Ben Jonson's *Alchemist* and Early Modern Laboratory Space

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ABSTRACT

This essay argues that The Alchemist *played an important but largely unrecognized part in the formation of early modern science. It shows how Jonson's innovative combination of alchemical content and neoclassical form produced a model of space, time, and dexterity useful for the development of laboratory experience. At the same time, the play demonstrates how new ideas about what a stage was and what it could do created a legacy of ambivalence in the development of the (semi-)public laboratory. Reading Jonson's play as exemplary, this essay will also indicate why we ought to consider early modern drama more generally as an important conceptual source of the protocols of experimental natural philosophy.*

> [Y]et surely to *Alcumy* this right is due, that it maybe compared to the Husband man wherof *Æsope* makes the Fable; that when he died, told his Sonnes, that he had left unto them gold, buried under ground in his Vineyard; and they digged over all the ground, and gold they found none, but by reason of their stirring and digging the mold about, the rootes of their Vines, they had a great Vintage the yeare following: so assuredly the search and stirre to make gold hath brought to light a great number of good and fruitfull inventions and experiments, as well for the disclosing of Nature; as for the use of mans life.
>
> — Francis Bacon, *The Advancement of Learning* (1605)

The Alchemist (1610) would seem to have a trivial role at best in any history of early modern natural philosophy. Other than a vaguely identified "glass" Doll strikes from Subtle's hands in the opening moments, the play

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shows no experimental equipment and the alchemical laboratory behind a back door on stage is entered and exited only by the con-men Subtle and Face. From the perspective of the audience, Subtle's "laboratory" is no more than the words used to evoke it, as many studies have noted.[1] We do not see any overtly proto-scientific work on stage, though we hear a torrent of imposing jargon and see a frenzy of action. We could add to this the fact that in performances from the Restoration through the nineteenth century the alchemical theme itself was often secondary—early modern and Enlightenment critics claimed that alchemy was not an essential target of the play, but merely one convenient vocabulary among others for a satire on general or topical themes.[2] The trio onstage are unequivocally cheats; the activity of gulling stupid people through skilled performance recapitulates in miniature the experience of the audience; in the final moments the (play)house is reclaimed from the realm of collective delusion by its owner. Could this play be anything other than Jonson's more or less self-indicting meditation on his own business of public theater?

In this essay I will argue that *The Alchemist* does in fact have an integral part to play in revisionist histories of the formation of early modern science. The role of Jonson's play in such a history has less to do with topical references to alchemy or magic (though they abound and are significant, as will be made clear) than it does with the manner in which its dramaturgy produces new images of space and time and models new kinds of relationships useful for the conceptual development of laboratory experience. Jonson's play demonstrates how new models of what a stage was and what it could do contributed to the nascent figuration of the public laboratory. Reading Jonson's important play as an exemplary instance, I will show why we ought to consider early modern drama, particularly when wrought by means of the evolving set of rules now summarized in the term "neoclassical," as an important conceptual source for the development of the protocols of experimental natural philosophy. *The Alchemist* is virtually unique in early modern English drama for being set in one unchanging room in accordance with the three dramatic unities that were to coalesce into neoclassical orthodoxy in the following decades, particularly in France.[3] This essay will show the mediating influence of the unities, as theory and practice, in the imagination of early modern laboratory spaces. In an age before the creation of purpose-built public laboratories as such, and while meditating on the nature of alchemy and dexterity, Jonson suggested new conceptual possibilities in his innovative use of stage space. In so doing he mapped out a corporate model of epistemology important for the creation of scientific societies. Finally, my reading of *The Alchemist* contributes to ongoing work in

science studies that analyzes how the "two cultures" of arts and sciences interrelated and shaped one another over the course of early modernity. This essay will make a strong claim for the influence of artistic innovations upon scientific discourse while at the same time acknowledging the fact that the latter distinctions themselves are in part a consequence of the play's dynamics.

Using an analogy with scientific procedure, L.A. Beaurline once described the form of Jonson's middle comedies as "a series of permutations with a fixed number of constants and one variable" (200).[4] But the quasi-scientific form of neoclassical plays such as *The Alchemist* is more than the mere analogical resemblance of two distinct and self-coherent discourses, natural philosophy and drama. In early modern England, natural philosophy was not yet sufficiently distinct from other discourses (most importantly natural magic, alchemy, demonology, and legerdemain) to serve as a mere "external" comparison with drama. Drama was imbricated with these practices and vocabularies as well. What readers like Beaurline, who assume a very modern "two cultures" divorce of arts and sciences, see as a briefly interesting analogy is in fact a strong symptom of the pre-disciplinary fluidity in the period. Natural philosophy and drama, but also masques, anatomy demonstrations, wonder-cabinet collecting and display, forensic rhetoric, and still other types of physical performance were in Jonson's lifetime all partially overlapping components of an older and broader realm perhaps best described by the broad term "theatricality." Some recent studies have begun to recognize this pre-disciplinary conceptual ferment and its consequences for our models of literary history.[5] The world was indeed a stage in the early seventeenth century, and natural philosophers, like princes and early capitalist entrepreneurs, had to work within inherited associations of "playing" before patrons.[6] This is one of the primary reasons *The Alchemist* holds a central place in the tangled discursive evolution by which the first purpose-built permanent theaters and the first semi-public laboratories evolved together and later grew apart as natural philosophers pioneered new strategies to understand and sometimes disavow the dramatic elements of their experimental repertoires. The larger question of the connotations of dexterity for early modern empiricism might be posed this way: what did it mean for natural philosophers to make deliberate, or what at the time were called "unobvious," experiments, in a culture prone to process all empirical work as spectacle? As late as the 1650s, for example, while future fellows of the Royal Society were meeting at Oxford to plan the new organization, Henry More mocked their work as that "Mechanical kind of *Genius* that loves to be tumbling of and trying tricks with the *Matter* (which they call *making Experi-*

ments)" (1: 36). How and when was an experimental trial not merely a performance in the sense of theatrical playing, but also something potentially more stable and significant intellectually? Jonson's *Alchemist* had already raised this question and sketched a solution to it at the same time.

Recent scholarship in science studies has shown the vital importance of understanding the role of place in knowledge production.[7] Laboratories[8] are spaces where purposive work is focused for processing outcomes: truth can be apprehended within the boundaries of a laboratory because in a paradoxical way the experimenter "withdraw[s] from the world for the purpose of attending better to it" (Alpers 405). Philosopher of science Joseph Rouse defines laboratories as specially prepared loci for the manufacture of "phenomenal microworlds" (71). Karin Knorr-Cetina calls laboratories "enhanced environments" for manipulating "natural and social orders" (26). At the same time it is important to note that for the purposes of science laboratories need not be a single room or a permanent structure. Indeed, a laboratory space at its most abstract is little more than a flexible frame and attendant epistemological rules. Rouse points out that labs can be simply a "context of equipment functioning together" (107), and Knorr-Cetina reminds us that they are sometimes only "virtual" and "coextensive with the experiment" as in computer simulations, outdoor fieldwork, and psychological research (35). A single closed room, a series of computers linked via networks, a field or dig site, a desk, a particle accelerator—all these locations in different ways can become what sociologist Thomas Gieryn has termed "truth spots" where, due to very human mediation and protocol, facts are then deemed to manifest themselves.[9]

