

Collocations

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Abstract

Collocations is a work of experimental writing that explores the disruptive implications of quantum mechanics for science, philosophy, literature and art. Designed for tablet computers, *Collocations* appropriates two excerpted pages from Albert Einstein and Niels Bohr's debates about quantum physics and transforms them through algorithmically defined systems in order to produce an interactive work of innumerable poetic texts. Interaction with the work transforms the user into an experimenter whose physical manipulation of the device determines the materialization of any possible number of unique textual configurations in a dynamic, non-linear and kinesthetic reading experience. This paper contextualizes *Collocations* in relation to the fields of experimental writing and electronic literature, describes how the work operates, and demonstrates the correspondences between *Collocations'* formal structure and the quantum phenomenon of complementarity on which it is modeled. Video documentation of *Collocations* can be found here: <https://vimeo.com/119868407>.

Keywords

Digital poetry, quantum mechanics, tablet computing, software art, art and science, interdisciplinary research practice, interactive art, new media art, experimental writing, electronic literature

Collocations

Quantum physics has utterly transformed our understanding of the world, rewriting the laws of time and causality and proving that matter is fundamentally indeterminate. How can it transform the way the world is reflected back to us through artistic practice? A work of experimental writing designed for tablet computers, *Collocations* asks whether it is possible to create new forms of reading and writing that are as different from "classical" forms of reading and writing as quantum physics is from classical physics.¹ Using the quantum phenomenon of complementarity as a formal and conceptual model, *Collocations* responds to users' movements through space by staging collisions between poetic subtexts within two excerpted pages from Albert Einstein and Niels Bohr's historic debates about quantum mechanics. [1] Drawing on quantum mechanics'

central principle that matter's ontology is never fixed but is instead in a continual state of flux as it moves across time and space, *Collocations* posits a new quantum poetics that resists fixed formations, allowing for a literary work that unfolds uniquely through a user's physical interaction with a device.

Collocations builds on and makes interventions into the fields of electronic literature and experimental writing. Chance operations and cut-up techniques have been used by literary avant-gardes for more than a hundred years and have played a central role in the history of electronic literature. While *Collocations* makes use of these strategies, the work neither leaves poetic significance entirely up to chance, nor cedes poetic agency entirely to an artificial intelligence. Instead, the algorithms that dictate *Collocations'* innumerable poetic possibilities have been written to bring together chance operations, weighted probabilities and the author's own poetic choices. The result is a work whose outcome cannot be predicted, but whose poetic vision remains cohesive.

Collocations also builds on the constraint-based literary practice most often referred to as "erasure poetics" but which I prefer to call "palimpsest aesthetics."² At the intersection of literature and the visual arts, palimpsest aesthetics explore the materiality of language and complicate the notion of authorship by appropriating and transforming already existing texts into new, "original" works of literature through operations of erasure and/or palimpsest. By bringing this practice into the realm of the digital through an engagement with quantum theory, *Collocations* torques palimpsest aesthetics' central concerns of materiality and authorship. In *Collocations*, language is a material that is erased, written over, encoded and recoded according to the quantum laws that govern matter at the subatomic scale. Moreover, by creating an interactive system whose poetic possibilities are indeterminate until a user interacts with the device, *Collocations* introduces a third term—the user—into palimpsest aesthetics' destabilization of the author.

Collocations is an open-ended work of experimental literature, not an illustration or demonstration of a scientific concept. Yet quantum theory is not merely its source

¹ *Collocations* was written for Apple's iOS operating system in C++ using the open source creative coding framework openFrameworks.

² I prefer the term "palimpsest aesthetics" for two reasons: "palimpsest" is a more accurate descriptor for the diverse ways in which this practice has been taken up; and "aesthetics" is a more versatile term for a practice cultural purchase beyond literature.

of inspiration or loosely defined starting off point. Rather, the work aspires to create a rigorous and methodical correspondence between scientific theory and literary form. To use N. Katherine Hayles' formulation, the unique way in which *Collocations* structures its user's experience forms a "material metaphor" that facilitates a "transfer of sense" between Einstein and Bohr's debates and the "material apparatus" that is comprised of the tablet computer and its custom software. [2]

Collocations takes as its formal and conceptual model the quantum phenomenon of complementarity, which stands at the heart of Bohr and Einstein's debates. Quantum physics demonstrates that a particle's fundamental properties always come in complementary but mutually exclusive pairs (most famously, position and momentum). Our ability to accurately observe these properties is limited: the more accurately we configure an experimental apparatus to observe a particle's momentum, the less accurately we will be able to observe its position, and vice versa.³ According to the principle of complementarity, when the apparatus is configured to observe a particle's momentum, the particle's position cannot be observed (and thus known). But the theory goes even further to state that at the time of observation the particle does not *have* a single, determinate position—it is in an indeterminate state of "superposition." In other words, quantum complementarity not only has implications for the limitations of what we can *know*, it denotes a limitation of what *is*—its implications are not merely epistemological, they are ontological. The experimental apparatus and the object being observed are ontologically entangled: as the apparatus' configuration changes, so does the *ontological* nature of the object itself. [3]

In *Collocations*, the particle being observed is a dynamic page whose possible textual configurations are drawn from two passages excerpted from Bohr and Einstein's debates; the particle's two complementary properties are two sets of unique poetic constraints derived from each of these source texts; and the experimental apparatus that allows those properties to be observed is the tablet computer. The experimental apparatus' configuration, which determines the degree of accuracy with which each of the particle's complementary properties can be observed, corresponds to the tablet's orientation along the z-axis (Figure 1), which determines what percentage of text visible on the page is Bohr's and what percentage is Einstein's. When the tablet is perfectly right side up at 0° or perfectly upside down at 180°, the page shows either Bohr or Einstein's original text in its entirety. As the user rotates the device, however, the

³ To measure a particle's position, an experimental apparatus must be configured with a fixed platform, but to measure its momentum, it must be configured with a moveable platform. Because these configurations are mutually exclusive, it is impossible to accurately measure both properties simultaneously. See Barad, *Meeting the Universe Halfway*, 111-115.

words within Bohr and Einstein's texts, which are differentiated by their opposite orientation, break apart and transform into one another.

