

STATIONARY LINGUISTIC SYSTEMS (EINSTEIN AND SAUSSURE)

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Concepts which have proved useful for ordering things easily assume so great an authority over us, that we forget their terrestrial origin and accept them as unalterable facts. They then become labeled as ‘conceptual necessities,’ ‘a priori situations,’ etc. The road of scientific progress is frequently blocked for long periods by such errors. It is therefore not just an idle game to exercise our ability to analyze familiar concepts, and to demonstrate the conditions on which their justification and usefulness depend, and the way in which these developed, little by little, from the data of experience. In this way they are deprived of their excessive authority (Einstein, *Phys. Zeitschr.* 17,101, 1916; cited in Hsu & Zhang 2001: 142).

Abstract

The stationary system of General Linguistic theory is presumed to refer to the state system of Newtonian mechanics. However, the 9 July 1909 receipt by Einstein in Geneva of his first honorary PhD at the 350th anniversary celebration of the foundation of the University of Geneva

suggests the possibility of an alternative, the stationary system described in ‘On the Electrodynamics of Moving Bodies’ (Einstein 1905).

1.0 Introduction

This article is the first in an intended series designed to place Ferdinand de Saussure at the centre of a dynamic, nonlinear linguistics. The series will trace the intertextual evolution by Saussure (1857-1913) of the theoretical constructs of Hermann Grassmann (1809-1877), Richard Dedekind (1831-1916), Karl Weierstrass (1815-1897), Heinrich Hertz (1857-1884), Henri Poincaré (1854-1912), and Albert Einstein (1879-1955) into his development of what subsequently became Modern Linguistics. The methodological approach adopted is essentially a contextual archaeology commencing with Einstein, descending first to Hertz, then to Grassmann, Dedekind, and Weierstrass, and then returning via Poincaré to attractor theory. In discussing two types of system modeling, linear and nonlinear, it will be shown, in passing, that Charles Bally

(1865-1947) and Albert Sechehaye (1870-1946) edited from the posthumous 1916 *Cours de Linguistique Générale* the ‘fin-de-siècle new physics, thereby establishing Euclidean space and Newtonian mechanics as the framework for Modern Linguistics. More than a historiography, the series plans to demonstrate how the practice of linguistic digitalization reveals the cause of flux through the patterns of fractal discourse evident in modern linguistic analysis.

Modern Linguistics, the product of the Age of Reason and the Enlightenment, assumes that the stationary system is a material, collective, combination orchestrated by orderly algebraic operations. But, in the corpus of Modern Linguistics, this Positivist logocentric notion, useful in the manipulation of physical objects, demonstrates side-effects of information asymmetry, discontinuity, incompleteness, and randomness more coherently represented by a Cantor Dust geometry than by a theory of algebraic integers.

1.1 Background

In 1905 Einstein published five papers. On the centennial of 1905 (a year which has been called ‘Annus Mirabilis’ in comparison with Newton’s publication of the *Principia*), this article examines the potential influence of ‘On the Electrodynamics of Moving Bodies’ upon the stationary system described by Ferdinand de Saussure in his Third Course of Lectures on General Linguistics (1910-1911) as recorded in the cahiers of Emile Constantin. It is in this remarkable

paper on the study of the laws of electrodynamics, optics, and kinematics that Einstein deconstructs the Newtonian concepts of the aether, absolute rest, absolute time, and absolute space, and replaces these classical concepts of mechanics with (a) light propagating at a constant and independent velocity (C) in all frames of reference and (b) the length of an object measured in the stationary system depends upon its velocity only. The semantic, structural, and system properties of this 1905 paper on relativity display a remarkable similarity to those of the 1911 Saussurean stationary system.

1.2 On the Electrodynamics of Moving Bodies

‘On the Electrodynamics of Moving Bodies’ commences with an anomaly; current theory in electrodynamics leads to the appearance of asymmetries which do not appear to be inherent in the phenomena.

1.2.0 In the Kinematical Part

Einstein compares a moving system (moving body) with a stationary system (stationary body). In this model, the stationary system consists of a:

system of coordinates, its position can be defined relatively thereto by the employment of rigid standards of measurement and the methods of Euclidean geometry, and can be expressed in Cartesian co-ordinates (Einstein 1905: 117).