But stages are also, of course, special places where time, space, and dexterity are variously bundled together, and often in order to produce truths of some kind. Although the history of theater seems overwhelmingly tied to a few types of buildings and acting styles, a full account of drama as such would need to include indoor and outdoor, impromptu and planned, small and large works, and their correspondingly different spaces of performance. As a cultural form, drama privileges "boundary effects," the play of ontological states and epistemological thresholds, where gestures, words, and things are charged with a new energy and the very apprehension of reality is explicitly theorized.[10] Laboratories and stages, then, share important physical and conceptual features consequent on being boundaries both virtual and real. By means of physical practices and mental representations, both labs and stages can link together local and distant places and employ a mix of fixed and mobile architectures. The stage can be considered one temporary knot

of time and space through which we encounter still others; even the most "local" of on-stage representations is tied inextricably to contiguous spaces (auditorium, dressing rooms, doors, windows), evoked "elsewheres," and other times. This latter description of drama accords well with recent science studies models of how laboratories do their work. For example, according to Bruno Latour's influential actor-network theory (ANT), the power of a laboratory lies in its linkage of formerly unconnected forces, objects, and people. A lab is a dense passage-point through which, for instance, near and far places and strong and weak forces are made to interact and signify in new ways together. Not only do the seemingly autonomous realms of the scientific and the socio-cultural come to interrelate in laboratory work, Latour argues, but in these special places "the very difference between the 'inside' and the 'outside,' and the difference of scale between 'micro' and 'macro' levels, is precisely what laboratories are built to destabilize or undo" ("Give" 143).[11]

In his study of the prehistory of the English public theaters, Joel Altman notes how early Tudor drama often served as a space of proto-aesthetic detachment from the world dedicated to the enhancement of forensic capability.[12] William N. West has recently augmented this account by showing how, under the pressure of the increasing number of live public performances as the sixteenth century progressed, inherited notions of what a theater was shifted from the static tableau known to the Tudor humanists (modeled on encyclopedias, temples of fame, and the like, and known primarily from books) to the increasingly volatile live-action flutter of theater and meta-theater associated with Elizabethan and Jacobean public playing. In what follows I will argue for a modification of these historical insights to emphasize that the proto-scientific use of a unified neoclassical knot of dramatic time-space by Jonson and several others in the seventeenth century shows that the older, "Tudor," notion of the theater as a largely indubitable space for the presentation of knowledge (on the model of legal forensics and oratorical display) did not disappear. Instead, with the rise of the public companies and the vicissitudes of live performance, the inherited Tudor model moved to a new intellectual venue—theories of "the unities"—a critical doctrine with a substantial vogue in England in the middle and late decades of the seventeenth century.[13]

We must first examine Jonson's intricate fashioning of dramatic time and space. Few plays have so consciously measured time and conveyed the effects of its passage on characters as *The Alchemist*. Among others, Ian Donaldson has shown the extent to which in Jonson's middle comedies time is a valuable commodity fought over and hoarded by characters (89–105). In *The Alchemist*

time is cast as invariable and in that way mechanical, even terrifyingly transcendent. Time cannot stretch, it will not disappear in dances or masques, and it barely weakens its hold in brief moments of psychological reverie. The unity of time is so extreme and literal, and makes such demands on the characters, that we can rightly liken Subtle, Face, and the others to parts in a clockwork or cogs in a vast impersonal system. Because of this temporal contraction it is easy to create a rigid timetable of the action.[14] The entire play is a frenzy of activity as cozeners and dupes come and go repeatedly through each act. A knock at the door often propels the next scene or complication, culminating in act 5 with furious knocking at the front door first by the returned Lovewit, and then by other dupes, neighbors, and officers. From the opening scene, the audience, like the trio of cheats, wonders anxiously which knock will signal the return of the master and the end of the illusion. The characters are never inactive save for Dapper's extended stint in the privy awaiting his visit from the "Queen of Fairy." At the end of act 2, Face must run in order to keep a meeting with Surly he arranged just a few scenes before. When all exit at the close of act 2, the stage is empty for the only time in the play. The only break in the represented time of the action comes between acts 2 and 3 and covers less than an hour, as Subtle's comments to the returned Ananias show (3.2.1–2). By the time we are in the thick of the plot, scenes become fused completely; the instantaneous, farcical transition of act 3 to 4 is marked only by Face pushing Dapper and his associates out of one door and letting Mammon in at another. Anxious improvisation and comic timing are conveyed simultaneously in the rapidity of the change from a loud, full stage where the trio tickle and rob the blindfolded Dapper to the calm, empty room Face opens to Mammon seconds later.

Like his work on stage time, Jonson's work on stage space in *The Alchemist* is particularly complex and meta-theatrical. Lovewit's "house" changes to fit the imagination of those who enter it, despite the fact that we literally see only one room on stage. Evoking boundlessness from within a quite limited area, *The Alchemist* demonstrates the dynamic nature and epistemological uses of the physical structures humans create and inhabit. Space is not an inflexible, static medium, nor is it a simple container. Space is produced and shaped by human relationships with the built environment and with other beings. As Henri Lefebvre argues in his classic study, *The Production of Space*, space is a more or less pliable medium through which the contours of the social self are negotiated: "[i]tself the outcome of past actions, social space is what permits fresh actions to occur, while suggesting others and prohibiting yet others" (73).[15] Stage space epitomizes this flexibility and emotional resonance, as

Jonson's self-conscious theatricality makes clear: stillness and motion, silence and cacophony, can engender feelings such as freedom and restraint. In *The Alchemist* one mundane room at different times suggests a number of places, from Peru (2.1.2) to a brothel (2.3.226) or a labyrinth (2.3.308). F.H. Mares calls Lovewit's house a "dream factory" (lii); Donaldson groups the play with *Volpone* as an exploration of "human expectation" (102).

In addition, the play's "permanent interior setting" recognized by E.K. Chambers decades ago as unprecedented in Elizabethan and Jacobean theater does more than simply present London to a London audience (3: 123). *The Alchemist* is set in the same place and time as the initial performance, as if it is the documentation of a single historical event or empirical trial.[16] The audience of the first performances walked into the Blackfriars theater only to be reminded that they were watching alchemy "here in the friars" (1.1.17). To make matters even more self-reflexive, the initial audience left their homes empty or in the care of others while they viewed a play about the criminal use of a home while its owner is away. The play represents more than the gritty London of its contemporary audience; it is a communal delusion tightly focused, like the actual stage itself, upon one neighborhood room and its adjacent doorways. Jonson fashioned a means of audience self-placement in an increasingly diverse and sophisticated metropolis. According to Henry Turner, in these city comedies the stage functions as "an objective screen . . . through which viewers recognized themselves as part of the collective civic entity, correlating a concept of citizenship not simply with the sense of legal and institutional belonging but with physical placement in a realistic urban topography" (195). The prologue's request of "two short houres" (line 1) with which to show "Bawd, squire, impostor, many persons more" (line 8), strives to be literally true in a way most plays do not. This scrupulous unity of place corresponds to the invariant passage of time, and both serve as laboratory controls for Jonson's epistemological agenda.

In this unified time-space knot in the Blackfriars, remarkable transformations occur and new relationships are produced. For example, *The Alchemist* is a frenzy of speech during which all of the characters spin dense webs of words for multiple purposes. In his influential reading of *The Alchemist*, Edward Partridge noted how in this play brimming with dialect, cant, and jargon, the language, like the plot, rises only to explode in the end. Audiences of *The Alchemist* are engulfed by the torrent of speech; William West for instance notes how "the languages of alchemy, kabbala, and other occult practices dazzle their hearers rather than escaping their notice; they are, to use the distinction Jonson makes

of masques, gazed at rather than read" (182). The play, in effect, stuns us by opening with an obscene shouting match and never slackening its full sensory barrage. Several scenes present Mammon's long fantasy-soliloquies and his cracked exegesis of alchemical lore. As Subtle, Mammon, and Face ply their jargon back and forth, Surly remarks that it reminds him of thieves' cant (2.3.42). In one scene, Surly's Spanish is not understood by Face and Subtle, in another an alchemical catechism is recited (2.5.22ff). Later, Doll portrays a mad noblewoman who torments Mammon with rambling apocalyptic genealogies. Finally, as Mammon and Face try to calm the raving Doll who is shouting in the background (4.5.25–33), the "laboratory" in the back room explodes (4.5.54).

