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Signs of the Times: Emblems of Baroque Science Fiction

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> Semantic Faculties: Factions within the mathic world, in the years following the Reconstitution, generally claiming descent from Halikaarn. So named because they believed that symbols could bear actual semantic content. The idea is traceable to Protas and to Hylea before him. Compare Syntactic Faculties.
> (THE DICTIONARY, 4th edition, A. R. 3000)[1]

In his 2002 tour de force essay on the Hispanic baroque *Barroco*, Fernando R. de la Flor introduces Juan de Borja's emblem, *Hominem te esse cogita* (think that you are [only] a man), as evidence of a Hispanic counter-proposal to the Cartesian revolution, signaled by Descartes's emblematic motto *Cogito ergo sum* (Fig. 1). The Spanish scholar's lengthy dissertation on Spain's contestatory relationship with European modernity deploys Borja's emblem as a prolepsis for his hypothesis concerning a specifically Hispanic strategy for negotiating the modern marriage of (proto-)capitalism and political absolutism. The essay goes to great lengths to excavate what the author identifies as the subversive nihilism at the heart of Counter-Reformation efforts to close off the Spanish empire from the progressive and instrumentalist thrust behind Descartes's attempt to define and legitimize the individual subject's encounter with, and analysis of, the real physical causes of the universe.

R. de la Flor's argument is dialectically anchored in his rejection of José Antonio Maravall's more instrumentalist (Cartesian) definition of the Spanish baroque: "I believe that the peculiarity of this hispanic baroque culture resides, precisely, in what Maravall denies from the beginning: that is, in the manifest capacity of its expressive system to move in the opposite direction to any established ends" (*Barroco* 19).

R. de la Flor's face-to-the-wind navigation of Spanish mysticism and skeptical philosophy frames its anti-Cartesian characterization of the Spanish baroque within Borja's emblem of *desengaño*:

> [Borja] manages to give a precise body to a Counter-Reformation ethos, profoundly contrary to what is revealed to be the growing substance and process of self-sufficient individuation, attached to the expansive logic of capitalism. An axiom, of course, which we could certainly not call foundational, rather, to the contrary, profoundly delegitimizing, since above all it introduces the concept of contingency and decay, that which is precisely opposed to what, I'll say it once more, the proud Cartesian *cogito* and the *sum* and the *e[r]go* erect. (*Barroco* 50)

According to this stance, the quixotic yet still modern drive of the Spanish baroque is produced in the very effort to seal Spain off from modernity in order to override internal material and social decay through the erection of what R. de la Flor calls, in another place, the "metaphysical peninsula."[2] In essence, the insistent and cruel ironization of the real reduces social and political hierarchies

Fig. 1. Hominem Te Esse Cogita, in Juan de Borja, *Empresas morales* (1680), (198–99)

to dust and thus open to derision. These "anarchical" tendencies of Hispanic baroque nihilism are seen to offer a perverse reflection of Cartesian scientific rationalism: where Descartes's indicative *cogito* rejects the neoscholastic desubstantialization of the human subject, Borja's imperative *cogita* reduces all hierarchical structures, including Reason, to the same nothingness at the heart of the confessional subject, thus preparing the ground for the liberating drive of modernity. In scientific terms, the gradual displacement of neoscholastic dogma concerning physical causality by "hypothetical" mathematical theorems results in a nihilistic relativism, especially where political necessity is concerned.

There are several problems with this characterization of the Spanish baroque, the most intractable of which arises from what has become a commonplace: the oft-lamented and/or celebrated *difference* as regards Spain's relationship to Europe. Another arises from a similarly categorical understanding of Descartes's place in modernity. As Lyle Massey points out, Descartes's attempts to legitimize an empirical approach to the central questions of natural philosophy are plagued by the same Augustinian interdictions concerning the finitude and fallibility of human faculties and bodies that R. de la Flor associates with an exclusively Counter-Reformation understanding of human (un) reason. In this light, Descartes's attempt to plot a mathematical way out of the vacuum that begins to surround traditional Neoscholastic notions of physical causality is no more or less modern than attempts by political and social elites, in baroque Spain, to respond to an analogous power vacuum that accompanies the erosion of traditional doctrines concerning blood-based social hierarchies. Seemingly overlooked by R. de la Flor is the fact that Maravall's notion of "baroque guided culture" as a reactionary social mentality is dependent on the nihilistic potential—and concomitant melancholy, or terror—of this epochal change (*Culture of the Baroque*).

The struggle between an unbounded—in theory at least—will to knowledge and institutional attempts to control the scientist's curious desire can be approached from a number of perspectives. But the point of departure and central trope of this essay will be "the emblematic mode of representation" (Daly). My thesis is that the emblem and the images of knowledge that it configures function as a middle space or medium for the negotiation of a residual desire to identify a unified meaning in the cosmos, on the one hand, and a fragmented, hybrid, and contradictory search for knowledge symptomatic of the modern world, on the other. In opposition to a nihilistic reading of Borja's emblem, *Hominem te esse cogita*, my reading of this emblem—and the two I will interpret toward the end of this essay—will focus on how Borja's desire to rein in

the desiring intellect can be seen as a conservative reaction to a modern intellectual program initiated within his own religious order, the Society of Jesus. More to the point, what is arguably culturally specific about Borja's emblem—although this is debatable as well—is the relationship between the desire for knowledge and the guilt produced by institutional attempts to lead the subject to reject his own desiring intellect. In the end, what is most evident in the emblem is not the actual existence of epochal change but rather the fear of change as it is represented in a literary expression emanating from one of the most powerful families in Europe. For this reason, I will take up R. de la Flor's linking of emblematics to science in a very literal sense.

