jesuit Church in G." still has a second part, which, via the biographical reconstruction of Berthold's prehistory, explicitly supplies the connection between mathematics and eroticism, linear perspective and female automata.

III

The Jesuit professor, Walther, who does not realize that he is addressing the "author of the fantasy pieces in the manner of Callot"—whose "manner" of subject-oriented narration is "mad" (424)—hands the narrator "a couple of pages of writing." On these pages a nameless student recorded the fragmentary autobiographical confessions of Berthold, in the course of which he practiced Callot's manner to the point that—to continue to cite Walther—"the writer without any indication or warning transfers words of the painter literally into the first person" (424). That is precisely the stylistic innovation that Hoffmann in "The Sandman" celebrates and substantiates as his very own (344). Without realizing or desiring it, the Jesuit "makes" the "writer" "a present" that (in the strict sense of Lacan) brings back his own message in reversed form and therefore already transfers the linear perspective of painting into literature's play of signifiers.

The tale of Berthold's sad love affair is quickly told. It must only explain how a promising Romantic artist could become a

subaltern architecture painter, rule-guided automaton, and presumed wife killer. Hence both student and narrator make a long story short—but with the dramatic consequence that the myth of subjective self-formation and the phantom of a painterly collected work dissolve, respectively, into discursive mechanics and proto-photographic media techniques. Berthold's artist biography only proves his statement that the Devil fools us with dolls and automata on which he has pasted angel wings.

As usual, the artist subject commences in the days of childhood and discourses of the other. An old painter advises Berthold's poor parents that their "son," although already endowed with "a pure authentic artist sensibility," can arrive at his "own thoughts" only by first taking the requisite trip through Italy (424). As is also usually the case, this command to think for oneself[25] leads to its exact opposite. At the start of his stay in Italy, Berthold chases the *fable convenue* that history painting occupies the pinnacle of his art. To climb up to the next developmental stage named landscape painting, it suffices either for Berthold to converse with Philipp Hackert or for Hoffmann to reach for the pertinent book by Goethe. That is the full extent to which Luhmann's celebrated autonomy of art, which allegedly had its origin around 1800, is subordinate to the discourse of art theories or art professorships. And because all good things come in three, only one more wise old man must appear in order to play off the ideal of a painting that is subjective-objective, historical-natural, and therefore truly speculative against Hackert's mere imitations of nature. From that point on, Berthold is himself the painter genius according to dream or possibility—but according to empiricism or application he is a nil:

> I tried to represent hieroglyphically in the manner of my dream what lay deep inside me only as dark intimation, but the elements of this hieroglyphic writing were human figures who moved around a point of light in whimsical entanglement.—This point of light was to be the most glorious shape that had ever entered a visual artist's fantasy; but I struggled in vain to grasp its traits when it appeared in the dream surrounded by celestial rays. Every attempt to represent it failed ignominiously, and I withdrew in hot yearning. (432)

To borrow once more words from Hoffmann's "The Sandman," Berthold has, then, an "inner image," which, however, does "not in the least" want to step outside (344). And yet this impossible interiority is always already outside: in the first place as "glorious shape" (of woman) and, in second place, as "point of light" that like the origin of the rays of a magic lantern "draws" all other "figures"

"with flame strokes in the air" (430). An interiority surrounded by all sorts of "whimsical entanglements" renders the distinction between inside and outside nearly untenable (as the curves thesis of Camille Jordan demonstrated in 1893).[26] Thus the pivotal ideal of woman, in whom the Romantic artist is known to find his calling, prefigures nothing else but Berthold's nightly experimental order. One need only set the wax torch in place of the point of light and in place of the whimsical entanglements the nonlinear distorted net to recognize that the hallucination is in linear perspective.

