

## SEMINAR 17: IMAGINING SCIENTIFIC FORM

### SEMINAR LEADERS:

Jenny C. Mann (Cornell University)

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### ABSTRACTS

**Piers Brown, Kenyon College**

#### **Donne's Astronomical Schemes**

The famous “New Philosophy” passage in Donne's First Anniversary (“And New Philosophy puts all in doubt, / The Element of Fire is quite put out . . .”) has long been deployed as the literary example par-excellence of the impact of the new theories and discoveries of the scientific revolution. But what sort of beliefs about Copernican astronomy and Galileo's observations with the telescope did it entail on Donne's part? And, how can it help us understand his figurative use of astronomy, natural philosophy, and medicine? In this paper, I will explore Donne's use of 'schemes' in his writing, a term that links cosmological models to rhetorical figuration. I will argue that the ability of different cosmological schemes to “save the appearances” made them potentially useful for figurative deployment irrespective of any claim that they actually reflected the form of the universe. In this context, I examine how Donne's organization of his poems can be read in terms of schematic models, developing, as an example, a reading of “Goodfriday, 1613. Riding Westward.”

**Jacqueline Cowan, Stephen F. Austin State University**

#### **Hawking Lunar Fables: The Imagination in the New Astronomy**

Having failed to espy the wonders Galileo reported in *The Starry Messenger*, Martin Horky accuses Galileo of having “hawked a fable.” And Horky was right. While Galileo certainly did not fabricate his astronomical observations, Horky's accusation lays bare the role of the poetic imagination in Galileo's discoveries. I show how Galileo and his supporters, namely Johannes Kepler and John Wilkins, mobilized the poetic imagination to render intelligible discoveries that contradicted the orthodox model of the heavens. Galileo, Kepler, and Wilkins frame the imagination in the language of “possibility,” allowing them to claim those discoveries that challenged unaided senses as “probable” opinion. Once considered probable opinion, I argue that the work of the imagination was endowed with the authority to make knowledge claims in the new natural philosophy. Through Galileo's telescope, probable opinion could be counted alongside knowledge to advance the purview of natural philosophy to new celestial worlds.

**Mary Thomas Crane, Boston College**

### **Form and Pressure in Shakespeare**

As is well known, both Plato and Aristotle use a metaphor of a seal stamped in wax to explain, in Plato's case, the ways in which human memory can be unreliable, and in Aristotle's case, the way in which human visual perception involves transmission of the form of the observed object but not its matter. Shakespeare often refers to human perception and emotion in terms of impressionability and in ways that seem to recall the wax and seal metaphor. However, Shakespeare's forms and impressions should be, in many cases, understood literally rather than metaphorically. Aristotle's theories of form and matter were not always clear or uncontroversial, and they were elaborated during the Middle Ages in ways that made concrete some of the operations that were not elaborated in classical sources. Shakespeare's physics seems more directly informed by work in optics, astronomy, and meteorology, begun in the middle ages and continued into the sixteenth century, which provided a concrete account of the ways that sensible forms could be transmitter across space in the form of rays that could leave impressions on the human body, on objects, and in the air. In my paper I look at some of these theories in order to explain what Shakespeare means by "form and pressure" in *Hamlet*, and how the concept of "pressure" influences his sense of the relationship between dramatic form and audience.

**Adhaar Noor Desai, Bard College**

### **"Mangled with prophane absurds": *Histrion-mastix*, Bad Theater and the Practice of Natural Philosophy**

This paper offers a view of both early modern theatricality and natural philosophy in terms of Andrew Pickering's influential concept of the "mangle of practice," which understands scientific knowledge to be the product of a dialectic of accommodation and resistance between human and machinic agencies. Bringing the "practical turns" of both science studies and scholarship of early modern theater into conversation, I examine how the late Elizabethan drama *Histrion-Mastix* critiques the sensory epistemology promoted by natural philosophers by offering a critique of theater itself. Central to my analysis is an investigation of the discursive position of bad theatrical performance—of poor actors, barren verses, and bumbling plots—in the early modern understanding of dramatic representation. Alongside this, I consider how anxieties about unscrupulous practices, carelessness, and unreliable observers troubled advocates and roused opponents of natural philosophy, which cast a shadow on its trustworthiness. *Histrion-Mastix* begins with a scholar hierarchizing forms of knowledge depending on how "abjunct" they are from "sencive matter"; he explicitly places natural philosophy below the liberal arts for this

reason. My reading argues that this opening discussion frames the remainder of this disjointed and chaotic play. Through moralizing a cultural descent into ruin characterized by increasing materialism among players and audiences alike, the play ultimately shatters illusions about the integrity of art in both theater and natural philosophy. In so doing, it witnesses how early moderns imagined “scientific form” to be just as vulnerable as theater to bad actors.