Although he never produced an emblem book, no texts are more emblematic of the baroque, courtly subject of representation than Baltasar Gracián's. Alciato's emblems appear sixteen times in *Agudeza y arte de ingenio*; moreover, in Gracián's assemblage of a genealogy of writers of "philosophical truths," emblematics is situated at the center of the curious relationship between baroque science and aesthetics.[3]

> A un mismo blanco de la filosófica verdad, asestaron todos los sabios, aunque por diferentes rumbos de la invención y agudeza. Homero con sus Epopeyas, Esopo con sus Fábulas, Séneca con sus Sentencias, Ovidio con sus Metamorfosis, Juvenal con sus Sátiras, Alciato con sus Emblemas, Erasmo con sus Refranes, el Bocalino con sus Alegorías y el príncipe don Juan Manuel con sus Cuentos. La semejanza es el fundamento de toda la invención fingida, y la traslación de lo mentido a lo verdadero es el alma de esta agudeza. (Gracián 425)

> (All wise men took aim at the same target of philosophical truth, although by different paths of invention and wit. Homer with his Epics, Aesop with his Fables, Seneca with his Sentences, Ovid with his Metamorphosis, Juvenal with his Satires, Alciato with his Emblems, Erasmus with his Adages, Bocalino with his Allegories and the prince Don Juan Manuel with his Stories. Semblance is the foundation of all feigned invention, and the translation of falseness into truth is the soul of this wit.)[4]

One of the most interesting aspects of this philosophical canon is the assertive way in which aesthetics and philosophy are held to be inextricably related, an early modern commonplace that is often overlooked by modern critics, who tend to bracket off literary creation from more "scientific" fields of practice. However, as Thomas Kuhn argues in his study of the Copernican revolution, "the real appeal of sun-centered astronomy was aesthetic rather than pragmatic. To astronomers the initial choice between Copernicus' system and Ptolemy's

could only be a matter of taste, and matters of taste are the most difficult of all to define or debate" (172). What unites Gracián's authors is the indirect or oblique manner in which they assemble and communicate their philosophical truths. All discourse falls under the rubric of what he terms *ficciones* in some places and *mentiras* in others, as aesthetic-philosophical practice becomes situated at the center of "a system of moral and epistemological rigor. . . . Truth, in short, becomes a function of learned judgment, not of the material itself, which in time seems to owe even its existence to the [literary subject]" (Said 67). Due to the self-conscious way in which they foreground their representational status, these allegorical genres both display and problematize the unstable and tenuous relationship between language, history, truth, and subjectivity. In Massey's words, "it is in the moment when skeptical doubt is strongest and most overwhelming that a glimpse of the truth or certainty of being is possible" (1163). Gracián foregrounds the fundamental cut between the desire for epistemological certitudes emanating from what R. de la Flor terms a medievalizing "organicist" ontology, based on Aristotle's metaphysics of substance and form, and the "fallacious" nature of man's epistemological faculties and instruments. If science, whether practiced by Aristotelian natural philosophers or Copernican astronomers, must rely on an inescapably fictitious terrestrial syntax, then what we find in Gracián's philosophical canon is the problematic and tension-filled space of science fiction.

Much can be learned about baroque representations of truth and the cosmos by relating early modern debates between mathematical astronomers and natural philosophers to the popular postmodern genre of science fiction: or as Neal Stephenson dubs it, "speculative fiction" ("Note" xiii). Science fiction deals primarily with hypothetical realities derived from theoretical speculation and technological projections, often based on actual scientific discoveries, which makes it an ideal sounding board for the complicated relation between science, fiction, and natural philosophy in early modernity. For example, Stephenson's *Snow Crash* (1992) is a sci-fi thriller whose most exciting action, both theoretical and "physical," takes place in the virtual space of the World Wide Web; and his bestseller *Cryptonomicon* (1999) is a mindbender that spans the years between WWII and the end of the twenty-first century, and whose plot is embedded in a complex history and performance of cryptography. In both novels, narrative space and storyline developments are formulated as binary mathematical duels and geometrical witticisms that have a direct bearing on the immediate or *real* circumstances of their metafictional worlds. Stephenson is probably best known for his trilogy *The Baroque Cycle* (2003–2004), which weaves a vast and compelling narrative from the philosophical,

scientific, economic, and political currents that drive the West's transition to modernity. Whether set in the past or the future, what sets Stephenson's fiction apart are his approachable and witty explanations and performances of complex theoretical concepts and conundrums, such as the ingenious parallels he draws between Leibniz's invention of "the calculus" and major advances made in cryptography in the seventeenth century (*The System of the World*).

His latest work of speculative fiction *Anathem* (2008), whose emblematic name combines the seemingly antithetical notions of *anthem* and *anathema*, takes place on the fictional world of "Arbre," and appears to be set simultaneously several millennia in the future and the past. *Anathem*'s narrator and protagonist is named Fraa Erasmas, and the action follows his movement between the two main social and political spaces on Arbre (a clever and theoretically plausible ramification of Earth). In one space we find the "mathic universe," which is made up of diverse, enclosed *monastic* orders of "avouts," each with its own theoretical or dogmatic identity—think aristotelians, neoplatonists, cartesians, etc. On the other side of the wall, literally, is the "extramuros world," which sports the technologically based, sensory overload of our own postmodern cosmopolis, and whose leaders, although they draw on the expertise and advice of high ranking members of the maths, wield the real power on Arbre and are referred to as the "saeculars." At several points in Arbre's violent history, the extramuros populations have succumbed to their fear of the avouts' ability to translate their theoretical discoveries into various forms of alternately amazing and terrifying praxis. This saecular fear of the avout has resulted in the separation and isolation of the latter in the aforementioned maths, as well as a strict prohibition on almost all forms of praxis (enforced by *The Inquisition*), especially any new ones that could give the mathic world power over the Saeculum. There are, in other words, at least two alien "races" already occupying parallel universes in the Arborean microcosm.

