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# “There is no ‘there’ there”: Gertrude Stein and Quantum Physics

JAN D. KUCHARZEWSKI

## ABSTRACT

This essay is a heuristic attempt to explore the correlation between the modernist aesthetics emerging from Gertrude Stein’s writings and quantum mechanical models of reality. It applies certain concepts taken from early twentieth-century quantum physics (e.g. Wave-Particle Duality and the Copenhagen Interpretation) to Stein’s work in order to examine possible isomorphisms. In this way I develop a new and distinctive set of metaphors for discussing Stein’s texts. A common ground between Gertrude Stein’s art of fiction and Niels Bohr’s interpretation of the quantum phenomena is established by tracing both visions back to William James’s *Principles of Psychology*. After briefly summarizing the basic concepts of quantum theory, I demonstrate how Stein’s creative use of language, which manifests itself in her ideas of the ‘continuous present,’ ‘in-sistence,’ and ‘resemantization,’ shows striking similarities to the way quantum physics has reinterpreted physical reality.

## 1. The Death of Laplace’s Demon

In the late eighteenth century the French mathematician Pierre Simon de Laplace brought Isaac Newton’s theory of mechanics and gravitation to its logical extreme by imagining an ‘intellect’ which knew the exact position and velocity of every particle in the universe at a given moment. According to the Newtonian principles this entity, which later came to be known as “Laplace’s Demon,” would be able to predict the entire future of the universe in every detail from the “greatest body” to the “lightest atom” (Laplace).

The idea of a deterministic clockwork cosmos based solely on the mechanical laws of cause and effect, interpreted as action and reaction, dominated scientific thought throughout the early twentieth century. Only with Einstein’s Theory of Relativity, Planck’s discovery of quanta, Bohr’s model of the atom, Heisenberg’s Uncertainty Principle, did this concept of an ordered universe, which is nothing but the mere sum of its parts, and which has an objective existence in itself, begin to disintegrate. From 1905 onwards—when Einstein published his Special Theory of Relativity—the traditional convictions of physicists “that such things as ‘space,’ ‘time,’ ‘force,’ and ‘matter’ had a real existence” (Whitworth 202) were shaken to the core by various discoveries on the subatomic and the astronomical scale which seemed almost *meta*-physical. Among other things this scientific turn “brought home the recognition that science is a construction of the human mind before it is a reflection of the world” (Bell 11), and therefore led to radical re-definitions and re-evaluations of basic epistemological and ontological questions.

As often seems to be the case with such fundamental changes and upheavals, there was a synchronicity of the development of non- or post-Newtonian physics and the beginning of the cultural epoch of modernism. The “radical and iconoclastic

environment in which literary modernism emerged and flourished” (Bradshaw 1) was reflected in the almost revolutionary spirit that seemed to encourage the ‘modernist scientist’ to redefine the universe based on new scientific data and intuitions.

Within the overwhelming quantity and variety of modernist literature the works of Gertrude Stein hold a special position. Not only was she one of the most prolific writers of her time, but in her search for new modes of artistic expression she was also one of the most radical. With her abandonment of narrative structure, her emphasis on the persistent now-ness of being (what she refers to as the “continuous present” [*Writings* 524]), with the philosophical implications of her deceptively simple vocabulary, and with her almost de-constructive approaches to meaning and signs, she also anticipated most of the concerns of postmodernism, even before modernism itself became an acknowledged cultural movement.

This essay explores the possible correlation between Stein’s writings and certain concepts taken from early twentieth-century quantum mechanics. Both Stein’s modernism and quantum physics can be seen as manifestations of a modernist moment, since both challenged the very foundations of their respective fields in order to renew them in their entirety.

Stein’s scientific training as a student of William James, her later discussions with Alfred North Whitehead which she relates in her *Autobiography of Alice B. Toklas* (1933), her interdisciplinary interests, and her education as a medical student at John Hopkins University make her works especially suitable for this kind of heuristic approach and seem to invite a ‘scientific’ reading.

Although Stein’s works have already been discussed in the context of natural sciences, these approaches were mainly concerned with scientific theories which preceded her literary career and which therefore could be identified as possible influences on her writings (cf. Meyer). In the case of quantum mechanics, the question becomes more complicated. Even though the science writer John L. Casti deploys Stein’s “withering assessment” (417) of Oakland, “There is no ‘there’ there,” as an analogy for the paradoxes emerging from the Copenhagen Interpretation, a direct connection between Stein and quantum physics is not detectable, since large amounts of her work chronologically precede the publication of the most significant breakthroughs in this field.<sup>1</sup> The purpose of this paper is therefore not to examine in how far Stein was aware of or influenced by the theories of quantum mechanics or whether Bohr proclaimed “Eureka!” after reading “The Gentle Lena,” but to point out the striking parallels between Stein’s modernism and the way quantum mechanics broke with the classical concepts of Newtonian physics. The death of Laplace’s Demon and the birth of literary modernism à la Stein can be seen as isomorphic shifts within two very different fields. Consequently, I would like to use the concepts and vocabulary of quantum mechanics as metaphors for and not as an explanation of certain aspects of Stein’s writing. As Stein said: “I cannot repeat this too often any one is of one’s period” (*Lectures* 177).