Prior to the explosion, as dupes continue to be taken in, Lovewit's house fills with new economic potential and the trio's titles inflate with euphemism and pretension. Subtle becomes "Doctor" and "Sovereign"; Jeremy the butler, sometimes Face, becomes "Captain"; punk Doll Common presents among other personae the Queen of Fairy and "Royall" Doll (1.1.74). The enraptured Mammon sees in Doll a likeness to "*Austriack* princes" (4.1.56). Through their skill in language, the "venter *tripartite*" (1.1.135) generates a dynamic space of possibility that Partridge nicely describes as "simultaneous existence on multiple levels" (120). Through their labor, the plain room in Lovewit's house becomes a factory for new social value, and one small locality a portal to the far away and unseen. Each character makes of Lovewit's house what he or she desires: "You may be any thing," Subtle confides to the excited Anabaptist brethren as they contemplate their future with the Philosopher's stone (3.2.53). No character is satisfied with himself or herself and each expects Nature to be transformed by artifice. The dupes who frequent Lovewit's house, despite their variety of professions and ambitions, ultimately "possess one common denominator, a susceptibility to the wiles of Subtle, Face, and Doll."[17] The truths produced by Jonson's stage-laboratory will be informed by and relevant to society as a whole.

Sir Epicure Mammon, the most extravagant of the dupes and, not surprisingly, the most deeply versed in alchemy, finds Subtle's garret a space of wonder and infinite potential. When he arrives with Surly, Mammon crosses the doorway into the domestic, but only to imagine the place more expansive than any building:

> MAMMON. Come on, sir. Now, you set your foot on shore
> In *novo orbe*; Here's the rich *Peru*:
> And there within, sir, are the golden mines,
> Great SALOMON'S *Ophir*! He was sayling to't
> Three yeeres, but we have reach'd it in ten months. (2.1.1–5)

Both time and space appear elastic in this breathless but ultimately empty rhetoric; Mammon fuses the language of epic romance with the quest imagery of hermetic magic.[18] Jonson, like his contemporary Francis Bacon, routinely attacked this slippery rhetoric of secrecy and accomplishment. Bacon was optimistic about empirical experimentation, but Mammon's boast that they have compressed to ten months the three years the biblical Solomon needed to gain the renewable riches of Ophir (I Kings 10:22) is a perfect example of the faith in magical shortcuts that Bacon criticized repeatedly. In the *New Organon*, for instance, Bacon argues that instead of a patient accumulation of experiments and axioms by method, magicians, alchemists, and Aristotelians shared common defects of thought that led them prematurely to establish abstract general laws and build "a fantastic philosophy on a few furnace experiments" (*Oxford* 11: 89). Because of such intellectual defects, which Bacon terms the "idols," men produce what he calls "*Ad quod vult Scientias*," or "*As-you-like-it* Sciences. For man would rather believe what he wishes to be true" (11: 87). By contrast, it took cooperative and painstaking effort to properly ground results for "a true pattern of the world as we actually find it and not as someone's own private reason hands it down to him" (11: 187). From Subtle's work Mammon expects universal power and the gratification of his ever-unfolding desires. The piety he presents to Subtle in desiring the philosopher's stone is all pretense (as, of course, is Subtle's profession of piety in creating it). Echoing conventional images of imperial excess, Mammon's "voluptuous mind" (4.5.174) aims almost exclusively at personal satisfaction, and his fantasies spin out of control as he speculates on his impending powers. William W. E. Slights is correct that the fantasies of Mammon and his fellow dupes create a "mystification of space" in the play (116). In an imagined oval room of pleasure, for example, special effects will enhance Mammon's senses with virtual reality. No longer content with simple appearances, his bedchamber will have mirrors

> Cut in more subtill angles, to disperse,
> And multiply the figures, as I walke
> Naked betweene my *succubae*. My mists
> I'le have of purfume, vapor'd 'bout the roome,
> To loose our selves in; and my baths, like pits
> To fall into: from whence, we will come forth,
> And rowle us drie in gossamour, and roses. (2.2.45–52)

Mammon's fantasy room, like the one in which he stands as he describes all this to the audience, is a web of illusion and reality, art and artifice, opaque spaces and discovered depths.

Though Mammon's alchemically inspired aims are the most blasphemous, he is not alone in his projects to reconfigure space. Abel Drugger wishes to charge the environment with new potential and force by hiring Subtle to magically align his new apothecary shop:

> DRUGGER. . . . (Here's the plot on't.)
> And I would know, by art, sir, of your worship,
> Which way I should make my dore, by *necromancie*.
> And, where my shelves. And, which should be for boxes.
> And, which for the pots. (1.3.9–13)

Drugger is given directions with which to reconfigure the spatial outlay of the shop. He is encouraged to bury a magnet under the threshold "to draw in gallants, that weare spurres" (1.3.70), and is given a "hieroglyphick" sign to place out front (2.4.24).[19] The young law clerk Dapper inflates with new desire as well. His initial goal is modest, simply a magic familiar (a "rifling *flye*") to help him win at occasional gambling (1.2.84). When the possibility of greater power is hinted at, however, Dapper's goals change quickly: "I would have it for all games. . . . I do think, *now*, I shall leave the law" (1.2.91, emphasis added). When later the "Queen of Fairy" blindfolds and robs him, Dapper recapitulates in miniature the experience of the audience: like the spectators he is immobilized physically and his senses obscured in order to experience temporarily a realm peopled with preternatural beings beyond ordinary human reality (3.5.15–82).

Subtle, Face, and Doll are by far the most adept projectors of self and environment, true masters at producing social space by filling otherwise mundane rooms with dexterity and desire.[20] By usurping Lovewit's empty house, they create new roles in the urban underworld of Jacobean London. In the opening scene, the trio fights over precedence, and the audience is provided with some perspective on where these cozeners have been before setting up house. As Subtle and Face argue back and forth, the fluidity of their lives is epitomized in the alchemical jargon:

> FACE: Why! Who Am I, my mungrill? Who am I?
> SUBTLE: I'll tell you,
> Since you know not your selfe—
> . . . . . .
> Thou vermine, have I tane thee, out of dung,
> . . . . . .
> *Sublim'd* thee, and *exalted* thee, and *fix'd* thee
> I' the *third region*, call'd our *state of grace*?

> Wrought thee to *spirit*, to *quintessence*, with paines
> Would twise have won me the *philosophers* worke? (1.1.12–14, 64, 68–71)

Although Subtle argues that he has created "Face" from a humble butler named Jeremy, Face maintains that he has invested the most time and skill in the effort. Face also reminds Subtle of his part in obtaining equipment and a house for the common enterprise:

> I ga' you count'nance, credit for your coales,
> Your stills, your glasses, your *materialls*,
> Built you a fornace, drew you customers,
> Advanc'd all your black arts; lent you, beside,
> A house to practice in. (1.1.43–47)

According to Face, they are now capable of new projects because of the particular location and prey he supplies. Part of alchemy's traditional allure, and the source of its rampant abuse in Jonson's eyes, was how easily its language doubled as a discourse of social mobility. Face, Subtle, and Doll come together as a perverse example of early modern corporate affiliation. The members of this household are not a family, but instead colleagues or a "company" in a sense contemporary with the emerging economy of early Stuart London. Jonathan Haynes has shown how *The Alchemist* gives a great deal of attention to this criminal underworld's nature and causes, dramatizing an entire social system in which dupes and cons, economy and crime, are mutually implicating and structuring. According to Haynes, Jonson "sees not only how the old order is breaking up, but the form and presence of a new economy . . . working through both society and the underworld" (29–30). He rightly notes that the trio's activity is an example of emergent corporate identity and dexterity; indeed the terminology of business, incorporation, and trade permeates the play.[21] Home-based, self-determining, more and less skilled, and more and less marginal technicians like Subtle, Face, and Doll were different in degree, not in kind, from the tradesmen and virtuosi who rivaled university-trained men for mechanical work in early modern England. Christopher Hill has pointed out that early virtuosi depended on the domestic or semi-domestic guild spaces of trade knowledge for their materials and routines. Following W.E. Houghton's pioneering work, Hill claims, "[t]he nearest that sixteenth and early seventeenth-century scientists could get to a laboratory . . . was in the workshops of metal-workers, glass-makers, paper-makers, dyers, brewers, sugar-refiners—new industries or industries in which new processes had been introduced" (66–67). One well-known enterprise, which Jonson glances at directly in the play (2.6.20

and 4.1.90), was that of the magus, mathematician, and sometime courtier John Dee who, with his associate "scryer" Edward Kelly, oversaw a household complex of more than twenty persons in the 1580s and 1590s. As Deborah Harkness has shown, several of the servants in Dee's alchemical household had criminal backgrounds, and with Dee they undertook experimental work, astrological speculation, and conversations with angels as means to fashion livelihoods at a time when natural and supernatural knowledge had no settled place in the culture. The new, skill-based bonds forged by Jonson's trio represent a haunting negative example of virtuoso collaboration, in a home and around a furnace, where the experimental activity of seventeenth-century natural philosophy would often take place.