Anathem's rather conventional plot is triggered by an astounding astronomical phenomenon: a massive spacecraft has been spotted orbiting the planet, and its discovery turns Arbre's society on its head, forcing the mathic and extramuros populations to work together to confront a possible common threat.[5] This is where the conventional part ends and Stephenson's particular genius for explaining and dramatizing ontological and epistemological conundrums begins to pull the phenomenological rug out from underneath his readers. For although the spacecraft displays a number of images (i.e., platonic forms) that are recognizable to avout and educated saeculars alike—such as triangles, circles, and, most importantly, a geometrical proof [Fig. 2]—Stephenson does not allow the reader to completely anthropomorphize the alien

"Geometers," a strategy which also effects a useful dehumanization of the Arboreans, lest we be lulled into forgetting that they also come from another time and space.[6]

The discovery that the aliens may deploy the same geometrical language as the Arboreans is the occasion for Stephenson to introduce a number of speculative thought experiments, which the avout use to explain the theoretical problems that arise from attempting to understand an alien linguistic system. One example features platonic models of a fly (all eyes), a bat (all ears), and a worm (all touch), and asks how three beings that rely on mutually exclusive perception faculties and linguistic systems might work together to solve a common problem. (We are not so far removed from the Augustinian denigration of the human senses that lies at the foundation of Counter-Reformation ontology

Fig. 2. Pythagorean theorem. (Courtesy Cilpart FCIT.)

and the nihilistic epistemology described by R. de la Flor.) The Geometers, it turns out, come from four different planets, each of whose evolutionary history has produced a type of matter that is literally impossible on any of the others, including Arbre. Each race is more different in nature from the others than is, say, a fly from a bat or a worm, all of which are carbon-based life forms and share fundamental molecular material. The theoretical problems produced by this situation are as numerous as they are profound, in that the same sensory faculties that allow a race to navigate and manipulate its reality turn out to be serious obstacles in encounters with competing realities: unless, of course, they can find a common syntax through which to communicate, such as geometry.

The plot line most germane to this essay concerns the decoding of the emblem engraved on the side of the ship, the aforementioned geometric proof, which introduces the opposed, linguistic orders mentioned in the epigraph at the beginning of this essay: the Syntacticians and the Semanticists. For the Syntactician, the emblematic riddle presents a series of challenges, the foremost of which is deciding which unique syntax, out of all imaginable syntaxes, might help identify the Geometers' intended meaning. This is complicated by the fact that each of the four races of Geometers communicates according to a different material and linguistic matrix. Since language is both made possible and absolutely limited by biological and chemical mechanisms embedded in corporeal matter, incompatible material matrices result in incompatible syntactic faculties. For the Semanticist, the problem may appear less difficult, since each linguistic sign harbors, a priori, a meaning unique to itself. The problem here would be to identify which of the inherited, or iconic, meanings the Geometers are deploying and whether this meaning would be unique to one of the four cosmologies, or common to all.

In Thomist terms, all of this speculation concerning the authorial intent of the Geometers is performed *ex suppositione*, or from effects to causes, which carries the potential of producing an infinite number of causal explanations in which the Geometers' arrival "makes sense." By bringing these competing cosmologies to bear on the scant physical evidence produced by the *starry messengers,*[7] Stephenson fashions a baroque space in which there are no stable foundations or boundaries, only increasingly complex folds of mathematical, philosophical, and religious matrices revolving around what is taken for a geometrical emblem, but which functions, in the end, as a limit or void; a veritable vacuum where reality and meaning are concerned.[8] Rather than stabilize the reality of the interstellar encounter, the emblem on the side of the ship functions as a medium in which distinct linguistic, scientific, and ideological orders are negotiated and questioned: in other words, a space where definitions and

speculation concerning the self and the other are brought into contact and conflict. Much like Borja's emblem of the skull, the meaning of the Geometers' trademark is never satisfactorily established. Indeed, although *Anathem*'s plot ends with a conventional romantic liaison, the reader is left with the impression that this is only one of a large if not infinite number of actual, coexisting endings, all but one of which is absent. This last one, in which "boy gets girl," also happens to be the one most desired by the reader. Other endings suggested by the text include: the death of all the main characters and the destruction of Arbre; or the death of all the main characters and the destruction of the spaceship. There are, in other words, a significant number of simultaneously hypothetical and real universes produced by the syntactic arrangement of the semantic possibilities of the novel, reflected, once again, in the title of the book: *Anathem*.