I will now establish the theoretical common ground between quantum mechanics and Stein’s modernism by tracing both back to the theories of James. James’s

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<sup>1</sup> For example, *Three Lives* was published in the United States in 1909, whereas Heisenberg formulated his Uncertainty Principle almost twenty years later.

influence on Stein has been widely discussed in critical literature (cf. Levinson), and Stein herself explicitly incorporates some of James's concepts in her essay "Portraits and Repetition." In his book *Thematic Origins of Scientific Thought* (1973) Gerald Holton examines similar parallels between Niels Bohr's explanations of quantum phenomena and certain passages from James's *Principles of Psychology* (1890). Consequently I will demonstrate that despite the fact that Stein and Bohr operated in two very different fields, they nevertheless relied on astonishingly similar theoretical backgrounds.

After discussing basic concepts of quantum theory in a brief summary, I concentrate on the similarities between the aesthetics Stein elaborates in her early fictional work *Three Lives* and the so-called 'Wave-Particle Duality' in quantum mechanics. My intention is to show that the texts convey notions of language that are essentially dualistic. In a way that is similar to the assumption that quantum entities can have properties of waves and particles without actually being either of the two, Stein's aesthetics and linguistic practice move beyond mere dichotomies towards a state in which the conditions of a word as a phonetic particle and a semantic wave exist at the same time. The final part will be dedicated to the parallels between Stein's writings and the more strictly philosophical implications of the Copenhagen Interpretation. Here the focus will be on Stein's use of a creative language in *Tender Buttons*.

## 2. Convergence: William James, Gertrude Stein, and Niels Bohr

According to a thesis put forward by Gerald Holton in his book *Thematic Origins of Scientific Thought* one can detect striking parallels between Niels Bohr's theoretical contributions to the Copenhagen Interpretation and some passages from William James's *Principles of Psychology* (1890). Although it is not clear in how far Bohr was influenced by James, Holton argues that there are two possible explanations for the "remarkable analogies and similarities between the ideas of James and Bohr" (122). Holton bases the first explanation on the transcript of an interview Bohr gave on November 17, 1962. In this interview Bohr refers to the chapter "The Stream of Thoughts" from James's *Principles of Psychology* and states that he read James "many years" (qtd. in Holton 122) before he made the decisive discoveries in quantum mechanics and that "William James is wonderful in the way he makes it clear [...] that if you have some things... they are so connected that if you try to separate them from each other, it just has nothing to do with the actual situation" (122). Bohr himself suggests in the interview that he "really knows something about William James" (122) and that "we should really get into this" (122). Unfortunately Bohr died the day after the interview, so that he could not further comment on the analogies between his quantum physics and James's philosophical theories.

Holton also argues that James and Bohr could have "independently arrived at the analogous thoughts" (123). For Holton the second alternative is "in some ways [...] the more interesting though difficult one, for it hints that here may be a place to attack the haunting old question why and by what mechanisms the same themata attain prominence in different fields in nearly the same periods" (123).

The influence William James's theories had on Stein's writings is easier to verify than a possible James/Bohr connection. First of all Stein was a student of James while being enrolled at the Harvard Annex from 1893 to 1897. It is more than likely that she encountered James's theories in detail during this time. As a junior, Stein also attended James's advanced seminar on "Consciousness, Knowledge, the Ego, the Relation of Mind and Body, etc" (Levin 150). Beside these biographical facts, Stein's texts also show a direct influence of James's *Principles of Psychology*. Especially in her essay "Portraits and Repetition," Stein transfers concepts and ideas developed by James into the context of a modernist aesthetics, as will be shown in the course of this essay.

Despite the difficulty of obtaining concrete biographical evidence for James's possible influence on Bohr's work, a closer comparison of Bohr's theories with selected passages from the *Principles* reveals an interesting degree of correspondence: similar to Bohr, whose quantum theory suggests a holistic universe in which the observer is as much a part of an experimental setup as the object which is supposed to be studied, James discusses the impossibility of the objectivization of thought. Since "our mental reaction to every given thing is really a resultant of our experience in the whole world up to that date," we "see things in a new light [from one year to another]" (28).

