# The *Unseen Universe* of art: Vortex motion in the Ether

This paper is a shorter version of a larger study I wrote in German a little while ago on Ezra Pound's early art theory. It was inspired by Linda Henderson's book on the 4th dimension in 20th century art. While Linda Henderson kept her focus on Futurists and Cubists I turned my interest to the Vorticists, an English art movement, inspired by both Futurists and Cubists. My main focus is the (mostly literary) "Vorticism" of Ezra Pound. Pound invented the name and for him – as I will argue – the Vorticist art theory he developed became the basis for most of his later work. He built a theoretical foundation before starting to write his major opus "The Cantos."

The work of Ezra Pound is crucial when studying connections between literature and science in modernist art. Pound is arguably one of the most important innovators in 20th century poetry and I will show how important a part science has played in his innovative project. Some of Pounds central artistic ideas come out of 19th century science that he translated into his art theory. What is so special about his translations is that – as we can read on the back cover of his Confucius – "Pound never wanted to be a literal translator. What he could do, as no other could, is to identify the essence, pick out 'what matters now,' and phrase it so pungently, so beautifully, that it will stick in the head and start new thinking." While I have to trust the opinion of sinologists on his Chinese translations I can easily agree with this description in relation to his 'translations' from science which were anything but literal. Pound may not have understood every detail of 19th century physics but he was very good at identifying what of this – at the time already a bit outdated physical theory – 'matters now' and he uses exactly that part to define his own artistic project.

Let me sketch out briefly the physics in question so I can then introduce their translation. The main point of interest is vortex motion. It started in hydrodynamics with a paper by the German scientist Hermann von Helmholtz who wrote on "Vortex motion in ideal fluids" in 1858. This text which brought the image of the vortex into the scope of 19th century physics was translated into English by Peter Guthrie Tait, a physicist and close collaborator of William Thomson's or, as he is better known today: Lord Kelvin. After a

considerable delay – because he had been so busy fixing problems around the laying of the first transatlantic telegraphic cable – the vortex treatise reached Kelvin in 1867 and he became quite excited about it. Helmholtz in this paper develops a mathematical theory concerning the motion of smallest particles in an ideal fluid[1]. What was clear for both Helmholtz and Kelvin – that it was a purely mathematical model – fell into oblivion with some of the later readers and followers of the theory.

The major claims of Helmholtz's paper were: the smallest particles of an ideal fluid are either moving or still, but without the intervention of an outside force they will remain in their respective state *infinitely*. The moving particles move in vortices and form *vortex filaments*, or *vortex strings*. These filaments again array to *vortex tubes*. All the moving particles are completely separated from the surrounding liquid. Because of the different properties of the vortices and the surrounding fluid the two will never mix and they have no intermediate state. This results in some very peculiar properties of the vortex tubes. One of which another physicist – James Clerk Maxwell – described poetically: "If the fluid is infinite the vortex tube must be infinite, or else it must return into itself."[2] What Maxwell expresses here is that the vortex tubes can only end where the fluid ends, or they return into themselves, meaning they form a ring. This ring will still be completely separated from the surrounding liquid. An English mathematician and reader of Helmholtz's summarizes it: "A vortex-ring may move from place to place, but it carries with it the liquid of which it is composed, never leaving any particle behind, and never taking up any particle from the surrounding liquid."[3] These Helmholtzian vortex rings, sometimes also called vortex knots, consequently exist indestructibly. They form within the instable fluidity of the liquid a particle of imperishable solidity.

These qualities made them most attractive to Kelvin who was contemplating – as many of his contemporaries – the concept of the ether and its relation to matter, especially the atom of which little was known. The ether in 19th century English physics was one of

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1 An ideal fluid is a fluid without friction and a few other properties that separate it from any fluid that could have been used in an experiment—at least back then. Today super-fluids come very close to being an ideal fluid.

2 Maxwell, *Atom*, 1875 in: Maxwell, James Clerk, The Scientific Papers of James Clerk Maxwell. (2 Vol.) ed. by W.D. Niven, Cambridge 1890, Vol. 2, 470.