We find an analogous situation in the baroque, where emblems serve as a theoretical space and strategic praxis for the negotiation of power and meaning in virtually every literary practice of early modernity.[9] Emblem scholars such as Daly, Russell, and R. de la Flor (*Emblemas*) have established the emblem's central role in the baroque culture of spectacle, but I would like to use Stephenson's speculative model as a guide for analyzing emblematics as a medium for the negotiation and problematization of dominant and emergent scientific paradigms of early modern Europe. We begin with the observation that the most important astronomical discovery of the seventeenth century is framed not as a scientific achievement but instead takes the form of an emblem, in which the discoverer Galileo exploits his discovery of the four moons of Jupiter (1609) in the celebration of the celestial legitimacy of the political dynasty of Cosimo II de Medici. Mario Biagioli writes:

> What he had observed, Galileo claimed, was not a discovery but a confirmation of the Medici's destiny, almost a scientific proof of their dynastic horoscope. . . . It was not by chance that the "bright stars offer[ed] themselves in the heavens" right after Cosimo II's enthronement. It was not by chance that such stars were circling around Jupiter (Cosimo's planet) like his offspring and that Jupiter was actually above the horizon at the time of Prince Cosimo's birth, thus passing on to him the virtues of the founder of the dynasty. (128)

Scientific achievement and emblematic wit are wedded in Galileo's device, and rather than framing the mathematical rigor of his method or the astronomical implications of such a discovery, the Medicean stars symbolize a political end: the destiny of the Medici dynasty. Nor is this Galileo's first attempt at emblematizing a scientific phenomenon in politico-mythological terms. It

was, in fact, an emblem he assembled on the occasion of Cosimo's wedding (to Maria Maddalena of Austria), that paved the way for his self-transformation from a university mathematician into the preeminent court philosopher in Italy. On that occasion, he composed an emblem based on the image of a lodestone, "identifying in the sympathetic attraction between the lodestone and the small pieces of iron a fine metaphor for the Medici political agenda" (Biagioli 121). Far from an exception to the rule, Galileo's Medicean stars tell us much about the interpenetration of mathematical astronomy and more courtly social practices in the baroque. In order to understand why and how emblematics becomes such an important key to the struggle for legitimacy of mathematical astronomy (and heliocentric cosmology), it is necessary to take a more comprehensive look at the hierarchies internal to early modern intellectual institutions: specifically, the relationship between the alien paradigms of mathematically based astronomy and neoaristotelian natural philosophy.

Let us recall that Copernicus wrote his famous treatise advocating the shift to a heliocentric conception of the universe in 1543. Sixty-five years later, Copernican astronomy has still not become the dominant cosmological model, even though its mathematical innovations made a significant impact on both the calculation of the movement of the planets and related efforts to reform the calendar. As Kuhn explains, "Using Copernicus' mathematical system without advocating the physical motion of the earth provided a convenient escape from the dilemma posed by the contrasting celestial harmonies and terrestrial discord of the *De Revolutionibus*" (187). The reasons for this seeming contradiction are numerous and stem from technical problems internal to Copernicus's mathematical models, as well as from external resistance emanating from philosophical, theological, and sociopolitical traditions. As previously mentioned, Galileo's *Sidereus Nuncius* demonstrates how any boundaries between these domains cannot be maintained without serious bracketing operations coming into play. In the words of Biagioli, "patronage is the key to understanding processes of identity and status formation that are the keys to understanding both the scientists' cognitive attitudes and career strategies" (14). His landmark study *Galileo, Courtier* convincingly demonstrates that the conversion of mathematical realism into the dominant scientific paradigm of modernity is, in the main, a question of social prestige and intellectual legitimacy, rather than a case of an empirically-based science triumphing over myth. Although Galileo's astronomical discoveries would not have been possible without his training and expertise in mathematics and optics, it was thanks to his artistry and wit as an emblematist that his discoveries became spectacular marvels in the Court, thus launching him into his new identity as court philosopher.

The main challenge facing the inventor of the telescope, one which he never completely overcame, was the low scientific and social status given to mathematics and astronomy in Scholastic and Neoscholastic thought and academic institutions. Analogous to the artisan status of medieval painters and sculptors, mathematicians and astronomers were considered mere technicians who dealt with abstract, hypothetical, syntactic devices—"syn-dev" in Stephenson's vocabulary—unlike natural philosophers, who dealt with the real *necessary* causes and meanings of cosmological phenomena. According to Rivka Feldhay's analysis of the Jesuits' attempts to legitimize mathematics as a necessary part of natural philosophy, "astronomical theories had the status of probable, hypothetical truths . . . but could not become the basis of a new cosmological vision" (206). Although mathematical calculation was useful and necessary to the practical problems of mechanics, navigation, and optics—as well as military installations, weaponry, and strategizing—mathematical forms, signs, and syntax were considered hypothetical rather than real. Furthermore, since mathematical proofs proceed from effects to causes (*ex suppositione*) rather than from universal causes to material effects, "mathematics could never secure the absolute necessity of a physical cause" (Feldhay 206). According to Gracián's view, its philosophical truths were communicated through fictional means.

In this light, one of the most surprising alliances of the Counter-Reformation was that between Galileo and Jesuit mathematicians and scholars at the Collegio Romano. A. C. Crombie and A. Carugo have demonstrated that "two autograph treatises on natural philosophy which [Galileo] published as juvenalia were based on textbooks, sometimes copied word for word, by three well-known Jesuit philosophers at the Collegio Romano" (167). Biagioli notes that, "without being Copernicans, the Jesuits eventually gave a very strong endorsement of Galileo's telescopic observations" (93). This relationship becomes less of a mystery once we recognize that the Jesuits, behind the forceful writings of Christopher Clavius, initiated an ingenious program to legitimize mathematics as both necessary and useful to the search for absolute causes at the heart of Thomist natural philosophy. As detailed above, the motivations for this tentative and incomplete rapprochement were as social and political in nature as they were philosophical and theological. But the kernel of discord in this modern struggle—essentially between the Dominicans and the Jesuits—is emblematic of the shift from the essentializing dogmas of Scholastic theology, wedded to the Ptolemaic cosmological system, toward the decentered scientific realism of the Copernican revolution.