Correspondingly Bohr writes that "for objective description and harmonious comprehension it is necessary in almost every field of knowledge to pay attention to the circumstances under which evidence is obtained" (qtd. in Holton 123). In this passage Bohr is referring to the famous 'double-slit experiment' (see section 3), in which a small change of the experimental setup 'proves' two mutually exclusive assumptions (e.g. the wave/particle nature of light). Depending on what one intends to demonstrate, the facts will emerge in agreement with the assumption. Whereas James points out the difficulty of objectively thinking about thinking, Bohr raises the issue of objective observation. Since Werner Heisenberg formulated his Uncertainty Principle in 1927 it became evident that in the quantum world objective observations are almost impossible, because "we cannot know, as a matter of principle, the present in all its details" (Gribbin 418). In its most basic manifestation the principle states "that no entity can have both a precisely determined momentum and a precisely determined position at the same time" (Gribbin 417).

Especially in the case of wave-particle duality models and abstractions no longer serve their purely descriptive purpose, for they 'force' a quantum entity (e.g. light or electrons) to assume the condition the respective experiment attempts to verify. Light might neither be a photon nor a wave, but something entirely different. By experimentally describing either of these conditions one actually creates the fact one is looking for. A parallel situation occurs in Stein's *The Autobiography of Alice B. Toklas* (1933) when Picasso is quoted as saying about his portrait of Stein: "Yes, [...] everybody says that she does not look like it but that does not make any difference, she will" (16). According to Picasso the abstraction will eventually create its own reality. Thus a first intersection between Stein's modernism, James's *Principles of Psychology*, and Bohr's quantum interpretations emerges: the question of the relationship between subject and object, representation and referent, human consciousness and reality.

James refers to this problem when he states that language “works against our perception of the truth” (34). By claiming that electrons are either waves or particles and then proving the claims in experiments, the true nature of electrons might never be discovered, because as James points out: “We name our thoughts simply, each after its thing, as if each knew its own thing and nothing else. What each really knows is clearly the thing it is named for, with dimly perhaps a thousand other things. It ought to be named after all of them, but never is” (34).

Similar to James, who criticizes our “inveterate habit” (38) of only “recognizing the existence of the substantive parts” (38) of a language, Stein states that “a noun is a name for anything, why after a thing is named write about it” (*Lectures* 209). In order to avoid this reductive naming of thoughts Stein developed the stylistic technique of ‘insistence.’ Although it is often mistaken for mechanical repetition, Stein argues in a passage reminiscent of James that she is “inclined to believe that there is no such thing as repetition” (*Lectures* 166), for “once started [...] expressing anything there can be no repetition because the essence of that expression is insistence, and if you insist you must each time use emphasis and if you use emphasis it is not possible while anybody is alive that they should use exactly the same emphasis” (167). The corresponding passage in James’s *Principles* reads:

When the identical fact recurs, we must think of it in a fresh manner, see it under a somewhat different angle, apprehend it in different relations from those in which it last appeared. And the thought by which we cognize it is the thought of it-in-those-relations, a thought suffused with the consciousness of all that dim context. (28)

Once again similarities to quantum mechanics become evident, because in one of the most prominent—though scientifically speaking outdated (cf. Gribbin 87)—interpretations of the quantum world Bohr adopted Erwin Schrödinger’s wave equation (see section 3) to explain that reality might be nothing but a sequence of probability waves which collapse into short moments of solidity. Bohr regards the measurement as the creative mechanism that forces the waves to collapse. The world is therefore not seen as existing in and for itself but only in relation to an observer. Consequently the world is different every time we look at it. Albert Einstein, in a famous remark to German physicist Pascual Jordan, refuted this solipsistic concept: “Do you really think that the Moon exists only when you look at it?” (qtd. in Gribbin 87). According to David Mermin “the Moon really *isn’t* there if you don’t look at it” (qtd. in Casti 443), and one can almost imagine Bohr quoting Stein in response to Einstein’s skepticism: “There is no ‘there’ there” (*Everybody’s Autobiography* 289).

James also thinks of our consciousness as a waveform (at least he uses lexically related terms like ‘stream’ and ‘flow’) that solidifies into short “substantive” (i.e. atomized or solid) moments:

Consciousness, then, does not appear to itself chopped up in bits. Such words as ‘chain’ or ‘train’ do not describe it fitly as it presents itself in the first instance. It is nothing joined; it flows. A ‘river’ or a ‘stream’ are the metaphors by which it is most naturally described. In talking of hereafter, let us call it the stream of thought, of consciousness, or of subjective life. [...] Like a bird’s life it [consciousness] seems to be made of an alternation of flights and perchings. The rhythm of language expresses this, where thought is expressed in a sentence, and every sentence closed by a period. [...] Let us call the resting places the ‘substantive parts,’ and the places of flight the ‘transitive parts,’ of the stream of thought. (33)

Since consciousness is a process, “it is very difficult, introspectively, to see the transitive parts for what they really are. If they are but flights to conclusion, stopping them to look at them before the conclusion is reached is really annihilating them” (James 36).