It is no wonder, then, that the profoundly inner ideal of woman steps forthwith into external life. "Not far from Naples," where Berthold has just recanted Hackert's false doctrines, there happens to lie "the villa of a Duke which, because it offers the most beautiful view of Vesuvius and the ocean, is hospitably open to foreign artists, in particular landscape painters" (432). As always in Hoffmann, ducal villas, princely gardens, and royal picture galleries are just now for the first time open to the middle class and artists to summon up out of museum, park, university, etc., the veritable "Bildungsstaat" (the "state" of culture, education, development, formation). And so it happens as it must: in the same park grotto where Berthold received his inner vision, the daughter of the Duke stands before the gaze of the artist, which immediately translates the proper name "Angiola T. . ." into the "angel face" of his impossible vision (432–33). At once Berthold is "completely turned around," "commences producing paintings himself," receives "commissions" for "great works," and produces "altar drawings" in which the central saint by all accounts resembles "Princess Angiola T. . ." "in face and form" (433). The inner image thus enters the external individuality named Berthold, but this individuality alone is fortunately incapable of such pattern recognition.

Not until "Bonaparte's victories," as "the French army nears the kingdom of Naples," does that change.[27] "French commissars" collect immeasurable contributions while plebeian "hordes" "set fire to the houses of the high and mighty who, they feel, sold them out" (433). Thus Berthold, too, finds his way from the suburban villa into the Duke's city palace. He saves Angiola from the counterrevolutionary "rabble," and with his "loot" (which is how this rabble views the Duke's daughter in his arms) he can flee home to Germany (434–35). Only now does Berthold recognize his dream image, and Angiola, too, considers herself fortunate to have been designated by Berthold's pious altar pictures as impious love object. With this knowledge (in the double biblical sense), only marriage is left for both of them, the decision to place their Romantic nuclear family of father, mother, son inside the altar picture.

But this is where Berthold precisely fails. Unfinished—and covered with "a blanket" to protect it—the painting of the Virgin Mary finally ends up hanging in the Jesuit church of Glogau (416), where (just as today) works no longer count but only processes or algorithms. It is well known that no woman of the Age of Goethe can be at the same time "heavenly Mary" and "earthly woman," algorithm and object of love (435). Angiola, Berthold's ideal, becomes "on the canvas a dead wax image that stares at him with glassy eyes" not only "when she sits for him and he wants to paint her." But it is also because the empirical Angiola recognizes Berthold's "hatred" and death wish against mother and child, that he can "read" "in Angiola's corpse-pale face" his "raving heretical origin" (435).

Whether or not Berthold murdered Angiola is left open right to the end of the story. Berthold threatens the narrator, who confronts him with this rumor, with a double murder—before he himself is pulled "one-half year" later out of the Oder River dead. But murder or madness is not at all at issue here. For already with the unfinished picture, painting itself comes to an end. Ever since Hoffmann's "Jesuit Church in G.," all literary attempts to create the picture of all pictures fail. Balzac's unknown masterpiece remains unfinished, chaotic, and covered up; Poe's oval portrait robs the painter's beloved of blood and life at the same time that it takes on life and color. Finally, Hebbel's poem "The Painter" includes the following two stanzas:

> He painted her cheeks red,
> The eye's gleam at the same time,
> Then her eye was blind and dead
> and her cheek pale.
>
> And as she stood completely realized,
> The graceful form,
> I took the girl's hand,
> But it was damp and cold.

All these stories, macabre or not, only demonstrate the factual circumstance that depiction changes its essence around 1820. Depiction ceases to be the projection in linear perspective of a multiplicity of points into other, namely, affine multiplicities of points. In place of this relational definition of depiction, there arises a material one. "Depiction should"—in the words of Rudolf Arnheim—"not only resemble the object but should also provide the guarantee for this resemblance by being, as it were, a product of the object itself,

that is, mechanically produced by the object itself—as the illuminated objects of reality impress their image mechanically onto the photographic surface."[28]

The demand for material resemblance poses problems for painting that can be solved only through media techniques like camera obscura and laterna magica or by magic. Such contact magic is at work, for example, not only when Angiola as painting is paralyzed "into a dead wax image" "with glassy eyes" but also when Angiola as model turns toward her painter a "corpse-pale face." To "fool us with dolls on which he has pasted angel wings," "the Devil" must depict in each other the materiality of human and automaton, of primal image and copy. This same contact magic is also at work when Balzac confesses to his photographer Nadar his fear that after nine sessions he would be left a corpse simply because every ensuing picture taken would take away another layer of its model.[29] That is how plainly and simply depiction as material resemblance makes the media-historical switch from painting to photography.