3 Clifford, William Kingdon, Review of *The Unseen Universe*. The fortnightly review. Vol. XVII, No. C, April 1, 1875, 783.

the basic and at the same time one of the most difficult physical concepts. The ether was needed because a vacuum seemed unthinkable. It was supposed to be a medium for light, electromagnetic waves, gravitation and other physical processes that could not be explained otherwise. It was supposed to be "an utterly homogeneous elastic solid, occupying the whole of space from infinity to infinity in every direction."[4] So on the one hand it has the rigidity of a solid, on the other hand – as Kelvin writes – "I move through this 'luminiferous ether' as if it were nothing." The ubiquitous problem was just that "though no sane person doubts the existence of the ether, we are sorely troubled when we are asked to describe it."

At that point Kelvin welcomed Helmholtz's vortex theory and applied it to the ether which had already earlier been described as an ideal fluid. On the basis of Helmholtz's vortex theory Kelvin in 1867 composed a vortex atom model. In this model the ether becomes the ideal fluid wherein vortex rings or knots exist. And these ether knots – so Kelvin – are the atoms. Kelvin actually starts his paper on the vortex atom with the opening remarks "that Helmholtz's rings are the only true atoms" and "all bodies are composed of vortex atoms in a perfect homogeneous liquid."[5] The twist in this model that makes it especially interesting is that the ether was supposed to be imponderable. Nevertheless it was to form by way of vortex motion the 'weightily' atoms as the basis of all matter. In this sense the vortex motion came to be (at) the basis of all creation. In Kelvin's theory – being a strictly mathematical concept – there was not much questioning of how it was possible that non-matter could become matter.

Two of his colleagues, though – Peter Guthrie Tait (who had translated Helmholtz's vortex-paper into English) and Stewart Balfour – followed up on the idea of the vortex atom. In their book "The Unseen Universe" (1875) they among other things pursue the question of *if* and *how* these ether-vortex-atoms are being created. Their conclusion is a

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[4] Thomson, W. [Kelvin], *On the Motions of Ether produced by Collisions of Atoms or Molecules, containing or not containing Electrions.* 1907, in: Thomson, W. [Kelvin]: Mathematical and physical Papers. Vol. 1-6. Cambridge 1882-1911, Vol. 6, 236.

[5] Thomson, W. [Kelvin], *Vortex Atoms*, 1867, in: Thomson, W. [Kelvin] (1882-1911), Vol. 4, 1-2.

somewhat spiritualist theory – firmly grounded in the latest insights of modern physics – which immediately became a bestseller.[6]

"The Unseen Universe" is particularly interesting in relation to my interest in Pound's vortex/vorticism-theory because it is an – at the time very well known – example of how the physical vortex concept could be and has been applied to other areas of thought. The complete title of the book is *The Unseen Universe, or, Physical speculations on a future state.* The goal of the book was to 'bring a conclusion' in a debate that had been ongoing in scientific circles—mostly in response to Darwin's theory of evolution—about the relation of science and religion, particularly concerning the question of *creation*. Stewart and Tait argue that "the presumed incompatibility of Science and Religion does not exist."[7] In a similar way as Kelvin with his vortex-atom was able to unite the theorists of the atom with the theorists of continuity—two parties of physicists around the problem that the concept of the particle atom seemed to disagree with the principle of continuity—the authors of the Unseen Universe attempt to unite (evolutionist) scientists and religious believers in divine creation by way of the vortex.

They start out with the fact that according to the Helmholtzian theory vortices exist either indefinitely, or can only be created or destroyed through an outside force. Stewart and Tait now explain—always thoroughly founded on current scientific data—why they are convinced that our 'visible universe' is not infinite; concluding that it must have had a beginning at some point, which means that the vortices of matter must have been created. The logical conclusion of their assumption that the vortices could only have been created by an outside force is that this force, obviously, could not have been part of the ether. Stewart and Tait call this vortex-creating-force an *intelligent agent*. To explain their assumption they use the analogy of smoke rings, just as Kelvin had done before when explaining his atom model. "Let us begin by supposing an intelligent agent in the present visible universe, —that is to say a man—to be developing vortex rings—smoke-rings, let us imagine. Now, these smoke-rings are found to act upon one another, just as if they were

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[6] Stewart and Tait had published their book at first anonymously. After its raving success the 3rd edition appeared under their names.