Stein’s texts exactly emphasize the transitive or rather transitory qualities of language through the use of ‘insistence.’ In her early fictional work *Three Lives* for example Stein disconnects certain adjectives (e.g. ‘gentle’ or ‘good’) from their established semantic relations and places them in new and seemingly inappropriate contexts. Thereby these words are resemanticized and assume new and continuously shifting meanings. This parallels Bohr’s Copenhagen Interpretation in which the “attributes an object might possess are *contextual*” (Casti 442). The idea of a contextual reality bears astonishing similarities to James’s concept of a thought that can only be cognized as “a thought suffused with the consciousness of all that dim context” (28). Additionally Jonathan Levin argues that Stein’s aesthetic of ‘insistence’ can be traced back to another passage from the *Principles of Psychology*, in which James suggests a word experiment with repetition and perception:

This is probably the reason why, if we look at an isolated printed word and repeat it long enough, it ends by assuming an entirely unnatural aspect. Let the reader try this with any word on this page. He will soon begin to wonder if it can possibly be the word he has been using all his life with that meaning. It stares at him from the paper like a glass eye, with no speculation in it. Its body is indeed there, but its soul fled. It is reduced, by this new way of attending to it, to is sensational nudity. We never before attended to it this way, but habitually got it clad with its meaning the moment we caught sight of it, and rapidly passed from it to the other words of the phrase. We apprehend it, in short, with a cloud of associations, and thus perceiving it, we felt it quite otherwise than as we feel it now divested and alone. (726-27)

I will later demonstrate how Stein takes up James’s word experiment and adds another dimension to it by not just simply reducing a word to its “sensational nudity,” but by simultaneously infusing it with a multitude of new meanings, thus creating a kind of quantum complementarity in which the word exists as a phonetic particle *and* a semantic wave.

With regard to Bohr’s concept of the quantum complementarity, Holton argues that it also might have its origin in *The Principles of Psychology*. The quantum complementarity is related to the Uncertainty Principle and states that one can never simultaneously demonstrate the wave characteristics and the particle characteristics of an electron (see section 3). Yet these characteristics are *not* contradictory, only complementary. The impossibility of seeing “the transitive parts for what they really are” in James’s texts is a complementary situation because “precise ‘thought’ and ‘thought *about* thought’ [...] are mutually exclusive at the same time” (Holton 120). Holton also points out that James uses the term “complementarity” when writing about hysteric patients with multiple-personality disorder, who “could deal with certain sensations only in either one consciousness or the other, but not in both at the same time” (125). Bohr seems to indirectly refer to James when he concludes his paper on complementarity from 1927: “I hope, however, that the idea of complementarity is suited to characterize the situation, which bears a deep-going analogy to the general difficulty in the formation of human ideas, inherent in the distinction between subject and object” (Bohr qtd. in Holton 124). Based on these theoretical

similarities between James, Bohr, and Stein, I examine in the following sections in how far the concepts of a quantum complementarity and wave-particle duality can be applied to the writings of Stein. I will begin this examination by briefly describing the so called ‘double-slit experiment’ and its implication for quantum physics.

### 3. Wave or Particle? A Quantum Paradox

According to Richard Feynman, the “central mystery” (1-1) of quantum mechanics is encapsulated in the so called ‘double-slit experiment.’ It is “a phenomenon which is impossible, *absolutely* impossible, to explain in any classical way, and which has in it the heart of quantum mechanics. In reality, it contains the only mystery [...] the basic peculiarities of all quantum mechanics” (Feynman 1-1).

About one century after Isaac Newton had deduced from his optical experiments that light is a stream of particles, the English physicist Thomas Young (1773-1829) set up the double-slit experiment to demonstrate the wave nature of light: a source of light is placed in front of a screen which has a narrow slit cut in it. After passing through the hole the light arrives at a second screen which, in turn, has two slits in it. Light spreading out from these two holes or slits finally falls on a blank wall where it produces a pattern of light and shade. This pattern is the result of waves which are diffracted by the double slits and then overlap on the screen. The overlapping produces an interference in which “two waves can interact to form a new composite wave, either by reinforcing each other through constructive interference or by neutralizing each other by means of destructive interference” (Casti 420). With the double-slit experiment Young showed that light is made out of waves, because the result refuted Newton’s particle model. In the Newtonian model the light particles should have behaved like rocks which were thrown through the double slits; thus one would expect an equal distribution of these ‘light rocks’ behind each of the two openings. But the interference patterns of Young’s experiment can under no circumstances be produced by a series of particles passing through the two slits.