At once theological and scientific, ontological and epistemological, the

main bone of contention at the heart of Neoscholastic thought, according to Feldhay, is man's free will: specifically, what God knows absolutely and/or hypothetically about man's future actions. Contrary to what is generally presupposed, "the Counter-Reformation gave birth to two different Thomist interpretations embedded in different institutional settings, with different problems and goals, different ideological frameworks, and different attitudes to knowledge" (Feldhay 197). In modern (fictional) scientific terms, we are looking at two distinct, if simultaneous, "Causal Domain[s]: A collection of things mutually linked in a web of cause-and-effect relationships—THE DICTIONARY, 4th edition, A.R. 3000" (Stephenson, *Anathem* 788). The "pure" Thomists were the Dominicans, who believed that God's foreknowledge of man's actions is absolute, because God's knowledge and will must remain inseparable if his omnipotence is to remain absolute: "The necessity of predestination derives from the absolute character of God's foreknowledge and will. Only by emphasizing the absolute necessity of predestination can God's omnipotence be satisfactorily vindicated" (Feldhay 205). Moreover, since *knowledge* and *will* only become knowable in God's willed *decree*, these three aspects constitute a closed triangle of simultaneous, atemporal acts, a formal structure that removes God's knowledge and actions from any temporal or spatial sense of progression. There is no room for hypothetical knowledge, which would arise only if there were to appear a space of indetermination, temporal in nature, between divine knowledge and the exercise of divine will, which would then resituate God's decree within a temporal framework and, in this way, allow for hypothetical knowledge.

This, however, is exactly what Clavius attempts to do by resituating God's knowledge and will according to a temporal relationship in which the exercise of his will in the realization of a divine decree is postponed, similar to the way a *deus ex machina* decrees the meaning and status of a dramatic representation after the action has come to a halt. Until such time as the decree is willed, God's foreknowledge remains hypothetical: "Separate and prior to the decree, the Jesuits contended, God has '*scientia media*' by which he knows with a certain and infallible knowledge man's future acts, although these are not yet predestined by his will. To some degree, God's voluntary decree is guided by his knowledge" (Felday 205). There is, of course, an irresolvable contradiction here, since if God's knowledge is infallible there is no logical reason for him to delay the exercise of his will and the pronouncement of his decree. Nevertheless, it is no more problematic than the Dominican concept of man's predestined free will. More importantly, it opens up a space for God's knowledge

itself to become hypothetical in nature, which allows for the legitimation of hypothetical fields of human knowledge, such as mathematics.

The problem for Copernicus, Galileo, and now Clavius is that Thomism "appeared to have doubts about the real essence of mathematical entities (geometrical circles, for example), and probably accepted the opinion that they differed essentially from physical entities (material bodies in the form of a sphere)" (Feldhay 206). In other words, it is as much a question of ontology as epistemology; or, perhaps better stated, ontology and epistemology are welded together by the doctrine of free will, whichever doctrine one happens to ascribe to. As Robert Westman writes, "Copernicus has made a physical claim and . . . this claim has violated accepted divisions of knowledge" (108). Since astronomical theories were dependent on these hypothetical, mathematical entities to express their theses and proofs concerning the calculation, measurement, and causes of the movement of celestial bodies, "[they] had the status of probable, hypothetical truths" (Feldhay 207). In institutional terms, this doctrine produced a de facto intellectual hierarchy that placed mathematicians in a socially and intellectually subordinate position. Westman has determined that mathematics professors earned about one-fifth the salary of professors of more prestigious disciplines, such as philosophy and medicine. Moreover, "at none of these institutions was there provision for the doctorate in mathematics or astronomy, no licensing, that is, which recognized that symbol of full disciplinary autonomy" (117). It is for this reason that the Jesuits' prolonged effort to raise the profile and legitimacy of mathematics moves in two directions at once.

From the theologico-philosophical point of view, Clavius, professor of mathematics at the Collegio Romano from 1564 to 1612, assembles an innovative defense of mathematics by performing a dialectical turn on Thomism's attempts to yoke it to the concept of a "middle, or mixed, science": "It was Aquinas who developed the concept of the 'mixed science,' which implied the denial of any methodological autonomy to sciences applying mathematical methods to physical principles (optics, mechanics, and music were also included in this group)" (Feldhay 206). Clavius turns this relation around by emphasizing the mediatory and necessary position and function of mathematics where the study of real physical objects and the analysis and communication of their causes and effects are concerned, since the latter cannot be properly analyzed and understood without the logical syntaxes of mathematics and geometry. Crombie and Carugo note that this posture is neoplatonic in nature: "Mathematics was necessary to natural philosophy because it was concerned with

'middle essence' lying between the 'sensible essence' of things and the purely 'intelligible essence' of the divine" (195). In Clavius's own words: "[The mathematical sciences] are concerned with things that can be considered apart from sensible matter, although they themselves are immersed in matter, thus being like both metaphysics and physics, each of which shares one of these modes of consideration" (qtd. in Feldhay 207). In this way, he is able to destabilize the rigid dichotomy between the hypothetical and the real, the sensible and the intelligible, and the probable and the necessary. Clavius's next move extends his critique of these dichotomies to the marriage between ontological and epistemological necessity. Since mathematics can be considered separate from "sensible matter" according to its designation as a middle or mixed science, true and real knowledge can also be separated from real objects: "There is true knowledge of mathematical entities, whose ontological status is now redefined as a hybrid between the hypothetical and the real. This special intermediate status constitutes them as a nexus between the rational structure of the mind and the real structure of the physical world" (Feldhay 208). By making this cut between being and knowledge, Clavius is able to argue that epistemological necessity may be established in the relationship between hypothetical knowledge and observed effects, although "this necessity is not guaranteed by an (ontological) necessity of the relation between causes and effects" (Feldhay 210). Scientific knowledge, thus, functions in the same way that "God's knowledge of the future acts of men was considered true knowledge of hypothetical objects, neither speculative nor practical—infallible, but not entailing ontological necessity" (Feldhay 207). Although the Jesuits do not ascribe to Copernicus's neoplatonic elevation of mathematical and geometrical forms to the plane of intelligible reality, one can see an affinity between Clavius's statement and Galileo's assertion that "the book of philosophy is that which stands perpetually open before our eyes, but because it is written in characters different from those of our alphabet it cannot be read by everybody; and the characters of this book are triangles, squares, circles, spheres, cones, pyramids and other mathematical figures fittest for this sort of reading" (qtd. in Crombie and Carugo 217).