The inventor of photography, Daguerre, started out, not so different from Hackert or Berthold, a painter of Vesuvius tableaux; his partner and precursor Nièpce, by contrast, had been involved in problems of mass reproduction. Nièpce's so-called heliography was intended to advance lithography, just then developed by Senefelder, to the point of automating the Gutenberg reproduction techniques of woodcut and copper etching.[30] The grand Napoleonic project to provide access to the totality of all books, documents, and images[31] thus influenced Nièpce and his insane brother, too, who long before Edison sought to invent invention itself. For it was this project that first demolished in museums like Denon's Louvre the old European hierarchy of landscape, history, and architecture painting in order to push through the general image concept of modernism that Berthold's theory also observes; this project burst open for the first time on the European continent the secret doors behind which palaces, churches, and monasteries had preserved and concealed books, documents, and images. The Neapolitan princess Angiola T. . . could only under these new conditions be the "loot" of a bourgeois painter, because in 1799 the kingdom of both Sicilies was the loot of the French armies in Italy. Hoffmann's work belongs, then, to that great image-looting campaign that around 1800 hunted down the insignia of old powers like the Jesuits in order to establish a new power of knowledge. To collect from Italian cities a "contribution" of artworks appropriate for the General Staff, General Bonaparte delegated a connoisseur and scientist who was at the same time his closest mathematician friend:

Gaspard Monge invented, in addition to projective geometry, the art of looting. Hoffmann's story reveals that the two are one.

Whether our era has escaped such world conditions is written in the stars. Certainly computer graphics liberated projective geometry from the materialism of photochemistry and elevated it to the dignity of a once-more strictly relational topology. But the relationship of God, man, and machine, which make loot for each other, is more finite and thus more algorithmic than ever before. Hoffmann's question, whether God and Devil "are not both surpassed in mathematics by man," is more likely posed today to God, Devil, and man: all three would appear to be surpassed in mathematics by machines.

Notes

[1] Ernst Theodor Amadeus Hoffmann, *Fantasie-und Nachtstücke: Fantasiestücke in Callots Manier / Nachtstücke / Seltsame Leiden eines Theater-Direktors,* ed. Walter Müller-Seidel (Munich: Winkler Verlag, 1967), quotation on 416–17; hereafter cited in the text.

[2] See Bernd Busch, *Belichtete Welt: Eine Wahrnehmungsgeschichte der Fotografie* (Munich: Hanser Verlag, 1989), 63ff.

[3] Jacques Lacan, *Le sèminaire,* livre VII: *L'èthique de la psychanalyse* (Paris: Seuil, 1986), quotation on 162.

[4] Ibid.

[5] On the structural homology between linear perspective, the Indian-Arabic zero, and modern monetary economy, see Brian Rotman, *Signifying Nothing: The Semiotics of Zero* (London: Macmillan, 1987).

[6] Lacan, *Le sèminaire.*

[7] Jacob Burckhardt, *Der Cicerone: Eine Anleitung zum Genuß der Kunstwerke Italiens* (Leipzig: Alfred Kroner Verlag, n.d.), quotation on 986.

[8] Manfredo P. do Carmo, *Differentialgeometrie von Kurven und Flächen,* trans. Michael Grüter, 3rd ed. (Braunschweig, Germany: Vieweg Verlagsgesellschaft, 1993), 178.

[9] Quoted in *A Source Book in Mathematics,* ed. David Eugene Smith (Mineola, NY: Dover, 1984), 315.

[10] Ibid., 316f.

[11] Ernst Theodor Amadeus Hoffmann, "The Sandman," in *Fantasie- und Nachtstücke* (see note 1), 331–63, quotation on 341.

[12] Lacan, *Le sèminaire,* 169.

[13] Ernst Theodor Amadeus Hoffmann, *Die Elixiere des Teufels,* ed. Walter Müller-Seidel (Munich: Winkler Verlag, 1977).