[7] Stewart, Balfour/Peter Guthrie Tait, The Unseen Universe; or, Physical speculations on a future state. London, New York 1875/1882, XI.

things or existences.]"[8] To demonstrate these qualities Tait had built a little contraption with which he had shown smoke rings first to Kelvin. It was used to watch smoke rings, their movements and interactions. "Just as the smoke-ring was developed out of ordinary molecules, so let us imagine ordinary molecules to be developed as vortex rings out of something much finer and more subtle than themselves,"[9] and so on. Each finer substance must and will exist previous to the less-fine substance and will go on existing when the coarser substance might be destroyed. "In fine, our conclusion is, that the visible universe has been developed by an intelligence resident in the Unseen"[10] through a "creative act,"[11] or as they write elsewhere: "an act of creation in time."[12] Here they are more or less citing Kelvin who had written in his paper on Vortex atoms: "To generate or to destroy 'Wirbelbewegung' (vortex motion) in a perfect fluid can only be an act of creative power."[13]

This creative power of vortex motion is the 'essence' that Pound immediately understands and translates into the world of art. In 1913 he writes to his fiancée about how artistic energy "depends on ones ability to make a vortex."[14]

But back to the physicists for a moment: By way of an extensive Bible reading Stewart and Tait connect the intelligent agent to a Christian God creator, which they consider to be the 'Divine agency' which "represents that conditioned, yet infinitely powerful developing agent, to which the universe, objectively considered, appears to lead up."[15]

This theory of the divine agency seems fairly obscure looked at it from today. But it was written and read by some of the most acknowledged scientists of the time. James Clerk Maxwell for instance concludes the article on *Ether* he wrote for the 1875 edition of the Encyclopedia Britannica with the following remarks: "Whether this vast homogeneous

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[8] Stewart/Tait, 1875/1882, 218.
[9] Stewart/Tait, 1875/1882, 219.
[10] Stewart/Tait, 1875/1882, 223.
[11] Stewart/Tait, 1875/1882, 140.
[12] Stewart/Tait, 1875/1882, 155.
[13] Thomson, W. [Kelvin], *Vortex Atoms*, 1867, in: Thomson, W. [Kelvin] (1882-1911), Vol. 4, 1.
[14] Pound, Ezra/Dorothy Shakespear, Their letters: 1909-1914. (ed. by Omar Pound and A. Walton Litz) New York 1984), 251.
[15] Stewart/Tait, 1875/1882, 226.

expanse of isotropic matter is fitted not only to be a medium of physical interaction between distant bodies, and to fulfil other physical functions of which, perhaps, we have as yet no conception, but also, as the authors of the Unseen Universe seem to suggest, to constitute the material organism of beings exercising functions of life and mind as high or higher than ours are at present, is a question far transcending the limits of physical speculation."[16] So this highly notional spiritualist theory was considered as "transcending" the limits of physical speculation, but not at all as nonsense.

Ezra Pound encountered this vortex theory in the early 20th century and while he most certainly disagreed with its spiritualistic ramifications, that didn't keep him from translating the "essentials" into his concept of true art.

The vortex appears in Pound's published writings for the first time in a poem from 1905,[17] and later, after his arrival in London in two letters before it culminates in the movement of *Vorticism*—named by Pound—in 1914. In the abovementioned letter to his fiancée he explained his concept of being an artist and argued that: "Energy depends on ones ability to make a vortex—genius *même*"[18]. So for Pound—just as for Stewart and Tait—the central question was: who produces the vortex. Pound was not interested in God or another divine agency, instead he declares—propagandistic and programmatic at the same time—the ability to make a vortex for an indication of the true artist. From the perspective of the *Unseen Universe* Pound puts art in the place of religion and the artist in the place of the divine agency. A little less dramatic it could be said, Pound derives the vortex from a key position, where in the Unseen Universe it stands for the assertion "god exists," and transforms it into his very worldly claim "true art exists."

In the first *Vorticist* publication, the magazine BLAST, it is very clear that the vortex is Pound's brainchild. In the magazine are three articles on the vortex by the three main figures of *Vorticism*: Pound, Wyndham Lewis and the sculptor Henri Gaudier-Brzeska, who was killed in 1915 fighting in the war. As one critic summarizes the three

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[16] Maxwell, *Ether*, 1875, in: Maxwell, James Clerk: The Scientific Papers of James Clerk Maxwell. (2 Vol.) ed. by W.D. Niven, Cambridge 1890, Vol. 2, 775.

