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THE DRAMATURGY OF PERFORMING SCIENCE

New Work in Interdisciplinary Contexts

Jules Odendahl-James

The Dramaturgy of Performing Science

This is a concise survey of new play projects that bring together the worlds of science and performance and the benefits that dramaturgical praxis can bring to both disciplines.

Three approaches common to both performance and science – collaboration, experimentation, and interpretation – are reflected in a series of case studies that demonstrate the ways in which dramaturgical tools can inform the wider public about scientific knowledge and practice, provide a truly reciprocal model of cooperation in collaboration that happens early on in the research process, and inspire the creation of new dramatic forms that enact, rather than translate, the dynamics of scientific research.

Part of the *Routledge Focus on Dramaturgy* series, this is a vital account of collaborative work for scholars and practitioners of theater and performance, as well as readers across the sciences.

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This book is dedicated to Kelly, always.

And to Linden, who is my hope for the future.

Thanks to my parents, who provided my first experiences of how the arts and the sciences can work together.

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Introduction
Of Forms and Formulas

To Reveal and Create

In the introductory chapter to his 1925 book *The Science of Playwriting*, lawyer and playwright Moses Malevinsky presents an extended survey of narrative and dramatic theorists. Quoting extensively from Barrett H. Clark's 1918 anthology *European Theories of the Drama* among other sources, he searches for terms like "formula," "technique," and "laws" to uncover the structure for dramatic writing. Malevinsky expresses disappointment in these sources' lack of "a consecutive formula, nor may one find an analytical or truly comprehensive definition of – a *play*" (6). By contrast, he will provide a "guiding compass" for theater informed by his work in the emerging field of copyright law. To that end, Malevinsky drafts "The Algebraic Formula" for plays: an emotion-rooted action "limited to approximately two hours" centered on "*one* theme, *one* central character, *one* plot" (110).[1] He argues that a play's "organic structure," comprises a "concentrated exposition of character in action, mental or physical, against seen and/or known and/or unseen and/or unknown forces" (107). Having won a 1925 copyright case (*Simonton v Gordon et al.*) by proving a successful play, *White Cargo*, was an uncredited adaptation of an earlier novel, *Hell's Playground*, Malevinsky presents The Algebraic Formula as the means to assess a play's essential qualities and the boundary between one artist's work and another's: "Not every play need necessarily be well made or closely knitted, but it must, by definitive processes (attained either scientifically, subconsciously or instinctively) be presented in such form as the masses of the people may understand and grasp" (108–9). Perhaps when Malevinsky employed The Algebraic Formula less successfully in a 1929 plagiarism case (*Nichols v Universal*), he realized the irreducibility of artistic expression to its structural components alone.[2] Writers and theorists

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might invoke the language of science to describe key dynamics behind a script's composition, but the relevance often remains at the level of metaphor and a script's success or failure in production introduces factors less obedient to universal laws, quantification, and rationality.

Nonetheless, students and scholars still pursue empirical rules by which to create and evaluate theater. For example, a dramaturg's role within a production has been described as "fixer" or "script doctor," someone with specialized knowledge to be applied to an object toward its better, ideal functioning (Proehl 132–33). Dramaturgy as "the theory and practice of drama," originates with Gotthold Ephraim Lessing (1729–81), a playwright and influential drama critic. Lessing, somewhat like Malevinsky, presented his skills of analysis and assessment as a service to the public and the profession at a moment when the possibilities and proprieties of theater were changing. Lessing's ideas regarding dramatic form and their use in new play development became more widely influential after his death. He is credited with imbuing the role of the dramaturg with desirable traits: a theater artist with a unique depth of knowledge regarding theatrical form and aesthetic innovation, who helps examine a play's effectiveness and anticipated reception.[3] Contemporary dramaturgs continue to navigate the spaces between empirical ways of knowing often associated with science and the assumed boundless imagination of artistic creation.