Andrew Pickering has used the term "mangling" to describe the manner in which scientific experimentation involves the open-ended evolution together of material and human agency as each is tuned to the other over time. Instruments and tools are developed, calibrated, and recalibrated; new technologies make new data possible; behavioral and mental protocols accommodate themselves to new technological necessities. Because of this mutual tuning—a "dialectic of resistance and accommodation" (xi) as Pickering summarizes it—the very contours of human action and natural force change as new potentials and limits emerge and with them new kinds of causal explanation. Amounts and kinds of agency are not necessarily constants, Pickering argues: new funding arrives or disappears; new skill-sets are realized by tinkering; and finally, "[n]o one knows in advance the shape of future machines and what they will do" (14). One of Pickering's central goals is a history of science that will enable us to understand comprehensively the real-time creation and stabilization of knowledge. When new routines and instruments are used in experiments, it can be difficult to decide what constitutes a factual signal and what is artifactual "noise." The concepts of "tuning" and the "mangle of practice" capture effectively the way different factors (sociological, legal, natural, personal, and the like) are themselves provisional and subject to change during the unpredictable and often improvisatory evolution of an experimental trial. With materials such as clothes, a furnace, and chemical instruments, with verbal acuity, and sometimes with routines as ordinary as spying out a window, Jonson's trio of cheats draw many resources together to make themselves more powerful than their victims. In Lovewit's house mundane objects become new and more efficient tools for future cheating, while physical acting routines—some rehearsed, others to be improvised ad hoc—are shaped for new ends. A good deal of the effort is linguistic, as we have seen above; words stun and un-

settle the dupes and the audience. But a more important, and novel, source of authority in *The Alchemist*, one crucial for the future of natural philosophy, is skill with instrumentation as a means of making the natural world and human behavior increasingly predictable, and perhaps even to an extent controllable. Early modern alchemy and natural magic, like their successor sciences, fashioned new phenomena by way of innovative performances with instruments and techniques.[22] Jonson the playwright and one-time actor engaged a similar dynamic firsthand through experience with props in the playhouses.

The Alchemist stresses the repulsiveness of alchemy's constitutive materials—onstage and ultimately offstage too—and the operations performed with them. As alchemy works to raise base material from the common to a form of exaltation and value, so it promises to do with human nature. Surly, the skeptic or "heretique" (2.3.3) to the alchemical faith, not surprisingly objects most forcefully to the sordidness of the entire business. For Surly, alchemy should stay hidden and domestic, for it is made only of the detritus of ordinary fallen existence and, despite a rhetoric of sublimation, projection, and "states of grace," Subtle and Mammon's object is no different from the folk medicines of the local cunning-woman or rustic. He asks Subtle,

> What else are all your termes,
> . . . . . .
> [Y]our broths, your *menstrues*, and *materialls*,
> Of pisse, and egge-shells, womens termes, mans bloud,
> Haire o' the head, burnt clouts, chalke, merds, and clay,
> Poulder of bones, scalings of iron, glasse,
> And worlds of other strange *ingredients*,
> Would burst a man to name? (2.3.182, 193–98)

The seemingly esoteric ingredients used in this sublime art could be found in any home and by gleaning the cast-off pieces of London's nascent industry. Alchemy here seems at best an impertinent redescription of the ordinary and profane. The precision and force of Surly's description of the trio as "household rogues" (4.6.16) lies in his recognition that the latter's activity has further poisoned a social space already under pressure from, among other things, changing gender roles and the growth of capitalist economic forces in the City. Just as alchemy is tied to sordid home-based objects, it can also be tied to the home's low-status, private inhabitants: women, children, and servants. Over the course of the seventeenth century, women were actively excluded from the increasingly public spaces of medicine and science, and natural philosophers struggled to set their newly established laboratories apart from the domestic realm in order to

construct early modern science's ideal "world without women."[23] *The Alchemist* in its form and setting crystallizes this very "problem" self-consciously—there is a crucial tangling together of alchemy, charlatanry, and the home. The play makes clear that Subtle could not possibly produce anything really effective or edifying in Lovewit's house (unless it is a moral lesson for the audience), and this is why we do not see an actual laboratory behind the back door: there are beakers and liquids and even a furnace, we are told, but it is only for magical sleight of hand. In *The Alchemist* such spaces are illusory and deceitful, like the theater that both fascinated and repelled Jonson.

And yet despite Jonson's overt satire of rogues and their playing, *The Alchemist* does in fact valorize creativity and dexterity. Anne Barton is certainly correct that *The Alchemist* "places a premium on amoral intelligence" (147). Over the course of the play, the stage is filled with secrecy and strategic revelation, with temporary truces and battles of one-upmanship, and with the labor of cheating, both linguistic and physical. Mary Thomas Crane has pointed out how *The Alchemist's* focus "is on the practice of performance, [but] from the perspective of the actors rather than of the audience" (181). Every character in the play, except perhaps Dame Pliant, has some knowledge or skill with which to create an advantage over others. Doll, for example, repeatedly holds secrets over her victims, appearing as the Queen of Fairy and as a rich woman, in addition to her more mundane role of lookout at the window. Even the rival and potential spoiler of the trio, Mammon's friend Surly, is no moral exemplar, for he is a card-sharp, pimp, and sometime blackmailer (2.1.9–14). Surly even recognizes the similarity of the trio's work to his own, exclaiming during his philosophical arguments with Subtle, "Alchemie is a pretty kind of game,/ Somewhat like tricks o' the cards, to cheat a man,/ With charming" (2.3.180–82). Subtle considers it a kind of challenge to fool Surly, since he recognizes that the latter is also a cheat: "O, but to ha' gull'd him,/ Had been a maistry" (3.3.7–8). Surly's later disguise as a Spaniard and his ability with the Spanish language are just the advantage in knowledge necessary to begin collapsing the trio's swindle. Though at a truce for much of the play, Subtle, Face, and Doll struggle among themselves for precedence too, keeping pieces of information away from one another when it is convenient.[24] When the situations become increasingly complicated after act 3, the double-dealing heightens and the venture begins to fall apart, turning the play into a demonstration of domestic anarchy and immorality.