This was the general assumption until physicists conducted the same experiment with electrons and later photons. Electrons were the first subatomic entities to be identified in 1897 by the British physicist J.J. Thomson, who received the Nobel Prize in 1906 for his experimental work which showed that electrons behave like particles.<sup>2</sup> The idea to treat electrons as waves originally stemmed from Einstein’s theory of photons which in turn is based on Max Planck’s concept of quanta. In his work on the photoelectric effect Einstein developed a particle theory of light which contradicted Young’s established wave theory. In order to prove Einstein wrong the American physicist Robert Millikan spent ten years testing Einstein’s explanations on the photoelectric effect, only to eventually verify the existence of photons and to receive the Nobel Prize for his experimental proof. Inspired by this photon theory Louis de Broglie put forward a proposal in 1924, “that all material ‘particles,’ such as electrons, could also be described in terms of

<sup>2</sup> Interestingly, his son George received the Nobel Prize in 1937 for his experimental work showing that electrons behave like waves.



waves" (Gribbin 61). This paradox is what Feynman calls the "central mystery" (1-1) of quantum mechanics, because when the light source in the double-slit experiment is replaced by an electron gun and the general experimental setup is refined to allow for observations on the subatomic scale, something strange happens. When only one slit in the experiment is open the electrons pass through it as J.J. Thomson would have expected them to: like bullets shot from a gun. Thus the particle nature of electrons seems to be established. But when both slits are open the electrons produce a definite interference pattern on the screen. This would of course prove the wave-thesis put forward by George Thomson.

In order to resolve the contradiction of this wave/particle duality, Bohr developed the concept of quantum complementarity. This theory states that neither photons nor electrons are waves or particles, but that they have certain characteristics which are usually associated with either waves or particles. These characteristics only appear in a complementary form, that is: never simultaneously. According to Casti, "[i]t's crucial to note here that the electrons still arrive at the phosphor screen as individual particles, i.e., as 'bullets.' It's just that their pattern of arrival makes it look like they collectively obey some sort of wavelike law of motion, making it impossible to assign a given slit to a given electron" (423). The most prominent explanation of this phenomenon is the so called Copenhagen Interpretation which, according to John Gribbin, "archived its position of pre-eminence largely through the forceful personality of Niels Bohr" (88). Since Bohr worked in Copenhagen (or more precisely in a mansion sponsored by the Carlsberg brewery to house an institute for theoretical physics) the interpretation was named after the city. Major parts of the interpretation were, however, "developed by Max Born and his colleagues in Göttingen, and the mathematical formalism describing the collapse of the wave function was developed later, by John von Neumann, in Princeton" (Gribbin 88).

Despite its controversial scientific value and Schrödinger's complaint that Bohr allegedly transformed his wave function into a "semi-mystical probability wave" (Gribbin 88), the Copenhagen Interpretation is still one of the most popular explanations of the wave/particle duality. This is mainly because the Interpretation tackles epistemological and ontological issues that do not solely depend on the context of physics. The philosophical accessibility of that theory and the "circulation of metaphors between the scientific discourse and the discourse of everyday life" (Whitworth 208) helped to promote it among non-scientists. With the hypothetical 'Cat Paradox'<sup>3</sup> in which Schrödinger connected the quantum world to our

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<sup>3</sup> See Schrödinger: "One can even set up quite ridiculous cases. A cat is penned up in a steel chamber, along with the following device (which must be secured against direct interference by the cat): in a Geiger counter there is a tiny bit of radioactive substance, *so small*, that *perhaps* in the course of the hour one of the atoms decays, but also, with equal probability, perhaps none; if it happens, the counter tube discharges and through a relay releases a hammer which shatters a small flask of hydrocyanic acid. If one has left this entire system to itself for an hour, one would say that the cat still lives *if* meanwhile no atom has decayed. The psi-function of the entire system would express this by having in it the living and dead cat (pardon the expression) mixed or smeared out in equal parts" (152).

everyday experience in order to demonstrate the absurdity of the Copenhagen Interpretation, the discussion about the validity of Bohr's theories also produced one of the most vivid metaphors of modern science.

In short the Copenhagen Interpretation claims that "it is meaningless to ask what atoms and quantum entities are doing when we are not looking at them" (Gribbin 88), because "all we can do [...] is to calculate the probability (never a certainty) that a particular experiment will come up with a particular result" (88). For this purpose, Bohr reinterpreted Schrödinger's wave function (originally intended as a description of a real physical wave) as a "mathematical description of the probability that an electron is in a particular state" (88). When the quantum entity is not observed, all possible wave functions are "intermingled into what is called a superposition of states, until a measurement is made" (89). This "superposition of states" once again evokes James's concept of the 'stream of thought,' which is made out of transitive parts that 'collapse' into substantive parts and then move on again.

#### 4. Wave-Particle Dualities in Stein's Writings

It is difficult to quote Stein when it comes to the concepts of 'insistence' and the 'continuous present' in her texts. How could it be possible to exemplify the notion of movement and resemanticization by ripping a sentence or paragraph from "The Gentle Lena" and thus reducing it to a linguistic instance, instead of preserving its fluid state?