According to the Dominicans' orthodox stance, Galileo's statement is untenable due to the aforementioned problems that arise when working from effects to causes (*ex suppositione*). Since mathematical and geometrical figures and symbols carry no stable, i.e., necessary, semantic content, relying on them in the establishment of causes creates the potential for multiple, even contradictory, cosmological truths. As Andrea Battistini points out, the possibility of what Stephenson calls the "polycosmic universe" carries serious ontological

and epistemological consequences: “Human minds were upset by the melancholic sensation that the Earth was deprived of its ancient centrality, lost in the infinite spaces that lacked secure points of reference as there no longer existed anything motionless in the universe” (22).

Fig. 3. O Quarto Dia, in Francisco de Holanda, *De Aetatibus Mundi Imagines* (1545?), folio 6r

If the Earth is just another planet orbiting the Sun, then it is but one of an infinite number of centers, which brings us close to Stephenson's speculative experiments with multiple causal domains.[10] It is precisely this type of instability, or freedom, that Galileo proposed when he began the process of self-transformation from university mathematician to court philosopher.

The subsequent history of the Jesuits tells us that, in political terms at least, their ingenious attempts to rewrite the Thomist doctrine of free will, as well as the philosophical program concerning hypothetical versus physical knowledge, were ultimately suppressed. Nevertheless, the drive to alter the hierarchical relation between mathematics and natural philosophy bore real fruit, in spite of the 1616 condemnation of Copernican astronomy and the censure of its most famous and accomplished proponent. Once again, the parallel movement of Galileo's career as courtly philosopher and Clavius's assertion of the legitimacy of mathematical-scientific knowledge provides a productive counterpoint. In opposition to the way in which philosophical disputations were traditionally organized in the university, Clavius argues that mathematics professors ought to be able to participate in these academic events. Following up on Westman's earlier comments, the Jesuits are in fact instrumental in creating many of the first mathematics professorships in Europe. That being said, it is ultimately in the absolutist court where mathematics first achieves the status desired by Clavius, through marvelous marriages of courtly spectacle and scientific achievements designed by figures like Galileo, Tycho Brahe, and Johannes Kepler. In the words of Biagioli, "in the same way artisans had become artists by representing the prince's mythologies of power in painting, sculpture, and architecture, Galileo turned himself into a philosopher by representing the satellites of Jupiter as Medici dynastic emblems" (156). Thus, even though the philosophical and scientific arguments and achievements would seem to be the substance of the transition to modern scientific realism, the material vehicle for this transition is the allegorical and iconological medium of the emblem. And although the emblem proved useful and effective for Galileo, its allegorical and philological machinery is not wedded to any one philosophical or ideological current of thought or institution in the baroque, especially in Spain. Like the geometrical figures it so often deploys for allegorical ends, its syntax carries no inherent semantic or ideological substance.

To this point, I have probably given the impression that the Jesuits were a progressive force in Counter-Reformation thought; and, by comparison with the Dominicans, they were, at least where scientific education is concerned. And it is in Jesuit emblematics, specifically the Hispanic emblem pioneered by Juan de Borja, where we once again find an alliance between scientific im-

ages and a Jesuit-inspired educational program.[11] Credited with the invention of the "empresa hispánica," Borja is the first Spanish author to write an original emblem book, and the changes he initiates in the genre are substantial enough to warrant his placement at the vanguard of Spanish emblematics.[12] It is noteworthy that during the years he was probably working on the book Borja is known to have brought into his diplomatic and social circles figures such as Francisco de Holanda, the painter and draftsman who composed the unpublished *De Aetatibus Mundi Imagines*, and Luis Jorge Barbuda, a well-known cartographer and draftsman. The influence of both *letrados* can be found in Borja's predilection for mathematical and geometrical images and metaphors.[13]

Francisco de Holanda was a court painter, architect, and sculptor for King John III of Portugal and, later, for the ill-fated Sebastian. Although he finds favor within the pro-Castilian reign of John III and his widowed daughter-in-law Doña Catarina of Hapsburg (sister to Felipe II), Holanda's dynastic connections will eventually contribute to his marginalization under the more independently minded Sebastian. But it is most likely the vast transformations in intellectual and artistic doctrine and practice ushered in by the Counter-Reformation that result in the condemnation of his work to the recondite shadows of the Iberian baroque. If we consider Holanda's first image of *The Creation*, the problems become immediately apparent in light of our previous discussion of sixteenth- and seventeenth-century Thomism: "Starting from a perfect circle, three triangles merge in the abyss, provoking a strange sensation as much of movement as of immobility. Alpha and Omega are inscribed on the first equilateral triangle, perfectly inscribed in the circle" (Deswarte 12) [Fig. 4].