Jonson highlights the very real dilemma of Jacobeans facing a proliferating urban culture and working to understand the effects of novel empirical

philosophies and technologies. In the world of early modern natural knowledge, instruments and skilled personnel were usually found outside the circuits of elite education. At the same time, there was what could be called an explosion of instrumental virtuosity in the decades when Jonson was meditating on dramatic form and intellectual power. The historian of scientific instruments Maurice Daumas identifies the early seventeenth century as a watershed period when "gradual advance gave way to a sudden outburst of invention which abruptly changed the rhythm of progress" (3; cf. J.A. Bennett). Jessica Wolfe claims, similarly, that "[t]he recreative dimensions of mechanics reach[ed] a pinnacle in the first third of the seventeenth century" (72). The newest stage props, masque technologies, and natural magic materials joined medicines and oddities of all sorts to become parts of a culture-wide movement for the creation and collection of wonderful objects.[25] Robert Burton, himself a kind of encyclopedic collector, noted caustically in *The Anatomy of Melancholy* (1621) that "[t]here be many Mountebanks, Quacksalvers, Empericks, in every street almost, and in every village" (2: 11). New instruments and new materials circulated for decades in various social contexts before being disciplined for use in natural philosophy. The first thermometers and barometers created in the decades around 1600 had little scientific accuracy but traveled widely as intellectual wonders; we might note, for instance, that the telescope mentioned in Jonson's masque *News from the New World in the Moon* (presented at court in 1620) appears as little more than a curiosity well known among tradesmen.[26] Instruments made famous by Galileo and others had for years been a part of the natural magic of Gianbattista Della Porta (d. 1615), Italy's most well-known virtuoso before Galileo. Dutch engineer and inventor Cornelius Drebbel arrived in London around 1605 to show mechanical wonders and subsequently became a valued entertainer at the Stuart court, reportedly demonstrating, among other things, a perpetual motion machine, lens and light shows, air conditioning, and a submarine.[27]

In this culture of wonderful display, the potential for trickery and self-authorization was marked since gentlemen-amateurs were often at the mercy of social inferiors for their materials and skill sets. The meaning and value of the skills involved in firing a furnace, contemplating a meteor or a shell or a wound, or playing in borrowed clothes on a stage relies on contextual significance. Those activities can be categorized as cheats or revelations or facts, depending on their place in a web of assumptions. We should recall here Peter Dear's Kuhnian argument about how cognitive expectations matter in the apprehension of data:

> [e]ven with novel deployments of apparatus and technique to bring about hitherto unknown behaviors, no knowledge can be created unless those new human practices and new natural appearances are rendered conceptually in an appropriate way. Indeed, even to identify a technical practice as new rather than as an unimportant variant upon an old practice, or to identify the resultant appearances as new kinds of natural phenomena rather than variants of previously known ones—or pathological instances—requires particular conceptual and cognitive expectations on the part of the knower. (12)

Face's many abilities, like Subtle's knowledge of alchemical terminology, are potentially valuable in a number of ways. In valorizing craft knowledge learned not at university and in books but from physical experience (such as Face stating how to blow on coals "to keep your heat even" [2.2.24]), the new natural philosophy created a dilemma for a hierarchical culture that both depended on and despised manual skill. Some examples can convey the kind of intellectual and social vulnerability that Jonson thematizes in *The Alchemist*. In 1579 the collector Bernardo Castelletti wrote to his friend and fellow collector Ulisse Aldrovandi (the latter's museum of natural and preternatural objects was the most famous in Europe at the time) about new specimens of fish, but also warned that the fisherman who sold them had tricked him before with a homemade monster-fish.[28] In the early modern period, the self-interest of "mechanicals" was proverbial: Burton's *Anatomy*, for instance, in a passage listing common prejudices about different professions, notes "a Mechanitian, [is thought] base" and "A Tradesman, [is thought] a lier" (1: 278). In Jonson's late play, *The New Inn,* Prudence laments, "[t]hese base *Mechanicks* never keepe their word,/ In any thing they promise" (6: 423). Similarly, in 1659, John Evelyn wrote to Robert Boyle to explain that he was giving up writing a Baconian history of trades because of "the many subjections, which I cannot support, of conversing with mechanical capricious persons" (qtd. in Houghton, "Virtuoso" 204). As late as 1726, it took several weeks for London physicians and virtuosi to evaluate the reality of plebeian Mary Toft's claim to have given birth to seventeen rabbits.[29]

It is illuminating at this point to compare Jonson with Bacon. The Lord Chancellor was having his own difficulties evaluating the ethical significance of dexterity in early Stuart London and also sought novel conceptual means to imagine lab space. While Jonson was writing what we now call his middle comedies, Bacon was analyzing the lack of serious purpose-built spaces for experimentation. He lamented in his *Filum Labyrinthi* (c. 1607) that since

the technical accomplishments of the ancient Greeks and Romans, "natural philosophy was never any profession, nor never possessed any whole man, except perchance some monk in a cloister, or some gentleman in the country, and that very rarely" (*Works* 3: 499). Almost twenty years later, in his utopian sketch of a state-funded and proto-professional "Salomon's House," Bacon was still working to imagine such a dedicated space. Because of a lack of purposive place and time, he argued, virtuosi hit upon progress only by chance, not by method. In contrast, Bacon's lifelong project for the reformation of philosophy was based on the studied recruitment of intelligence and the disciplining of potentially wayward dexterity. Bacon never ruled out an endeavor's potential for adding to human betterment; for example, his writings show that he was of two minds about alchemy. "The world has been much abused by the opinion of making of gold," he wrote in *Sylva Sylvarum* (1626), but "the work I judge to be possible; [only] the means (hitherto propounded) to effect it are, in the practice, full of error and imposture" (*Works* 2: 448). In an Aesopian fable, which appears as the epigraph to this article, Bacon suggested that alchemical desire at the very least spurred activity that might lead to unintended positive consequences.[30]

Bacon found ideas and tools among natural magicians and legerdemain artists such as John Dee, Cornelius Drebbel, and William Vincent (a.k.a. James I's court magician "Hocus Pocus").[31] Baconian "natural histories" and histories of trades would search out the useful knowledge embedded in things and in people and begin to catalogue it. It was a radical social plan at the time in England, when folk knowledge of medicines (often called "empiricks") and trade knowledge were both economically valuable to middling people and often unappreciated by gentlemen schooled in the humanist curriculum. Practical knowledge of almost any sort, including geometry, arithmetic, and bookkeeping techniques, had little interest for elite men and women before the seventeenth century.[32] In contrast, Bacon's project to compile histories of phenomena would involve the collection and accumulation of knowledge, at first indiscriminately, to determine by conscious method and not by accident what was known and what was not. For this reason the *Advancement of Learning* (1605) has been called an encyclopedia of an unprecedented kind, "an 'encyclopedia' of work needed, of not yet existing knowledge, an encyclopedia of *lacunae*, as it were, which a new philosophy would fill in."[33] Bacon's project for reform took as its objects high and low culture, ancient and modern sources, written and physical knowledge. In other words, among his many sources, Bacon wanted to learn from people

exactly like Subtle, Face, and Doll. *The Advancement of Learning* sounded the call just a few years before *The Alchemist* was first performed:

> Another defect [in traditional education] I note, wherein I shall neede some Alchimist to helpe me, who call upon men to sell their Bookes, and to build furnaces, quitting and forsaking *Minerva*, and the *Muses*, as barreyne virgins, and relying upon *Vulcan*. . . . And therefore as Secretaries, and Spyalls of Princes and States bring in Bills for Intelligence; so you must allowe the Spyalls and Intelligencers of Nature, to bring in their Billes, or else you shall be ill advertised [i.e. advised]. (Bacon, *Oxford* 4: 58–59)

Jonson's alchemical satire could not be more precise. Subtle, Face, and Doll are certainly ambitious "Spyalls and Intellegencers," willing to bring in bills from Vulcan when opportunities presented themselves. Doll Common helps to encourage the Baconian seeker's turn away from "*Minerva,* and the *Muses,*" those "barreyne virgins," toward a much more voluptuous brand of empirical activity. In short, as Jonson demonstrates in his play, to create Baconian histories, and with them the future of natural philosophy, one had to go to risky places like Lovewit's house in order to learn. The domestic setting of science and technology was the norm, not the exception, for the entire early modern period. Consequently, Jonson's comic theatrical setting is highly realistic in that the play portrays a scenario where the next person to knock at the door of the house looking for advice or materials could be Bacon himself.