Stein's texts are in constant motion. In "The Good Anna" the motion manifests itself in a form of contrapuntal composition: the same attributes (the predominant example being the 'good' Anna) appear again and again in connection to a certain character, but the more one learns about the character, the less appropriate the attributes seem to become. While the phonetic and printed materiality of the word remains the same, its contextual meaning changes. Consequently a word is always a product of its environment, as are the wave and particle characteristics of electrons. Stein uses a relatively limited set of adjectives in order to describe each of her protagonists. Typical examples would be:

The good Anna was a small, spare, german woman. (*Three Lives* 5)

Lizzie was an obedient, happy servant. (5)

Old Katy was a heavy, ugly, short and rough old german woman, with a strange distorted german-english all her own. (7)

Sallie was a good, obedient german child. (8)

Anna was a medium sized, thin, hard working, worrying woman. (18)

Besides the fact that the protagonists often seem to be characterized through their physiognomies (thus emphasizing their 'physicality'), this 'insistence' on certain attributes in ever differing contexts creates a sense of motion. Not only do these paratactic, almost list-like sentences have a rhythmic quality, but they also form a counterpoint to how the reader perceives each of the characters. The 'good' Anna,

for example, has “an aggressive need to dominate relationships” (Charters xiv). And even though there is “no suggestion of character development in the course of Anna’s life” (xiv), Stein places this static character in her text to make the “movement of words” visible (Levin 145). Stein herself writes in a passage reminiscent of Einstein’s Theory of Relativity: “But the strange thing about the realization of existence is that like a train moving there is no real realization of it moving if it does not move against something and so that is what a generation does it shows moving is existing” (*Lectures* 165). In the same essay, Stein states that “this generation has conceived an intensity of movement so great that it has not to be seen against something else to be known” (165). As one of her earliest texts, “The Good Anna” still has an element of relativity in it: the fluid words move *against* the static characters. Therefore the reader is confronted with a quantum paradox: the dichotomy between Stein’s emphasis on the phonetic (and thus the physical, material, and fixed) aspects of language and her concern with the ‘continuous present,’ i.e. the constant resemantization of words and dematerialization of meanings.

The need to “keep words on the move” (Levin 155), to make the “movement visible” (154) through ‘insistence’ stands in sharp contrast to the reduction of words to their “sensational nudity” (James 726). Whereas the former underlines the dislocation of textual meanings and the importance of contexts and semantic shifts (therefore being a literary equivalent to an oscillating wave: a form of energy which moves *through* the text, instead of being bound to one word, phrase, or sentence), the latter decontextualizes and isolates the solidity of single linguistic units. Similar to James’s experiments with repetition and perception in the *Principles of Psychology*, certain words are detached from their signified and acquire an almost physical (in contrast to a symbolic or referential) quality. By emphasizing “the non-representational dimension of language” (Levin 147), words are stripped down to their phonetic raw material and are eventually given the status of solid objects or particles: signs becoming their own signified. As in the double slit experiment, in which an almost identical experimental setup demonstrates two mutual exclusive characteristics, Stein’s ‘insistence’ produces two very different perceptions of language: on the one hand there is the printed condition of words as signs that appear so frequently that they seem to lose all contact with anything outside the page or beyond their own sounds. But on the other hand Stein is not a Dadaist, an author of nonsense texts who simply wants to drain words of their meaning. On the contrary: in *Three Lives* words are invested with polymorphous meanings and connotations as they reappear again and again in different and unfamiliar contexts (at the end of “The Good Anna” one would certainly not think of calling the major character a ‘good’ person). They become vessels for a multitude of possibilities and probabilities. Or to put it in the terminology of quantum physics: they become pure potentials that collapse into momentary concreteness according to their respective contexts.

Just as the electrons in the double-slit experiment arrive at the phosphor screen as individual particles, but still form a pattern of arrival that makes it look like they “collectively obey some sort of wavelike law of motion” (Casti 425), words in the quantum logic of Stein’s texts are perceived as autonomous solid objects, yet at the same time their meaning is not fixed but part of a continuous motion. In this complementary condition they are both, phonetic particles *and* semantic waves.

But Wave-Particle Dualities can not only be found in *Three Lives*. An exemplary passage taken from Stein's essay "Pictures" demonstrates that even her non-fictional works contain underlying quantum phenomena:

There is the oil painting in its frame, a thing in itself. There it is and it has to look like people or objects or landscapes. Besides that it must not completely only exist in its frame. It must have its own life. And yet it may not move or imitate movement, not really, nor must it stay still. It must not only be in its frame but it must not, only, be in its frame. (*Lectures* 86)

The entire paragraph can be interpreted as a reformulation of the Wave-Particle Duality: an oil painting must be in motion and still at the same time—it must be particle and wave, flux and stasis, energy and matter. The last sentence is a culmination of every duality presented in the essay: by inserting only two commas into an otherwise identical sentence, Stein is able to express two contradictory statements with the same sequence of words. Not only does her definition of an ideal oil painting mirror the Wave-Particle Duality, but language itself acquires a complementary state: as in the double-slit experiment a minimal change of the initial condition (opening a second slit, inserting two commas) produces two mutually exclusive results. Here Stein demonstrates in a very condensed form how 'insistence' actually functions: by shifting the emphasis of two lexically identical sentences, two opposing thoughts are expressed. With regard to quantum mechanics it can be argued that Stein perceives words as pure potentials and, like James and Bohr, emphasizes the importance of the context in which they appear. Just as a quantum entity does not have a fixed state but constantly fluctuates between particle and wave characteristics until being observed, words in Stein's texts do not always have intrinsic meanings. Their meaning is often the result of a language-in-use, of processes, of dynamics, of the participatory acts of "talking and listening at the same time" (*Lectures* 170).