**Howard Marchitello, Rutgers University**

### **Galileo Furioso**

This paper considers two important documents in the history of hydrostatics written by Galileo: the first is a brief unpublished essay--cast in the form of a letter to Cosimo II--written in 1611 and the second is a thoroughly revised and expanded treatise on the matter--*Discorso Intorno alle Cose che Stanno in su l'Acqua o che in Quella si Muovono (Discourse on Bodies in Water)* published in 1612.<sup>1</sup> In addition to--or, indeed, as a part of--Galileo's specifically scientific work achieved in his studies on floating bodies, these texts manifest an important relationship to what one might call the poetic imaginary. In particular, these texts display both the important influence of Ludovico Ariosto's romance epic *Orlando Furioso* (1516, 1532) on Galileo's imagination and his appropriation of poetry precisely for its power as a discourse for the production of knowledge. My discussion focuses on the figure of the *composite*, a term that is crucial for both Galileo's hydrostatics, on the one hand, and, on the other, for a more general understanding of the scientific-literary as the *form* of Galilean discourse.

**Jessica Pfeffer, Tufts University**

### **Gendering Materials: Figurations of Sex and Gender in Early Modern Anatomy**

Early modern anatomy is rife with contradiction and complication, particularly surrounding the divisive figure of the hermaphrodite, whose presence in anatomical pamphlets evinces a tension between learned Galenic medicine and observed, empirical knowledge. Contemporary criticism has read both the hermaphrodite and the numerous stories of females transforming into males (both culturally and anatomically) as indicative of a particular politics that reflects the recent incorporation of trans identities into our culture. Most notably, Christian M. Billing, in his 2008 *Masculinity, Corporeality, and the English Stage 1580-1645*, consistently refers to subjects whose embodiment shifts and refuses specific gendering as either MtF or FtM, in line with contemporary trans politics. “Gendering Materials” returns to early modern anatomy to consider how inconsistent and conflicting knowledges of the body played themselves out in the materializing of gender through discussions of sexual difference. I argue that, rather than ascribing to a one-sex or two-sex model, these scientific writings demonstrate a fidelity to mutable anatomy that becomes inconceivable within contemporary identitarian politics. Considering early modern pamphlets as figuring sexual difference through material inconsistencies, “Gendering Materials” contends that contemporary debates of gender and

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<sup>1</sup> Quotations from the *Discorso* are from Stillman Drake, *Cause, Experiment and Science* (Chicago: University of Chicago Press, 1981).

embodiment rely on a narrative of anatomical fixity that early modern discussions consistently refuse and, in insisting upon a body that contains gendered truth, these politics ignore how the material body is consistently formed through fantasies of coherence.

**Shankar Raman, Massachusetts Institute of Technology**

### **Milton, Leibniz, and the Mathematics of Motion**

“Milton, Leibniz and the Mathematics of Motion” seeks to connect, through the problem of the Fall, Milton’s treatment of movement in *Paradise Lost* to Leibniz’s efforts to thread what he memorably called “the labyrinth of the continuum.” It seeks to uncover the mathematical as a terrain shared by their theodicies. In particular, how Milton handles time and space in certain areas of his epic speaks to the relationship between continuity and unassignable or vanishing movements that leads to Leibniz’ version of the differential calculus. These play a central role, too, in the negotiating a path through that other labyrinth of abiding concern to both Milton and Leibniz, that of freedom or free will.

**Jessica M. Rosenberg, University of Miami**

### **The Poetics of Practical Address**

Petruchio ends a description of his methods – which model the taming of his new wife on the techniques of falconry – with a goad to the audience: “He that knows better how to tame a shrew, / Now let him speak: 'tis charity to show.” The action of the play – and not just these words – seems to present a method that demands to be repeated, a kind of expert practice that exceeds the bounds of mimetic entertainment. This paper will consider these iterative forms of practical knowledge by looking at the kinds of repetition that instructional books both invite and project – in particular, by considering how printed handbooks use direct and indirect address to conjure their own futures. So often, instructional books (and this is at the core of how we designate the genre) ask to be read in terms of ability: enablement, empowerment, popularization, democratization. My paper will try to resist this naturalizing approach to practical address, asking instead how theories of poetic apostrophe might intersect with the formal phenomena of instructional books – and, in particular, what insight they might offer into the constant danger of readerly disobedience. Finally, turning to both versions of *Shrew*, I’ll ask how instructional genres might interfere with, amplify, or transform the register of performance (especially as the “promises” of method might intersect with comedic futures.)