Since Jonson's trio are charlatan-alchemists, it is ironic that Face has indeed wrought gold by the end of the play. Face goes unpunished, and in fact he is celebrated by his returned master in the closing scenes. Lovewit keeps the material spoils of the trio's enterprise, and Face provides him with a rich young widow who will make him feel "seven yeeres yonger" (5.3.86). By contrast, all of the dupes are cheated, Surly is beaten away in humiliation, and Subtle and Doll, now abandoned by Face, must scurry over the back wall and presumably back to poverty. John Dryden was obviously not the first to identify the troubling lack of poetic justice in a denouement he called "notorious" in 1671 (*Works* 10: 208). As Crane and others have pointed out, the play's very form and focus give an implicit sanction to the con-men and compel the audience to identify with their vitality and their goals. Face is a genius at disguise and his master, also appropriately named, is smart enough to recognize a good opportunity when it presents itself. "I will be rul'd by thee in any thing, Jeremie," Lovewit says cheerfully to his servant and now partner-in-crime (5.5.143).[34] More troubling still for conventional morality,

Face seems to invite the audience to partake of the spoils as well. His epilogue both confides in us and challenges us:

> . . . And though I am cleane
> Got off, from SUBTLE, SURLY, MAMMON, DOL,
> Hot ANANIAS, DAPPER, DRUGGER, all
> With whom I traded; yet I put my selfe
> On you, that are my countrey: and this pelfe,
> Which I have got, if you doe quit me, rests
> To feast you often, and invite new ghests. (5.5.159–65)

The epilogue's ambiguity teases by forcing us to consider simultaneously the notion that we are partners with Face, who has at last taken off his mask, and the possibility that we are being mocked as fools whom he has also cheated. After all, we have paid admission to watch him do his work, and will return home again with nothing but the memory of words and actions. If we acquit him, are we also cheats, or are we among the "new ghests" to be cheated at a future date? Face and his allies, first Subtle and Doll, later Lovewit, have turned suspect effort into worldly success for reasons they clearly understand, even if others do not—namely, superior skill. So *The Alchemist* illustrates very well Bacon's fable of alchemy: the very aim of producing gold can in fact create it, but in a different form and by different means. And if Face and Lovewit have ultimately turned their dexterity and wit into gold, then so has Jonson himself. The acrostic "Argument" to the play serves as an early warning that alchemists, playwrights, and actors all resemble one another: the trio of "Cos'ners," "onely wanting some/ House to set up, with [Face] they here contract,/ Each for a share, and all begin to act" (lines 6–8). In the words of John Gordon Sweeney, the play provided in its content "the chance to project onto the alchemists with vengence whatever sense of imposture and insubstantiality [Jonson] felt about his own professional role" (146). The alchemist and experimenter of the play's title is Jonson as much as it is Subtle.[35]

But the tangling together of the alchemist's work with the poet's has a stronger and more important ideological force, for it provided Jonson with a creative position from which to make sense of his own ambivalence about fiction making on stage. It is here that the dramaturgy of the three unities specifically becomes a proto-scientific solution to the crucial problem of how to invent fictions and/or manipulate material and still tell effective truths about the world. It is here, too, that we see most clearly how natural philosophy and drama were but two tangled strands in an older and larger, but increasingly unstable, shared discourse. Well read in the new classicist criticism arriving

from the Continent, Jonson worked within a model of *poesis* as "worldmaking" that Elizabeth Spiller has shown spans poetics and natural philosophy in the Renaissance. Whether on a small scale as in magnetic globes and wonder-cabinets, or on a large one as in dramatic and epic poetry, to fashion new worlds wholesale was not necessarily associated with deception. Of Philip Sidney and William Gilbert, for example, Spiller notes "[w]hereas for us worldmaking often seems hypothetical or counterfactual, [they] insist that worldmaking is not an escape but a more powerful and more meaningful engagement with reality than can be found in the world at large. For them, art (fiction, experiments) grounds their ability to claim to produce knowledge" (16). And this poetic making is empirical, practical, and proto-scientific. As Turner reminds us, Sidney's version of "poetic making can be seen as 'experimental' in the specific medieval and early modern sense of the term: artificially constructed conditions in which knowledge might be produced" (109). He continues,

> [f]or Sidney . . . poesy does more than 'imitate,' 'assist,' or supplement nature: it departs from nature and improves upon it . . . [in ways] typical of other instrumental arts such as alchemy or natural magic. . . . The power of the poet lies partly in his capacity to reproduce nature's own processes and apply them to things that nature never intended. But it also lies in his ability to 'invent' an iconic model in which the workings of nature might be studied, a set of artificial or hypothetical conditions that correspond [to] or 'imitate' reality but which have been deliberately constructed to reveal causes and general principles. (109–10)

Jonson's model of *poesis* is, to be sure, less Platonic than Sidney's in its rhetorical presentation. But his practice of unified dramaturgy in *The Alchemist* is absolutely of a piece with Sidney's theory in feeling the need for an empirical grounding of creativity and finding it in part in the seeming rationality of Italianate poetic "rules."

In theory and in practice, then, Jonson, like Sidney, Gilbert, and others in the pre-disciplinary ferment of early modern England, formulated what was a paradox for the traditional Aristotelian but was to become a crucial premise for the new science: human mediation, whether in a well-wrought play or an experimental trial, is in fact a means for revealing what nature is like when it is unmediated. Jonson's clock-like drama conveys his strategy for consciously examining the boundaries of truth and artifice, and is his means of embodying the ultimately very scientific concept of truth-through-artifice. Using the strict dramaturgy of the three neoclassical unities, Jonson could invent creatively and also maintain that his effort was wrought with self-conscious method. Since

poets are fundamentally makers, as Jonson argues in the *Discoveries*, labor and artifice are often the truest measures of the lasting value of a work: "Indeed, things, wrote with labour, deserve to be so read, and will last their Age" (8: 638). Against what could be called a naive inspiration model of poetics, Jonson stresses control and education: a poet must "not thinke, hee can leape forth suddenly a *Poet*, by dreaming hee hath been in *Parnassus*, or, having washt his lipps (as they say) in *Helicon*. There goes more to his making, then so. For to Nature, Exercise, Imitation, and Studie, *Art* must bee added, to make all these perfect" (8: 639). This means that Jonson differentiates various *kinds* of impostures, as it were—crafting internal and external ones—by foregrounding his own usage of the unities in *The Alchemist*. Invariant controls for his stage-laboratory, the three unities are artificial, mechanical, and for that very reason to be taken as stable and in large part indubitable. As a playwright but also a critic, Jonson simultaneously immersed himself in and held himself apart from the experiential vicissitudes of live theater. In Jonson's drama, then, elaborate method is crucial mediation; it is the ability to transcend the smaller closed horizons of the dupes' fantasies (and the audience's as well) in order to work upon them as the raw material for deliberate and controlled experimentation. In *The Alchemist*, *internal* illusions, for instance the dupes' predictably profane self-fashioning or the trio of cheats' skills at promising, are ultimately hollow, no matter how compelling the physical routines they perform or transcendent the rhetoric they employ. At the same time, with the three unities Jonson fashioned *his own cheat*, an *external* illusion, based on highly artificial controls of theatrical experience. Jonson does this, ultimately, to redeem parts of theater from theatricality and to ground real truths while acknowledging his artifice.

This means that there is after all a laboratory present in performances of *The Alchemist*, but it is not the one that remains unseen in the back room. The laboratory Jonson actually produces is the environmental ensemble of setting and skill, including the stage and the audience. The invisible lab in the back room is a playful distraction from the true experimental work going on in the playhouse, including the audience, ticking off like clockwork and ripening its results. This is how Jonson anticipates the phenomenology of laboratory experience at a time when few purpose-built scientific spaces existed and the latter had yet to be rigorously distinguishable from domestic and theatrical practices and spaces. *The Alchemist* in its performed totality functions as a proleptic portrayal of empirical experimentation in laboratories: first, scripted control of a few elements at the outset; then, concentration of space, time, and dexterity in one special area where natural and human

qualities come to seem not essential but rather negotiated over time; and finally, attention to the more or less predictable results.