This book explores this crux between the art and science of theater, focusing on a specific subgenre: theater about/of/with science. To engage this subject necessitates some acknowledgment of C.P. Snow's notion of Art and Science as the "two cultures"[4] ever in tension. Theater historian Kirsten Shepherd-Barr, a foundational scholar of science theater, notes how much each field "borrow[s] from one another for metaphoric explanations of what they are and what they do" (2020, 1). In her introduction to the *Cambridge Companion to Theatre and Science*, she argues that the notion of "Theater as laboratory" presents a long-standing, productive "common ground" between science and performance (4). The intertwined domains of theater and medicine have been well documented, perhaps most frequently in discussions of the operating theater, anatomical teaching and learning practices, and the freak show where bodily display and the performance of self that might counter or complicate a medical narrative offers an early vision of performance art.[5] Theater theorist Sue-Ellen Case, in her 2007 book *Performing Science and the Virtual*, notes the historical use of performance practices on and beyond the theatrical stage to "locate and define the scientific discoveries of their times" via "strategies of representation" that blur the "immaterial and

material" (2). The "virtual" in her reading is not simply an outcome of digital technology innovations but a concept historically rooted in notions of effect, appearance, and potential, all elements central to theatrical performance as well as to "moral philosophy, optics, physics, and ontology" (3).

My interests in this arena of theatrical work began in the early 2000s after many years exploring the visual dramaturgy of forensic science depicted in popular culture, particularly serial television. There, the lab tools of many scientific fields (e.g., chemistry, anatomy, physics, psychology, engineering) are presented as quasi-independent actors, solving crime by uncovering a criminal's hidden motives.[6] Lab reports offer a new kind of deus ex machina, appearing at the critical moment with irrefutable material evidence and prompting a confession. Beyond the forensic frame, I began investigating visual and performance artists who engaged the worlds of biological and material sciences. I found scientists with artistic practices and scientists who employed visual or sonic tools such as microscopy, radiology, geographic information system (GIS) mapping, and data modeling to capture, depict, and articulate the representational elements of their research. I also noticed a growing strain of new plays and critically acclaimed productions of historical plays that dramatized scientific discoveries and scientist biographies. These seemed to parallel a new push for STEAM (**S**cience **T**echnology **E**ngineering and **M**ath or STEM + Arts) curricula in secondary schools and undergraduate liberal arts institutions.

The chapters that follow review science theater and performance projects since the mid-2000s, examining engines of new science play development in the United States, higher education's interdisciplinary dynamics around STEAM collaborations from which new work may spring,[7] and postdramatic and performance art experiments that construct research playgrounds out of scientific fields, techniques, and technologies. Thinking dramaturgically about plays inspired by science, about research collaborations forged between artists and scientists, and about the wide range of performance experiences they create provides new conceptions for interdisciplinary collaboration beyond the question of whether art serves science or science serves art. Dramaturgy, a practice of excavating histories and incubating possibilities, is a field uniquely positioned to curate and catalyze shared principles and bring the work of scientists and theater artists into compatible synergy even as our social authority and value remains disparate.

Facts and Truth

In his 1959 address best known for articulating the "two cultures" concept, physicist C.P. Snow presented an array of binary oppositions (Ideal vs. Real; Mind vs. Body; Nature vs. Culture) about whether phenomena are *found* or *made*, whether knowledge is *objective* or *subjective*, whether meaning is *inherent* or *constructed* (23, 33). While writers tend to invoke the "two cultures" as Art and Science broadly, Snow's construct focused on literary academics and radical poets, whom he characterized as conservative and backward-looking compared to physicists and engineers post–Manhattan Project, who were future directed and innovation oriented. Ultimately, Snow asserts a both/and conceptualization of knowledge as simultaneously found and made and points toward opportunities for interdisciplinary collaboration across the sciences and humanities. Science philosopher Thomas Kuhn and sociologist Bruno Latour each elaborated Snow's call. In *Structure of Scientific Revolutions* (1962) Kuhn cautions the reader to not mistake the science textbooks' presentation of a linear, positivist progression of scientific experimentation and discovery for reality. The rationality and objectivity of science are not given; they are constructed structures and practices:

> The existence of this strong network of commitments – conceptual, theoretical, instrumental, and methodological – is a principal source of the metaphor that relates normal science to puzzle-solving. … In these and other respects a discussion of puzzles and of rules illuminates the nature of normal scientific practice.
>
> (42)

Similarly, Latour (1987) argues in *Science in Action* that science is a force in society, not because of its inherent factualness but because of the networks circulating among scientific processes and products. It avoids incoherence through scientific methods that are evaluated by "the number of points linked, the strength and length of the linkage, the nature of the obstacles" (201). Kuhn and Latour helped forge a new field, Science Technology Studies (STS), inviting scholars to interrogate and intervene in the art-science binary, challenging assumptions regarding evidence, experimentation, and knowledge production. This line of reasoning regarding science as truth might be familiar to theater artists regarding discussions of realism as a *form* of theater not the a priori condition of theatrical representation itself.