**Suparna Roychoudhury, Mount Holyoke College**

### **Seeming to See: Imagination, Optics, and *King Lear***

Corporeal vision and mental representation were closely allied in early modern thinking. Their relation, intuitive for Shakespeare and his contemporaries, can be traced to ancient and medieval

optics, in which eyesight and insight were assumed to be contiguous or similar. During the Renaissance, this assumption would be both depleted and renewed in strength. On the one hand, eye and mind's eye were decoupled, thanks to the work of Johannes Kepler and others, which irrevocably made the study of light and vision a matter of mathematics. On the other hand, there was the increasingly nuanced conviction that imagination, the mental faculty responsible for the creation and manipulation of intelligible species, works like a distortive lens. The paper considers *King Lear* in light of early modern science and culture, less as an affirmation than as a bleak dissolution of elegant conceptual symmetries no longer tenable. Against the backdrop of the shifting epistemic paradigms of his time, Shakespeare portrays a world upside down, whose necessary correction endows imagination with a crucial and yet impossible role.

**Stephanie Shirilan, Syracuse University**

### **Feeling for Form and Air**

Shakespeare gives us abundant examples of cognition as a process requiring the extension of mind and spirit(s) into air – a literal reaching or sending out (extramission) of one's sensory and intellectual apparatuses into a dense and dizzy atmosphere comprised of sensory data, images, and the messy projections of other people's minds and spirits. The risks of this procedure have been amply explored around the theme of "misprision" (literally, mistakes) in Shakespeare's plays. My paper extends this research, along with the predominantly eco-critical and phenomenological research on air in Shakespeare, in order to explore the ways that Shakespeare's meditations on air illuminate and may be illuminated by contemporary debates about the power of the imagination (specifically, the nature of sympathetic transmission) and the materiality of form as the shape or rendering of feeling and conceit. How, I ask, are scientific and theological inquiries into the substance and potencies of air analogous to investigations of the matter of (especially, literary) form? How are capacities to perceive and describe the seemingly invisible operations of and in the air imagined as intellectual, aesthetic, and spiritual acuties to the work of form?

**Daniel Allen Shore, Georgetown University**

### **The Linguistic Forms of Early Modern Science**

Every field of scientific inquiry has a specialized vocabulary that an initiate must learn in order to talk and think like a scientist. In some cases these vocabularies consist of words coined to name a field's objects, concepts, and processes; in other cases, words already in general use acquire a divergent or more precise meaning within the discourse of a field. The progress of scientific inquiry does not only, as Bachelard suggests, introduce ruptures between ordinary knowledge and scientific knowledge, but between ordinary vocabulary and scientific vocabulary. Talking about specialized scientific vocabularies allows us to reframe some familiar questions about the new science in the sixteenth and seventeenth century. What did it mean to talk like a scientist (or natural philosopher) in and across these

periods? To what extent did various inquirers or communities of inquiry accept or reject vocabularies from (for example) Aristotelian physics or Euclidean geometry? Yet I wish to suggest that learning a scientific vocabulary is only one part of learning to talk like a scientist. Initiation into the linguistic communities of early modern natural science also involved acquiring a specialized repertoire of abstract “linguistic forms” – what cognitive linguists variously refer to as grammatical, syntactic, or schematic constructions. As with words, these forms existed in the language at large but (I hypothesize, since it may turn out not to be true!) also took on specific functions within scientific discourse. Working between Shakespeare’s plays; a variety of early modern “scientific” documents; and the 44k full-texts in the EEBO-TCP corpus, I aim to explore two linguistic forms that possess or acquire divergent functions in the natural philosophical discourse of the early modern period: stipulation (Let X be Y [such that Z]) and reductive predication (S is [only, just, really, but] P).

**Sarah Smith, University of Virginia**

### **Material Disorder and Disobedience in *Paradise Lost***

Milton critics have argued that the poet’s representation of chaos in *Paradise Lost* is incompatible with his assertion in *Christian Doctrine* that matter is “good.” My paper argues, however, that the sinister aspects of chaos are attributed in the poem, not to matter per se, but to the space’s disorder. I connect this reading of chaos with instances of divine and satanic creation in the epic, which I suggest are similarly concerned with proper and improper orderings of materials. The episodes of satanic creation in particular, I argue, tie together the correct ordering of matter with obedience and the disordering of matter with disobedience. By demonstrating the links between material order and morality in this way, I hope to enrich our understanding of Milton’s materialism.