The philosophical essence of the Copenhagen Interpretation can be transferred to "Pictures": meaning is contextual and to some degree description is always creation. An example from James's *Principles of Psychology* could serve to clarify this. James proposes an experiment with the French phrase *Pas de lieu Rhône que nous* "in order to point out that one could read the phrase over repeatedly without realizing that its sounds are identical to those in the English sentence, *Paddle your own canoe*" (Levin 151). But once this realization occurs the "words will acquire very different meanings as the contexts in which they are viewed or heard shift" (151). Casti explains the Copenhagen Interpretation from a quite similar perspective: "Dynamic attributes are not a property of either the quantum object or the measuring device taken separately, but are a property of the *joint relationship* between object and device" (Casti 443).

### 5. *Tender Buttons* and Quantum Reality

There is another, less scientific, more metaphorical way of looking at the paradoxes of the quantum world: they can be seen as a crisis of description, of representation, or in even more general terms: as a crisis of language. The often noted gap between language and reality can therefore be regarded as one of the basic

reasons for the quantum paradoxes. According to Casti, Werner Heisenberg's 'Duplex Interpretation'<sup>4</sup> of the quantum world claims "that objective reality is a physical fiction brought on by our lack of linguistic sophistication and inability to comprehend what it could possibly be like to live in a world of pure potential" (Casti 451).

Describing the world always means abstracting and reducing it to signs, sounds, numbers, and formulas. This reduction is exactly what classical physics was striving for and what gave birth to the idea of Laplace's Demon: according to the Newtonian principles any complex system could be reduced to the language of mathematics. In an isomorphic process this reduction would still serve the purpose of describing the system in its entirety.

In the quantum world, a world so small that even 'looking' at it might change its course, system-preserving reductions and objective observations are no longer possible. Heisenberg's Uncertainty Principle with its conjugate variables of position and momentum is only one of the manifestations of this problem. According to the Copenhagen Interpretation a description of the quantum world is to some extent also an act of creation (although a physicist would probably frown at this formulation). What results from this view is the idea Schrödinger and Einstein found so hard to accept: that by describing the quantum world one reduces it to an abstraction and simultaneously creates a reality that corresponds with the abstraction.

Something quite similar occurs in Stein's enigmatic text *Tender Buttons* (1914). Published only one year after Bohr presented his quantum-model of the atom, it is also situated "midway between representation and abstraction" (Nicholls 118), between description and creation. Despite its elusiveness, its cryptic arrangements of phrases, *Tender Buttons* "is not so much a failure of reference as a problematizing of reference itself" (Nicholls 117). The very first paragraph of the text already exemplifies this:

*A carafe, that is a blind glass*

A kind in glass and a cousin, a spectacle and nothing strange a single hurt color and an arrangement in a system to pointing. All this and not ordinary, not unordered in not resembling. The difference is spreading. (*Writings* 313)

Since the passage is placed at the very beginning of *Tender Buttons*, it can be understood as a self-reflexive introduction to the entire text: the difference between reality and representation "is spreading," the text itself is "not ordinary" and yet "not unordered in not resembling." Like a cubist painting it obeys its own intrinsic laws. It circles "around the object so confidently announced in the title" (Nicholls 117), without ever clearly referring to it. *Tender Buttons* is "an arrangement in a system to pointing." The term "arrangement" suggests a compositional method, thus emphasizing the status of the text as a text (and not as a representation of something extra-textual), whereas the phrase "system to pointing" can be read as referring to language itself: language can point to something beyond its phonetic or printed physicality, but the "difference is spreading."

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<sup>4</sup> Heisenberg concluded "that reality consists of two disjoint worlds, the world of *potential* (*potentia*) and the world of *actuality*, with the two joined by the act of measurement" (Casti 451).