[14] See Richard Wagner, *Oper und Drama,* ed. Klaus Kropfinger (Stuttgart, Germany: Philipp Reclam, 1994), 101. With great elegance, Wagner anticipated Julius Robert Mayer's theory of the thermodynamic "trigger" (*Auslöser*).

[15] In addition, Berthold has carefully numbered all his colors (Hoffmann, *Fantasie- und Nachtstücke,* 420).

[16] Johannes Kreisler accordingly speaks "as complete machinist" of the "effectiveness" of the theater "machines" that contribute with "magical power inexplicable to the audience" to "the intended total effect" (quoted in Hoffmann, *Fantasie- und Nachtstücke,* 59).

[17] See Samuel Edgerton, *The Heritage of Giotto's Geometry: Art and Science on the Eve of the Scientific Revolution* (Ithaca, NY: Cornell University Press, 1991), 254–87.

[18] Ernst Theodor Amadeus Hoffmann, *Seltsame Leiden eines Theater-Direktors,* in *Fantasie- und Nachtstücke* (see note 1), 611–707, quotation on 677.

[19] See Wolfgang Schivelbusch, *Lichtblicke: Zur Geschichte der künstlichen Helligkeit im 19. Jahrhundert* (Munich: Hanser Verlag, 1983), 183.

[20] Friedrich Joseph Wilhelm Schelling, *Philosophie der Kunst* (Darmstadt, Germany: Wissenschaftliche Buchgesellschaft, 1966).

[21] See Brian Rotman, *Ad infinitum: The Ghost in Turing's Machine; Taking God Out of Mathematics and Putting the Body Back In—An Essay in Corporeal Semiotics* (Stanford, CA: Stanford University Press, 1993).

[22] See Bettina Heintz, whose book bears this title (*Die Herrschaft der Regel: Zur Grundlagengeschichte des Computers* [Frankfurt am Main/New York: Campus, 1993]).

[23] For the path from the Spinning Jenny to Jacquard and Babbage, see Wolfgang Coy, *Industrieroboter: Zur Archäologie der zweiten Schöpfung* (Berlin: Rotbuch, 1985), 41ff.

[24] "But we are poor musicians and our bodies the instruments. Are the ugly sounds that are cheated out of them only there in order to press higher and higher and finally subsiding quietly to die like a voluptuous aspiration in heavenly ears?" (*Dantons Tod,* act IV, in Georg Büchner, *Gesamtausgabe: Werke und Briefe,* ed. Fritz Bergemann [Leipzig: Insel Verlag, 1968], 78).

[25] See Heinrich Bosse, "Der geschärfte Befehl zum Selbstdenken: Ein Erlaß des Ministers v. Fürst an die preußischen Universitäten im Mai 1770," in *Diskursanalysen 2: Institution Universität,* ed. Friedrich A. Kittler, Manfreid Schneider, and Samuel Weber (Opladen, Germany: Westdeutscher Verlag, 1990), 31–62.

[26] See Hans von Mangoldt and Konrad Knopp, *Höhere Mathematik: Eine Einführung für Studierende und zum Selbststudium,* 16th ed. (Stuttgart, Germany: Hirzel, 1990), 2:411f.

[27] In historical fact the capture of Naples by General Jean-Étienne Championnet had less to do with "Bonaparte's victories" in 1796 than with the rash desire for revenge on the part of Naples's queen, a sister of Marie-Antoinette. However, this makes it all the more significant that Hoffmann makes the connection.

[28] Rudolf Arnheim, *Kritiken und Aufsätze zum Film,* ed. Helmut H. Dieterichs (Munich: Hanser Verlag, 1977), 27. We find a similar view, albeit presented in physi-

ological terms, in Jonathan Crary, *Techniques of the Observer* (Cambridge, MA: MIT Press, 1994).

[29] Nadar (Félix Tournachon), *Quand j'ètais photographe* (Paris: E. Flammarion, 1899), 26.

[30] See Friedrich von Zglinicki, *Der Weg des Films* (1956; repr., Hildesheim, Germany: Olms Verlag, 1979), 145.

[31] See Jacob Burckhardt, *Napoleon I: Kulturgeschichtliche Vorträge,* ed. Rudolf Marx (Leipzig: Alfred Kroner Verlag, n.d.), 159.