For all these reasons it seems to me that Jonson's innovative dramaturgy in *The Alchemist* can be seen as a relevant cultural pretext—a means of conceiving the very possibility of the space—for the Royal Society's later synthesis of fact production and social decorum. And in this special case it means as well that Jonson's middle comedies and masques share some formal features and ideological consequences. In *Mercury Vindicated From the Alchemists at Court*, for instance, performed before James I in January 1616 and set in "a laboratory, or alchemist's workhouse," a personified Mercury emerges from a large furnace and is pursued by alchemists wearing beakers and alembics for hats (213). Like *The Alchemist*, linking alchemy and fantasies of social mobility, Jonson's Mercury seeks King James's intervention against "the sooty tribe" that seems to have access to everyone in the culture. According to Mercury, self-made alchemists now range from the "child o' the scullery" to wenches, officers, gamesters, courtiers, and fine ladies (216). Detailing his sad trials as an antimasque, Mercury notes he is the alchemists' "crude and their sublimate, . . . corroded and exalted and sublim'd and reduc'd and fetch'd over and filtered and washed, and wip'd . . . my whole life with 'hem hath bene an exercise of torture" (215). Vulcan is chastised for preferring unruly fire and foul materials to the "excellence of the sun and Nature," and then Mercury initiates a change to a "glorious bower" where personified Nature ends the masque with a dance (221). Like Lovewit returned home to claim the spoils at the close of *The Alchemist*, the King's presence at the masque moves all from chaos to harmonious concord. Functioning something like a utopian idyll to *The Alchemist's* gritty realism, the *Mercury Vindicated* masque also portrays a scenario of unauthorized empirical work redeemed by a choice of dramatic form and a more sophisticated audience.

As a private criminal endeavor struggling to go public and threatening (recall Face's closing words) to replicate itself, *The Alchemist* is a perverted anticipation of the *Mercury Vindicated* masque. On his return home Lovewit is wise enough to recognize the value of co-opting this potentially self-directing empirical activity, and by doing so authorizes it on his own terms and for his own ends. The Face-Lovewit alliance may not last forever, but for the immediate future it has constructed a system of mutual protection and reward. The *Mercury Vindicated* masque ends likewise with a royally established concord of dexterity and natural truth. The new Royal Society, founded in 1660 when another absent master, Charles II, had returned home, would similarly co-opt such potentially unruly and semi-public experimental endeavors. Perhaps be-

cause of such symbolic legacies, leading Royal Society fellow Robert Boyle made sure to disavow the traits of drama, court masque, and natural magic show in the work of the new virtuosi. In his apologetic *Usefulness of Experimental Natural Philosophy* (1663), for example, he argued "the [natural] works of God are not like the tricks of jugglers, or the pageants, that entertain princes, where concealment is requisite to wonder" (*Works* 2: 30). Instances of such defensiveness could be multiplied indefinitely; during the middle and late decades of the seventeenth century the experimental community anxiously analyzed the dramatic resonances of their work, consciously and unconsciously raising the specter of Jonson's play in the course of doing so.[36] The Restoration settlement, as Shapin and Schaffer have influentially shown, was a double establishment in epistemology and in politics. This essay would add to their important argument a reminder that both parts of that double establishment had conceptual roots in the discourse of theater. The founding members of the Royal Society had in fact learned lessons from Jonson as well as from Bacon, though they credited overtly only the latter. Indeed, Charles II's new scientific society, "truly Royal!" (*Works* 1: 84) as Dryden lauded it in 1666, ought rightly to be seen as institutionalizing simultaneously Lovewit's opportunism and Bacon's optimism.

NOTES

This essay has benefited from the insights of Anne Cotterill, Helen Marlborough, Michael McKeon, members of the University of Chicago Renaissance Workshop, and readers for *JEMCS*. For editorial suggestions I would like to thank Miranda Lukatch.

1. Smallwood claims that through magisterial verbal manipulation "we fall into the same trap as Sir Epicure and his fellows. For, after all, there is no laboratory" (154). Cf. Partridge, who argues, "the explosion of the furnace in the fourth act is an objectification of what happens in the plot" (114). All quotations from Jonson's works will be from Herford, Simpson, and Simpson's *Ben Jonson* and cited parenthetically in the text.

2. In 1709, Steele commented on a performance he had recently seen, explaining that *The Alchemist* "is an Example of Ben's extensive Genius and Penetration of the Passions and Follies of Mankind" (1: 125–26). For Steele, the satiric object of the play was "Coveteousness," and no mention of alchemy or natural philosophy was made. Noyes notes that *The Alchemist* was revised to mock various contemporary examples of "projecting" and cheating, for example after the South Sea Bubble of August 1720 (112, 115–18). There are many studies of Jonson's knowledge of alchemy and of the sources he used in the dense passages of jargon. The most complete studies are those of Duncan and Linden.

3. The doctrine of three dramatic unities (of action, place, and time) was codified in Ludovico Castlevetro's mid-sixteenth-century synthesis of Aristotle and Horace. On Castlevetro, see Burnley Jones and Nicol 27–34, and Weinberg.

4. Cf. Auerbach, who likens Racine's neoclassical dramatic forms to scientific experiments (383), and Baridon, who describes the goal of the tableau favored by neoclassicists from Jonson to Racine this way: "Once the three unities were complied with, once the passions were placed in the best possible light, this [dramatic] mechanism acted with the precision of a time-bomb and the compelling power of a demonstration. Hence Rymer's [1674] remark on the moderns following Aristotle for 'reasons clear and convincing as any demonstration in mathematics'" (782).

5. In his important study, Turner notes, for example, that "one of the most important developments in sixteenth-century English poetics lies in the way that the field of dramatic poesy comes to constitute itself first by borrowing techniques, vocabulary, and basic epistemological assumptions from several fields of early scientific practice and then by gradually distinguishing itself from them" (21). For other recent studies of the drama of the period informed by the history of early modern natural philosophy, see Bruce R. Smith; West; Wolfe; Sokol; Brückner and Poole; Spiller.

6. For recent studies of how patronage shaped early modern science, see Biagioli; Smith, *Business of Alchemy*; Findlen, *Possessing Nature,* especially part 3; Moran. Pumfrey and Dawbarn provide an overview for England from 1570 to 1625, and they note how display-rhetoric differed in England and on the Continent. For a seminal account of how the discourses of the market and the theater separated in early modernity, see Agnew.

7. Shapin pioneered such research on early modern England (see Shapin, "House;" Shapin and Schaffer). For a wider overview and useful bibliographic survey of the topic, see Livingstone. For important studies of the settings and spatial dynamics of early modern science, see Golinski, especially chapter 4; Hannaway; Harkness; Findlen, "Masculine Prerogatives."

8. The etymology of "laboratory" and "elaboratory" (both forms of the word were used throughout the seventeenth century) derives from the Latin "laboritorium," a room for work, combined with the iterative connotations of "elaboration." For early modern usages, see Shapin and Schaffer 57n66; Hankins and Silverman 3; *OED,* s.v. "laboratory;" Smith, "Laboratories."

9. Cf. Livingstone, who notes the "monumental efforts [that] have gone into constructing 'placeless places' for the pursuit of science, spaces that aspire to ubiquity" (3).

10. For a lucid theoretical treatment of "boundary effects" in drama, see Benjamin Bennett, especially the introduction and chapter 7.

11. My reading of Jonson is indebted to Latour's insights, but I find Pickering's related, post-ANT, notion of the "tuning" or "mangle" together of human and machinic agency in experimentation more satisfactory for examining early modern drama. Pickering's work avoids the theoretical weaknesses of Latour's "hybrid" model while preserving its strongest insights concerning temporal change and improvisatory agency (dynamics particularly important in the action of *The Alchemist)*. Trenchant critiques of Latour's work can be found in Kenshur; Lee and Brown; Cohen. Lee and Brown are correct that Latour's rhetorical insistence on maximal extension of democratic inclusion and representation for all things (human *and non-*

human) becomes so vaguely metaphoric as to be useless as a realistic critical intervention: "If we follow the ANT trajectory, we must conclude that no topic, no objects or area of inquiry, can escape redescription or assimilation within it. In other words, ANT is so liberal and so democratic that it has no Other . . . it has made itself into a 'final' final vocabulary (774). . . . ANT's move to broaden the franchise is at the same time a bid to be recognized as the only proper representative of all" (780). They also rightly note that to challenge the ANT vocabulary of inclusion is risky for the critic in that it implies an objection to democratic values. Kenshur argues that Latour has proposed a new master narrative that reduces the complexity of its objects of study by insisting on treating all phenomena the same way, as "hybrids" of nature/culture: "[Latour] seems to feel the need to reject any modes of explanation in which there are beliefs that are not taken seriously. Thus, paradoxically, Latour's avoidance of reductive or one-sided explanations results in his refusal to recognize that not all phenomena require the same sort of explanation. . . . Every scientific theory, in his view, appears to be, in essence, half ideology and half science" (293).