To a certain degree *Tender Buttons* is a fragmentation of the isomorphic process that usually ‘translates’ objects into language via reference. Except for a single noun (“glass”) one cannot find anything in this opening paragraph that would directly point to the non-textual object of a carafe. Yet a self-reflexive reading of the passage reveals that the text is “not unordered in not resembling.” Stein rather seems to avoid the reductive acts of naming and describing in order to preserve the entire complexity of the carafe. Similar to the compositional methods used in cubism (to which the text has often been compared), Stein is abstracting so consciously ‘around’ the objects that the abstraction actually creates its own reality. The abstract textual entity of “a carafe, that is a blind glass” is no less real than a non-textual carafe. On the contrary: it might be even more of a carafe than a referential description of this object because language itself acquires a certain materiality. Correspondingly, Peter Nicholls points out that it is “not surprising that so many pieces in Stein’s *Tender Buttons* are concerned with food, for eating epitomizes the fundamental association of linguistic materiality with oral pleasure (locutionary and sexual) which runs throughout her work” (119). By consequently disconnecting words from their referential functions, Stein gives language itself the status of an aesthetic object. Therefore the phrase “a carafe, that is a blind glass” almost functions like a self-referential Quin-Sentence that actually points back to its own sequence of signs. Thus “a carafe, that is a blind glass” foremost is “a carafe, that is a blind glass.”

*Tender Buttons* could also be regarded as some kind of textual Rorschach-Test in which the reader is challenged to give meaning to the seeming randomness of verbal objects. Similar to the idea presented in the hypothetical ‘Schrödinger’s Cat’ experiment, and also in accordance with John A. Wheeler’s ‘Austin Interpretation’<sup>5</sup> of the quantum world, the consciousness of the reader becomes an integral part of the artistic process. In not seeming to refer to a carafe at all, the passage is likely to produce a strong reaction on the part of the reader. The way in which the text does not resemble anything but itself is almost provocative and comparable to the impact cubist art might have had on viewers who were only used to the representational conventions of the nineteenth century. In the case of *Tender Buttons* the method of linguistic abstraction and alienation could actually lead to a more conscious perception of reality by making the reader aware of what language actually is: signs and sounds, and not the objects we usually connect them to. Therefore it would be wrong to dismiss *Tender Buttons* as merely an exercise in nonsense prose.

The crisis of representation which is at the core of quantum mechanics also manifests itself in Stein’s *Tender Buttons*. But instead of trying to overcome the gap between signifier and signified, Stein invites the difference. *Tender Buttons* can be seen as Stein’s attempt to ‘surf’ the probability wave without ever allowing it to collapse into solidity. *Tender Buttons* preserves the energies of the world, the flux of sensation; it accepts elementary wave/particle dualities without forcing them to take on only one of these properties. Stein herself wrote that “nothing

<sup>5</sup> According to Wheeler “no elementary phenomenon is a phenomenon until it is an observed phenomenon” (qtd. in Casti 447). Thus reality is actually seen as being “consciousness created” (Casti 444).

could bother [her] more than the way a thing goes dead once it has been said” (*Writings* 361). In this regard the text presents its objects much more completely than any detailed description could have done. Therein lies one of the major differences to other modernist authors and poets such as T.S. Eliot or Ezra Pound. Whereas they developed naming and reduction as the ultimate creative methods (Pound with his ‘absolute metaphor,’ Eliot with the ‘objective correlative’), Stein deliberately created tensions of significance and referentiality in her texts that are almost impossible to resolve. Since her writings are primarily concerned with transitive and intermediate states and not with the installation of certainties, Stein’s works anticipated some of the most fundamental realizations of post-Newtonian physics regarding the nature of reality.

## 6. Conclusion

Despite the remarkable correlation between Stein’s modernism and quantum physics there is no concrete evidence that either Stein or the quantum physicists were actually aware of each other. Therefore the heuristic approach presented in this paper can only function as a working hypothesis, an attempt to analyze Stein’s text from a slightly different angle, and not as a proof for a factual connection between Stein and quantum mechanics. Most of the thematic and stylistic characteristics of Stein’s writings do not necessarily depend on a ‘quantum reading,’ and can also be traced back to other origins: besides the obvious influence of William and Henry James, Cezanne, and Flaubert, other sources of inspiration for Stein could have been John Dewey, Henri Bergson, or the descriptionist philosophies of Karl Pearson (esp. *The Grammar of Science* [1892]) and Ernst Mach (who in turn probably inspired William James). One should also not neglect the immense influence the teachings of Zen Buddhism had on a larger group of modernist artists, especially since Zen ultimately attempts to transcend dualistic notions of the world and to overcome our reliance on verbal thinking. In this context, Stein’s *Tender Buttons* might as well be interpreted as a Western version of a Zen koan. Yet, a ‘quantum interpretation’ of Stein’s work offers an alternative set of metaphors for discussing her sometimes very complicated texts. Despite the mysteries usually associated with it, quantum physics is still a ‘hard science.’ What makes it so different from classical Newtonian physics is its self-reflexiveness, and the way it questions its own methods and the knowledge gained from them. Quantum mechanics basically reflects modernism’s self-conscious understanding of language and art. Similar to the “recognition that science is a construction of the human mind before it is a reflection of the world,” Stein’s modernism exemplifies the notion that art is not necessarily a reflection of the world, but always an expression of itself.

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