STS scholars pull back the curtain on the dynamic processes of scientific inquiry and note external social pressures on the field and its practitioners that shape those dynamics. They do not, however, promote the adjudication of scientific findings by nonexperts. Only scientists hold authority over the meanings of scientific inquiry, but the drive to articulate generalizable rules does not mean absolutism: "Science aims for refined degrees of confidence, rather than complete certainty" (Reproducibility and Replicability 32). Journalists, the wider public, and even some scientists, however, can confuse absolutism with what science historian Naomi Oreskes (2017) calls "organized, [collective] scrutiny." Scientists create and test hypotheses to explain phenomena, particularly those not readily observable without technological assistance whether via microscope or mathematical model. They assert facts based on these measures rendered from and tested through the application of formulas and equations and their reproducibility to produce the same results. Artists might employ facts toward a goal of illuminating truths grounded in the deeply affectual realm of subjective experience. Art engages emotion, temporality, and perception as key attributes of its effects. Artists also do more than imagine things into existence, argues Dutch photographer Barbara Visser, "the artist can also accomplish something else: bring together different forms of knowledge and insight like an orchestrator" (266). As a result, that which makes art unique makes its successes similarly difficult to capture and reproduce. Malevinsky's Algebraic Formula might result in an object called a play, but it is less likely to produce a play of critical or commercial significance through adherence to structural rules alone.

Knowledge construction is itself a dramaturgical concern related to reception and authority. Both science and theater depend on reception within and beyond their disciplinary fields for funding and social influence. Both navigate the complexity of communication on multiple levels: to fellow experts, students, and the wider public. For theater artists, positive audience or critical reception offers more paths to economic capital beyond governmental funding streams that remain minimal for artistic research and development (R&D).[8] In calls for increased governmental support, performing arts advocates cite scientific studies that employ a range of quantitative measures from the social and natural sciences to certify impact in terms beyond revenue and attendance.[9] Although relatively well supported with funds and infrastructure, scientists anticipate limited public consumption of their research due to their fields' specialized language and methods. As a result, educators

recognize the need to translate or transform disciplinary-specific knowledge into products that can reach a broad audience with the goals of attracting a steady stream of students to train into professionals and drafting public advocates who will support the fields' public funding.

Whether funding considerations or the expansive array of information streams and technological platforms and instruments has led scientists to artists or artists to scientists, we are in a new era of collaborative storymaking and knowledge building. Recent surges in disinformation campaigns regarding climate change and public health, for example, illustrate the pressing need for better ways to articulate and understand complex conditions with the goal of collective action. What better field of work for dramaturgs in their roles as what scholar Michael Chemers calls "practical aesthetic philosophers" (11), bridging multiple disciplinary and interpretive divides between production and audience, script(writer) and production team, practice and theory? Now is a moment of invention and, as Lincoln Center Theater dramaturg Anne Cattaneo asserts, "The real job of all good dramaturgs is to extend and explore territory that the theater has not yet made its own" (14).

The SciArt of Dramaturgy

For scientists, the impulse to collaborate with artists for the purpose of educating said public has grown more attractive, but there are also collaborations where the final outcome is imagined, not realized.[10] Whether such collaborations include an identified dramaturg, the projects themselves call for a dramaturgical sensibility to support, contextualize, and assess their storytelling. In her introduction to the *Routledge Handbook of Dramaturgy*, Magda Romanska, traces etymological, historical, and social strains of dramaturgy as a "field, skill, and profession" that tends to coalesce around the process, theories, and practices of meaning making around a given experience or an experience as it unfolds for its participants/viewers (7). Dramaturg as cosmologist is the role invited by Elinor Fuchs in her essay, "EF's Visit to a Small Planet: Some Questions to Ask a Play":

> *The puzzles may hold the key.* Assume that the dramatic world is entirely conscious, determinate, limited. Give an account of that world that attempts to consider the role of every element in that world—visual, aural, temporal, tonal, figural. . . . Of course you