At every degree of rotation along the z-axis, the tablet can also be rotated along its x and y axes (Figures 2 and 3), allowing the user to observe and make determinate the system's poetic constraints. The result of these poetic operations is represented by certain words from within Bohr and Einstein's original texts beginning to vibrate, becoming highlighted and forming poetic subtexts (Figure 4).

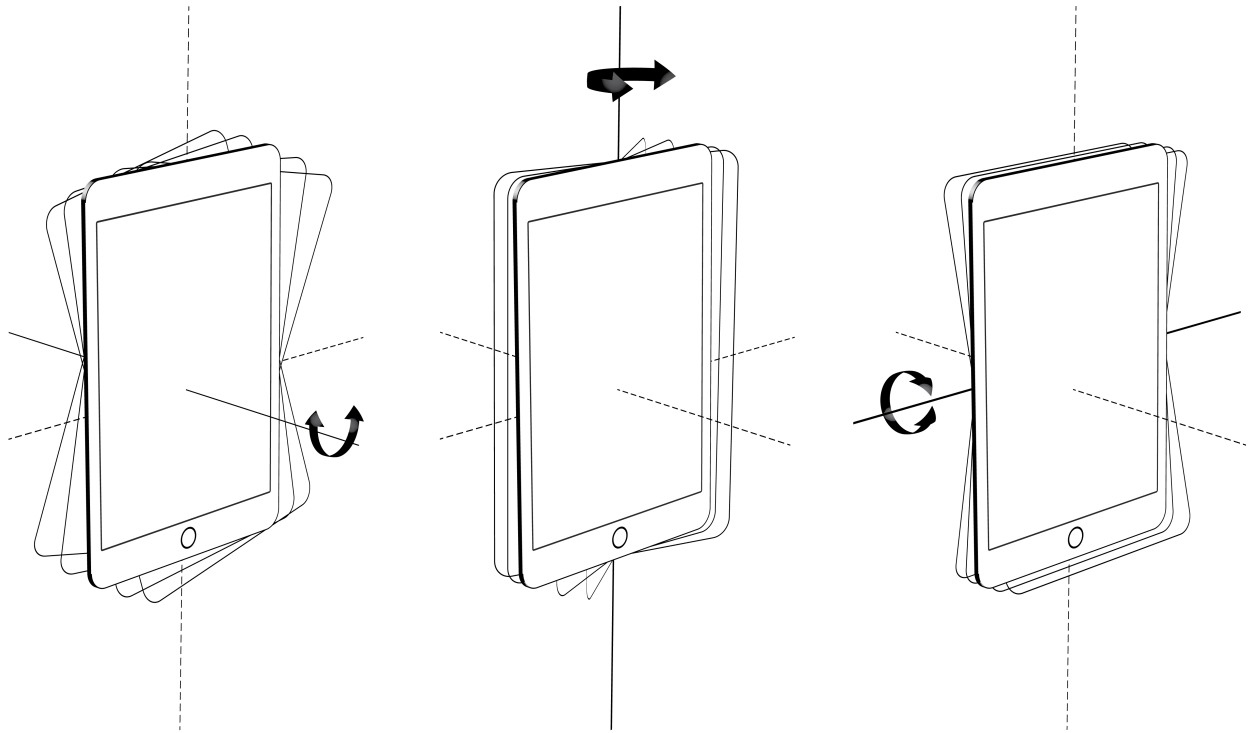
Every system of correspondence, no matter how rigorous, must eventually break down. When *Collocations* is configured to observe the poetic constraints associated with Einstein's text, the poetic constraints associated with Bohr's complementary text are not, in fact, suspended in a state of quantum and ontological indeterminacy. Rather, that indeterminacy—and its profound philosophical implications—are gestured toward through the work's visual and poetic form. The user's interaction with the device transform her into an experimenter whose acts of observation unfold unique textual configurations in a dynamic, non-linear and kinesthetic reading experience.

Author Biography

Abraham Avnisan is an experimental writer and new media artist whose work is situated at the intersection of image, text, and code. Each of his projects appropriates and transforms a key 20th century text that challenges us to reconsider the most fundamental ways in which we understand ourselves and the world around us. He has presented and exhibited his work at the 2015 &NOW Conference of Innovative Writing, the 2015 and 2014 Electronic Literature Organization conferences, the Museum of Contemporary Art Chicago's Word Weekend event, and at Fignant! and Centotto Gallery in New York City. His work has been published in *Stonecutter*, *The Poetry Project Newsletter*, *Drunken Boat*, *New Delta Review*, *Rain Taxi*, and others. He holds an M.F.A. in Poetry from Brooklyn College, and an M.F.A. in Art and Technology Studies from The School of the Art Institute of Chicago, where he received the New Artists Society Merit Scholarship. He maintains a website at <http://abrahamavnisan.com>.

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2. N. Katherine Hayles, *Writing Machines* (Cambridge: The MIT Press, 2002), 22.
3. Karen Barad, *Meeting the Universe Halfway: Quantum Physics and the Entanglement of Matter and Meaning* (Durham: Duke University Press Books, 2007), 97-131.



Figures 1, 2 and 3. Rotating the tablet computer on its z, x and y axes, respectively.



Figure 4. Collocations – installation view.