[17] Elsewhere in a detailed close reading of this early poem *Plotinus* I am able to show that even here in 1905 the vortex already had a connection to the physical concepts.

[18] Pound/Shakespear, 1984, 251.

texts: “Pound links the symbol of the Vortex to his ideas of primary form; Gaudier uses it as the starting point for his magnificent survey of the art of sculpture; Lewis […] makes much use of the name, but barely acknowledges the possibilities of the symbol.”[19] Without being able here to go into the details of the two others, it is obvious that Pound’s vortex has a special quality.

Pound sets out with the statement that “The vortex is the point of maximum energy.” His further description refers to such technical terms as “efficiency”, “mechanics” and “fluid force.” He calls for a “primary pigment” of art: “The *Vorticist* relies on this alone: on the primary pigment of his art, nothing else.” This primary pigment of the Vorticist is “the most highly energized statement, the statement that has not yet SPENT itself in expression, but the one which is the most capable of expressing.” For readers familiar with Pound this description refers of course also to his earlier imagist theory. But with the vortex he seems to have found the proper name and concept for what he wanted to express.

Pound had been writing theoretical texts on art and literature since his college days. But in 1923 he stated: “I consider criticism merely a preliminary excitement, a statement of things a writer has to clear up in his own head sometime or other, probably antecedent to writing.”[20] So the criticism he didn’t even consider writing. It is not entirely clear when Pound started *writing* the first of the Cantos, but he did not pursue them in earnest until 1915, after *Vorticism*. In the 1960s he himself remembers “I began the *Cantos* about 1904 [...] or 1905. The problem is to get a form—something elastic enough to take the necessary material. It had to be a form that wouldn’t exclude something merely because it didn’t fit.”[21] So he apparently began work on the Cantos but could only succeed in it after he had ‘cleared up his head’ and found an elastic enough medium to make vortices in.

In another one of his texts, Pound even gives a sort of explanation why he doesn’t think it necessary to clarify his use of the vortex: “I believe that the proper and perfect

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[19] Michel, Walter, Wyndham Lewis. Paintings and drawings. Berkeley, 1971, 63.
[20] Pound, *Criticism*, *The Criterion*, January 1923, 146, in: Pound, 1991, Vol. 4, 266.
[21] Hall, Donald, *Interview with Ezra Pound*. Venice 1960, in: *Writers at Work. The Paris Review Interviews*. Second Series. (Introd. by Van Wyck Brooks) London: Secker & Warburg 1963, 36. Pound did in fact write the poem *Scriptor*

symbol is the natural object, that if a man use 'symbols' he must so use them that their symbolic function does not obtrude; so that *a* sense, and the poetic quality of the passage, is not lost to those who do not understand the symbol as such, to whom, for instance, a hawk is a hawk."[22] Readers for whom a hawk is just a hawk do of course miss a whole dimension of meaning that Pound as a scholar of medieval literatures knew only too well. In the same way for readers to whom a vortex is just a whirl "*a* sense, and the poetic quality of the passage" may not lost, but for readers with some knowledge of the underlying physical theories a whole new dimension is revealed. Just as Pound writes in the *Wisdom of Poetry*: "For the initiated the signs are a door into eternity and into the boundless ether."[23] And elsewhere about perfect symbols: "They make their revelations to those who are already expert."[24] I hope this text has enabled the reader to become a little more of an expert in the symbol of the vortex.

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*Ignotus* in 1904/05 which contains the lines: "And I see my greater soul-self bending/ Sibylwise with that forty-year epic/ That you know of, yet unwrit/" etc. (Pound, 1908/1965, 38.)

[22] Pound, *Prologomena*, *Poetry Review*, Feb. 1912, in: Pound, 1991, Vol. 1, 60. Pound's choice of the hawk as an example for his use of the symbol reveals just how much the 'naïve' reader misses. Pound as a lover of medieval poetry must have known the immense significance of hawks in the power structure of the middle ages. See for instance http://www.r3.org/life/articles/falconry.html: "For the nobility, falconry practiced on a magnificent scale became an essential element in establishing and maintaining personal and national prestige."

[23] Pound, The Wisdom of Poetry, Forum, April 1912, in: Pound (1991), Vol. 1, 76.

[24] Pound, Ezra, The spirit of romance. London 1910/1960, 89.