Holanda represents the intelligible reality of the Holy Trinity through a "hypothetical" syntax of geometrical figures. Even though he will insist on the contrast between the plane of ideal, incorporeal forms and the "imperfect copy in the terrestrial zone," his visual language betrays its genealogical indebtedness to the mixed sciences of Neoplatonism, hermeticism, Christian cabala, and Lulism (Deswarte 22).[14] From 1545 to 1547, when Holanda begins working on his ambitious project, this is perhaps not so problematical; but his work on the cosmological history of the world is interrupted by the religious, aesthetic, and social reforms initiated at the Council of Trent. By the time he returns to *De Aetatibus*, Spain and Portugal have been colonized by Counter-Reformation artistic and philosophical theories and practices, which is where Juan de Borja enters the scene.

Borja comes to Portugal in 1570 as Felipe II's ambassador, with the assignment of arranging the forever-postponed marriage of Don Sebastian. Deswarte writes: "As the son of Francisco de Borja, he is particularly well re-

ceived by the queen, who is very dedicated to his father [eventually canonized as San Francisco] who was her valet in his youth in Tordesillas and whose spiritual influence, since he was a Jesuit priest and general of the Society since 1565, had grown during his various sojourns in Portugal" (64). Borja, who will eventually publish the *Empresas morales* in Prague in 1581, meets Holanda and apparently counsels him on how to alter *De Aetatibus Mundi* so that it will

Fig. 4. O Primeiro Dia da Criacão, Francisco de Holanda, *De Aetatibus Mundi Imagines*, (1545?), folio 3r

be more attractive to potential patrons and publishers. Without going into detail, Holanda transforms his mystical and geometrical history of the world into a series of spiritual meditations more in line with Ignatius of Loyola's *Spiritual Exercises*: "It is, in truth, difficult to reconcile it with the spirit of the first images, that vast cosmogonic and neoplatonic poem" (Deswarte 62). Even though the work is never brought to press, Holanda's influence on Borja's book of emblems is undeniable, although the *Empresas morales* move in the opposite direction to Holanda's project, as well as to what we have seen with Galileo.

One of the most important aspects of the *Empresas morales* is the way in which Borja redefines his chosen emblematic vehicle, the *empresa*. According to its humanist theorists, the *empresa* differs from the emblem in that it contains and expresses a future, personal goal, often associated in the Renaissance and early baroque with feats of martial or amorous prowess.[15] In this light, Galileo's emblem of the Medicean stars is much closer to the Italian *impresa* than to the Spanish emblem. In the words of García Mahíques, "Juan de Borja formally composed in the Italian manner, adapting and inventing conceptual artifices according to the model provided by *empresas*, but he eliminated from these their particular character—associated with the knight's intention or the praise of his virtues—and makes them applicable to the moral universe" (Introducción 45). In essence, Borja converts a heretofore individualistic enterprise into what Maravall calls a "program of cultural guidance," as preexisting predispositions for allegorical play are set in motion around a newly articulated reading practice (*The Culture* 57). Instead of participating in an ingenious courtly joust, or penetrating the hieroglyphic sign in search of ideal and original knowledge, Borja's reader is guided toward a hermeneutical practice in which all signs point to the impossibility of illumination and transformation of the worldly self and, by extension, the world.

The sixth emblem of the first part of the *Empresas* is titled *In pusillo nemo magnus* (no one is great in small things). Its body is composed of what appears to be a representation of the world, with a cross on top and a tiny dot in the middle of the circle so small that it could almost be an ink stain produced in the printing of the book. The subscription reads: "Quan pequeño sea todo lo que en el Mundo, es tenido, y estimado por grande, se puede bien conocer, si se entiende primero, quan pequeño sea el mismo Mundo; el qual, segun los Astrologos lo pruevan, es como un punto en comparación de la circumferencia de la ultima Esfera, y siendo tan pequeño, aunque señoreandole, y governandole todo?" (We can see how small everything in the world is, which is esteemed and taken for great, if we first understand how small the World actually is; which, as the Astrologers prove, is like a small point in comparison with the

circumference of the last sphere, and being so small, what in it could be great, even mastering and governing it?) (14) [Fig. 5].

What appears to be the Earth is actually the entire cosmos, with the Earth reduced to a tiny point. The spiritual thrust of the emblem could not be any clearer: one should not worry about things as tiny and insignificant as the terrestrial world; rather, one should look to the next world. Thus, R. de la Flor is correct when he identifies the nihilistic drive of the emblem; on the other hand, this negative ontology extends its reach to encompass the desire of the reading subject to act in the world, which means that there is no way out of Borja's "desert."

Fig. 5. In Pusillo, in Juan de Borja, *Empresas morales* (1680), 15[16]

Another emblem shows an elliptical space through which two lines pass horizontally: a solid line above, and a line of dots underneath. The inscription reads: "*Sic instantibus aeternitas*" (Thus does eternity depend on individual moments), and the commentary clarifies:

> Ninguna cosa es mas de estimar, ni verdaderamente es mas nuestra, que el tiempo . . . no el passado, ni el de por venir, sino tan solamente el presente . . . que es tan breve, que no se mide, sino con un instante; que es el mas corto espacio, que se puede imaginar (porque assi como un punto, que no se puede dividir, por no tener partes indivisibles, pero con todo esto de muchos puntos se forman las lineas) de la misma manera, aunque un instante no se puede dividir, se deve much estimar, pues de infinitos instantes consta la Eternidad. (140) [Fig. 6]

> (Nothing is more dear, nor more truly our own, than time . . . not the past, nor the future, but rather only the present . . . which is so brief, that it cannot be measured, but with an instant; which is the shortest space, that one can imagine (because like a point, it cannot be divided, since it has no divisible parts, but even so from many points lines are formed) in the same manner, although an instant cannot be divided, it should be held dear, as from infinite instants Eternity is composed.)