**Jacob A. Tootalian, University of South Florida**

### **Mists and Uncertainties: Browne, Ross, and the Poetics of Natural Philosophy in the English Revolution**

In the explosion of controversial prose in the mid-seventeenth century, English polemicists often pursued their arguments by debating the perceived figurativeness of significant pieces of language, bringing to the fore the question of when to call a metaphor a metaphor. Debates in natural philosophy in particular were often preoccupied with how to interpret the poeticness of linguistic descriptions of nature. While much attention has been paid to the discursive dimensions of empirical science during the Restoration, the theory of language championed by Thomas Sprat in *The History of the Royal Society* (1667) was explicitly framed as a reaction against the “mists and uncertainties” that “specious tropes and figures have brought on our Knowledge.” Natural philosophers in the 1640s and 50s, though, did not merely wallow in a state of linguistic

chaos. As the polemical debate between Thomas Browne and Alexander Ross shows, the problem of figurativeness was a key concern in the endeavor to understand nature. In *Pseudodoxia Epidemica* (1646), a catalogue of errors realizing a critical piece of the Baconian project, Browne pored through the intellectual tradition, often attributing misinterpretations of nature to metaphorical misreading. Ross, a prolific defender of scholastic natural philosophy who railed against nearly every major English philosopher of his age, sought, in his *Arcana Microcosmi* (1652), to salvage many of the apparent errors that Browne had dispatched with, employing an approach toward tropes of nature that is surprisingly more sensitive to poetic representation than Browne's. Focusing on this exchange as a case study, I argue that acts of figurative reinterpretation in naturalphilosophical prose of the English Revolution show evidence of the period's effort to reconfigure the connection between philosophy, rhetoric, and poetics, helping us consider the question of form's relationship to scientific knowledge.

**Henry S. Turner, Rutgers University**

### **Francis Bacon's Art of Thinking; or, Let Us All Begin to Generalize**

A paper about the notion of "art" in Bacon's work, as a way into a cluster of problems having to do with the nature of abstraction: modes or forms of abstraction that are typical of literary and scientific thinking; what the project of "imagining scientific form" implies about the limits of materialist methodology in current criticism; how Bacon's "art of thinking" compares to more recent accounts of aesthetics as a philosophy of form and sensibility. What kind of knowledge are we able to obtain through "art," understanding this term in its pre-modern, pre-aesthetic sense as a mode of practical operation and practical knowledge, a habit of abstraction, as it were, about which we can give a provisionally reasonable account but which never quite rises to the level of theoretical statement? What are the virtues of generalization as a habit of thinking through "form"? The paper will use examples from Bacon to explore a notion of "art" as a species of tactful generalization: a procedure of operating with forms and materials in ways that are sometimes opposed to the power of nature and sometimes compared to it.

**Lauren Beth Weindling, University of Southern California**

### **Empirical Errors: Illegibility and the Failings of Empiricism in *The Comedy of Errors***

*The Comedy of Errors* has as its premise two sets of identical twins who defy distinction. But in addition to humor, this confusion might produce a real anxiety. It troubles not only the assumption that one body corresponds with only one person, but also that one can obtain reliable knowledge by observation. I contend that Shakespeare's *Errors* suggests the unreliable nature of visible signifiers, highlighting that the practice of visual examination — the very foundation of empiricism — only *appears* to allow accurate identification. The characters import a vocabulary of metamorphosing bodies to voice their frustrations with identifying others (or themselves) according to bodily appearances. Coincidentally then, Shakespeare's play anticipates the

anxieties around the empiricism later expressed by Francis Bacon with the Proteus figure: the wily sea god in continual metamorphosis, who must be pinned down and forced to return to his original shape before he reveals the truth. Yet unlike Bacon's urge to dispel uncertainty and violently force it into submission, *Errors* advises that we embrace indeterminacy as a positive vision of union over empiricism's project of distinction, separation, and hierarchy. The audience is invited to applaud the final utopian image: the Dromios leaving the stage hand in hand and not one before the other.

**Travis D. Williams, University of Rhode Island**

### **Writing the Unspeakable in *Paradise Lost* and Early Modern Mathematics**

In Book 12 of *Paradise Lost*, Michael's remediation of Adam's experience of biblical prophecy emphasizes the precarity of the reader's experience of the epic, and draws yet more attention to the problems of accommodation in the poem. Given the epic's constant reference to that which is unspeakable, uncountable, and generally unknowable, human perception of God, heaven, hell, and creation seem to be always already defeated. But this unspeakability is stated by a poet who has found, time after time, ways to rhetorically disguise the gap between what a reader can actually know and what a reader appears to know. The means of achieving this accommodative success is of course rhetorical, but in a seventeenth-century context it is also clearly related to mathematical debates about what in *that* discourse is unspeakable, uncountable, and unrepresentable. Moments of writing in *Paradise Lost* and modes of writing in contemporaneous mathematics might be understood to achieve the same effect of giving fallen human readers the chance to achieve a greater degree of access to divine perfection.