12. Quigley makes a parallel argument for modern theater, noting how frequently the stage has been used for "improved means of inquiry" (61).

13. For more on the proto-scientific use of the unities in the drama of Cavendish, Davenant, and Flecknoe, see Shanahan, "Indecorous Virtuoso," especially 224–26, 236–39.

14. For instance, editors Herford, Simpson, and Simpson set the opening of the play at 9 a.m. when Dapper arrives and conjecture that it is around 3 p.m. when Lovewit returns home (10: 49–50).

15. Cf. Bachelard. Johnson has recently shown that Jonson was intimately familiar with new architectural theory and annotated heavily his copies of Vitruvius and Colonna.

16. The setting of *The Alchemist* has been dated to November 1610 using internal remarks by Dame Pliant (4.4.29–30 with 2.6.31) and calculations by Ananias (3.3.131–32; 5.5.102–03). The play was definitely staged at the Blackfriars in early November 1610, when the theaters reopened after a four-month closure due to plague. On the evidence of a September 1610 performance at Oxford, Mares tentatively suggests that the premiere was in London in July just before the closings (lxiii). On the doubling of place, see Turner 272. On dates in the play, see Smallwood 146–47.

17. See Dessen 109.

18. Among the new experimenters associated with the Royal Society, such romance discourse was quickly losing its appeal, and we can take Robert Boyle as an example of the shift: in 1649, the young Boyle wrote to his sister of his growing sense of vocation around the (al)chemical furnace this way: "*Vulcan* has so transported and bewitched me, that as the delight I taste in it [experimenting] make[s] me fancy my laboratory a kind of *Elysium*, so as if the threshold of it possessed the quality the poets ascribed to that *Lethe*, their fictions made men taste of before their entrance into those seats of bliss. I there forget my Standish and my books, and almost all things but the unchangeable resolution I have made of continuing till death" (*Works* 6: 49–50). In *The Sceptical Chemist* (1670) and later works, however, Boyle argued for a public and verifiable chemistry, and largely avoided romance figuration and

hermetic secrecy. On Boyle's early alchemy, see Principe; for his later methods, see Shapin and Schaffer; Sargent.

19. Drugger might seem a marginal character to modern readers, but he was a centerpiece of early modern performances. In the eighteenth century the plot centered on his farcical fights with Kastril. Noyes notes that over the seventeenth and eighteenth centuries "the history of *The Alchemist* was virtually the history of the role of Abel Drugger, about whom . . . more was written up to Garrick's death [1779] than about any other comic character except Falstaff" (103).

20. Jonson's choice of name for his rogue-alchemist is important. For an illuminating discussion of the etymology of the word "subtle" and the richness of Renaissance discourses of "subtlety," see Wolfe 11–12.

21. E.g. 1.1.110, 1.1.156, 5.4.71–72, 1.3.105–09. Cf. Partridge 139–44.

22. For an overview of the debates about instrumental mediation and the extent to which science constructs its object, see Hacking; Latour and Woolgar; Latour, *Science in Action*; Shapin and Schaffer; Golinski chapters 4 and 5.

23. The phrase is Noble's. We should note, however, Findlen's caveat in "Masculine Prerogatives" that because of the domestic setting of so many museums and cabinets of curiosities before 1700, and despite engravings invariably showing only men in them, "the early modern scientific world was nonetheless a world filled with women" (46). Relevant too is Shapin's analysis of the manner in which technicians' labor was largely written out of seventeenth-century laboratory reports ("Invisible Technicians"). On the growing differentiation of "scientific" from other types of domestic space, see McKeon 212–68, especially 212–18.

24. For example, Subtle and Face keep their plans for Dame Pliant from Doll (2.6.92), and Face pretends that he sent for Lovewit in order to scare off his former partners (5.4.131).

25. On wonder-cabinets and other modes of Renaissance collecting, see the essays in Kenseth.

26. *Printer*: Oh, by a trunk! I know it, a thing no bigger than a flute case. A neighbor of mine, a spectacle maker, has drawn the moon through it at the bore of a whistle and made it as great as a drumhead twenty times and brought it within the length of this room to me I know not how often. *Chronicler*: Tut, that's no news; your perplexive glasses are common" (Jonson, *Complete Masques* 295). Future references to the masques will be to this edition, and parenthetical in the text.

27. For Drebbel's perpetual motion display, see Harris 137, 140–41; for his 1608 lightshow for James I, see Colie 254; for his submarine journey in the Thames in 1620, see Harris 161–70. Jonson mentioned natural magic wonders several times in his works, e.g. *Epicoene* 5.3.55 (Drebbel's perpetual motion machine) and 4.1.132 (Simon Forman), *News From the New World*, lines 77–81 (telescope) and 320–23 (perpetual motion).

28. See Findlen, *Possessing* 176–77.

29. See Todd 1–105.

30. Bacon used this fable and moral again in *The New Organon*, part 1, aphorism 85. The edition and translation by Jardine and Silverthorne has "daughters" for "sons" in the passage (71).

31. On Bacon's debt to natural magic, see Rossi, *Francis Bacon* chapter 1; Zetterberg. On natural magic generally, see Eamon; Clark 214–32. On the court-entertainer "Hocus Pocus," officially licensed by James I "to exercise and practize the Arte of legerdemaine," see Mowat 298–99. Mowat has Vincent and Hocus Pocus as two different people, but Bawcutt has recently identified the formerly anonymous "Hocus Pocus" as Vincent.

32. Mathematician and Royal Society fellow John Wallis described the status of mathematical learning at Cambridge in the 1630s this way: such studies "were scarce looked upon as Academical Studies, but rather Mechanical, as the Business of Traders, Seamen, Carpenters, Surveyers of Lands, or the Like, and perhaps some Almanack-Makers in London" (qtd. in Heilbron 2). On Bacon's novelty in privileging trade-knowledge, see Rossi, *Philosophy*. On the place of mathematics in early modern England generally, see Feingold.

33. See Vickers 54n34; cf. West chapter 6.

34. Gurr has recently suggested that Lovewit is in part a representation of Shakespeare.

35. Thayer 102. Cf. Flachmann 280; Donaldson 82–83.

36. Warned by Thomas Hobbes to be wary of a solicitation for funds to support a new optical project by Walter Warner, William Cavendish wrote to his cousin, the third earl of Devonshire, in 1637: "My service to Mr. Hobbes. Pray tell him Mr. Warner would make us believe miracles by a glass he can make. I doubt he will prove Ben's Doctor Subtle" (qtd. in Sarasohn 723n20). William Johnson, official chemist to the College of Physicians, echoed *The Alchemist* (4.5.66) when he attacked the works of unlicensed Helmontian and Paracelsan chemists in 1665: the latter are "Pretenders to Pyrotechny . . . [who] will, like their own false Preparatives, vanish *in fumo*" (qtd. in Mendelsohn 71). Fellows of the Royal Society were well aware of their perception in some eyes as a kind of third theater in Restoration London: Pepys recorded in his diary that Charles II laughed at the Royal Society for weighing air (5: 32–33 [1 Feb 1664]). The King was known to call his virtuosi "jugglers" and "court jesters," and to lay bets on the outcome of experiments (Knowles-Middleton). Robert Hooke objected to fellows who came to Society meetings "only as to a Play to amuse themselves for an hour or so" (qtd. in Hunter and Wood 62), and Hobbes mocked the new philosophers as those who "display new machines, to show their vacuum and trifling wonders, in the way that they behave who deal in exotic animals, which are not to be seen without payment" (qtd. in Shapin and Schaffer 348).

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