In both emblems, Borja performs the same dialectical turn with respect to neoplatonism and its influence on sixteenth-century mathematics and astronomy that R. de la Flor perceives in the Spanish diplomat's anticipatory transduction of Descartes's *cogito ergo sum*. In spite of Clavius's energetic and ingenious attempts to save mathematical realism from the charge of hypothetical fictions, Borja's conservative use of astrology and geometry ties the mathematical sciences to a program of spiritual introspection that explicitly rejects any attempt to find lasting truth and meaning on the terrestrial plane. The reduction of mathematics and geometry to terrestrial dust also acts as an inhibitor where the social aspirations of mathematical astronomers are concerned. If mathematical science merely serves to underline the impossibility of intellectual insight concerning physical objects and their causes, what aspirations can a practitioner of these mundane praxes dare hope to realize? The difference with respect to Galileo's and Copernicus's assertions to the contrary could not be greater.

So, what are we to do with these seemingly contradictory programs for deploying identical mathematical and geometrical syntaxes? Stephenson uses the sci-fi term "causal domain shear" to refer to the radical effects that occur when two completely distinct universes come together, even if it is only "a single photon that manage[s] to travel somehow between them" (*Anathem* 28). In the

case I have just presented, the conflicting cosmologies that result from opposing syntactical arrangements of mathematico-geometrical figures share much more than a single particle of light; they are produced by the same religious order, or math. I would argue that in spite of, or even thanks to, the efforts of Jesuit emblematics to enclose the curious modern subject within a guilt-ridden ontological and epistemological vacuum, nevertheless, the theoretical substantiation of previously immaterial hypothetical truths charts an equivocal course

Fig. 6. Sic Ex Instantibus, in Juan de Bora, *Empresas morales* (1681), 141

toward the conflicting and multiple perspectives we associate with the more modern characteristics of the baroque. Once Clavius initiates his dialectical attack on the doctrine of free will, the cut is made, and there is no way to neatly contain the forces of hypothetical world-making unleashed by the legitimation of syntactical play that comes at the expense of semantic rigor. Similarly, the syntactical possibilities of Borja's circles, triangles, and lines cannot be completely contained by his allegorical program of spiritual guidance. This does not mean, however, that R. de la Flor is correct when he states that baroque aesthetics willingly moves to destroy the foundations of the monarchical-seigniorial metaphysics of presence; rather, in modernity, no organicist framework for meaning can avoid subverting its drive toward legitimacy, since the syntax on which it depends necessarily places its causal domain in contact with competing cosmologies. Its natural philosophy becomes one more expression of science fiction, a tiny speck in an infinite universe of other fictions.

Notes

1. Neal Stephenson, *Anathem* (511).
2. See R. de la Flor, *La península metafísica*.
3. Selig has compiled all of the references to Alciato's *Emblematum liber* in the *Agudeza* in his study of Gracián.
4. All translations from Spanish to English are my own.
5. The spaceship's form is that of an *icosohedron* (twenty sides), which is one of Plato's five basic solid forms, and is associated with the element of water.
6. The aliens' emblem turns out to be a representation of the Pythagorean theorem, which on Arbre is called the "Adrakhonian Theorem." Stephenson includes the image in the text. It seems that Arbre's Syntacticians base their thought on an ancient figure named Protas, who bears a striking resemblance to Plato: "Protas: A student of Thelenes during the Golden Age of Ethras, later the most important theor in Arbran history. Building on the foundation laid by Hylaea and later strengthened by the Orithenans, developed the notion that the object and ideas that humans perceive and think about are imperfect manifestations of pure, ideal forms that exist in another plane of existence" (Stephenson 905).
7. The title of Galileo's treatise announcing his discovery of Jupiter's four moons in 1609 is *Sidereus Nuncius* (Starry Messenger).
8. For a baroque reading of Leibniz through the extended metaphor of *the fold*, see Deleuze.
9. See my *The Persistence of Presence: Emblem and Ritual in Baroque Spain* (2010).
10. "CAUSAL DOMAIN: A collection of things mutually linked in a web of cause-and-effect relationships" (Stephenson, *Anathem* 893).

11. Juan de Borja is the third son of (San) Francisco de Borja, Captain General of the Jesuit Order in sixteenth-century Spain (see García Mahíques).
12. The first critic to note the Spanish turn toward a more religiously informed and institutionally framed theory and practice of the emblem is Giuseppina Ledda, *Contributto*. For a more complete picture of the Spanish emblem book scene, see Pedro F. Campa, *Emblemata Hispanica: An Annotated Bibliography of Spanish Emblem Literature to the Year 1700*.
13. García Mahíques (37).
14. As far as education is concerned, the privileged place Holanda gives to mathematics and geometry anticipates Clavius's reforms of the late 1500s: "Francisco de Holanda gives a privileged place to cosmography and astrology in the education of the painter. On par with geometry, mathematics and perspective, he recommends them . . . in order to reach the heavens in the hope of one day arriving to the Empyreum and realizing celestial works" (Deswarte 24).
15. Daly writes, "The *impresa* represents the 'principle of individuation' (Sulzer 35): it was used by one person only 'as the expression of a personal aim' (Schöne 45). The word itself comes from the Italian for 'undertaking,' which underlines the functional purpose of the *impresa*. The emblem, on the other hand, is addressed to a larger audience, its message is general, and it fulfills a didactic, decorative, or entertaining function, or any combination of these" (*Literature* 23).
16. Although Borja's collection was originally published in 1581, the more common edition to cite is the 1680 edition, due to its inclusion of a second century of emblems.

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