{The system of General Linguistics

is based on the methods of Euclidean geometry, and can be expressed in Cartesian co-ordinates.)

Almost immediately following, Einstein discusses the understanding of time by reference to a train.

If, for instance, I say, "That train arrives here at 7 o'clock," I mean something like this: The pointing of the small hand of my watch to 7 and the arrival of the train are simultaneous events" (Einstein 1905: 117).

{A train leaves Cornavin at 5.25 every day; as far as we are concerned it is identical (Komatsu & Harris 1993: 82).}

Discussion on the train is followed by the introduction of the 'Observer' 'Observer' appears specifically fifteen times throughout the text. There is the stationary observer and the moving observer.

Immediately following the Euclidean geometry, the Cartesian co-ordinates, the train, and the observer, Einstein introduces the definition of synchronism by reference to two synchronous stationary clocks, i.e., time is defined by means of stationary clocks in the stationary system, and this is called "the time of the stationary system" (Einstein 1905: 119).

{It is Saussure who removes time from the linguistic system, and this removal of time can be surmised to belong to the notion of a stationary clock.}

In less than half a page, the terms

'synchronize' (3), 'synchronism' (1), 'synchronizes' (3), 'synchronous' (4), 'simultaneous' (1), and 'simultaneously' (1) appear in quick succession and are specifically connected to stationary clocks (3) and stationary systems (3) (Einstein 1905: 118-119). Shortly afterwards, the terms 'synchronizing' (1), 'synchronize' (1), 'synchronous' (3), 'synchronization' (1) 'simultaneity' (1), and 'simultaneous' (2) appear within the space of a page with the conclusion that no absolute signification can be attached to the concept of simultaneity and hence they are relative (Einstein 1905: 120-121).

{The Saussurean linguistic system is a synchronic system based on relative values.}

Einstein discusses two rigid rods of equal length (one stationary and one moving), the two observers, and their two clocks {The two rigid rods of equal length can be considered as trains.}. Current kinematics assumes that the measurement of the stationary rod and of the moving rod are precisely equal. Einstein concludes that the observers moving with the moving rod would find that the two clocks are not synchronous, while the observers of the stationary system would declare the clocks to be synchronous.

{Saussure discusses two systems, one stationary and one diachronic, and observes that a moving observer travelling through the countryside and experiencing various panoramas would find it impossible to derive a single perspective.}

Almost immediately following, Einstein

observes that to the system of values defining the place and time of an event in the stationary system the equations must be linear on account of the properties of homogeneity which we attribute to space and time, and that a point at rest in the system must have a system of values independent of time (Einstein 1905: 122).

{The system of General Linguistics is a system of values based on linearity and homogeneity attributed to space independent of time.}

On the X dimension of the Cartesian co-ordinates, the greater the velocity of the moving object, the greater the shortening, with all moving objects - viewed from the stationary system shriveling up into plane figures (Einstein 1905: 126).

The section closes with the constant speed of light, symmetrical transformations, and the observation that the laws of the theory of kinematics correspond to Einstein's two principles.

{Saussure develops a theory of General Linguistics based on two principles.}

1.2.1 In the Electrodynamical Part

This section transforms the Maxwell-Hertz equations for empty space. In a discussion of the system of equations, the system of co-ordinates, and the two systems (stationary/moving) the asymmetry discussed in the Introduction disappears.

Einstein discusses the source of electrodynamic waves very far from the

origin of co-ordinates, the amplitude of the wave-train, the direction of the wave norms in the moving system, and their appearance as plane waves upon the perfect reflective surface of the co-ordinate plane (work equal to the product based on the principle of energy) (Einstein 1905: 132-135).

{In November 1910 Saussure discusses isoglossematic linguistic waves, a succession of waves, contrasting boundaries, and the propagation of linguistic waves by contagion. The terms 'propagated' and 'propagation' in relation to waves are used by Einstein (1905: 124-125)}

By the method employed by Einstein, all problems in the optics of moving bodies can be solved by being transformed into a system of co-ordinates at rest relative to the body, and all problems in the optics of moving bodies will thus be reduced to a series of problems in the optics of stationary bodies (Einstein 1905: 136).

{Saussure reduces all of linguistics to a system of co-ordinates at rest relative to the mobile body, and considers that all problems of *La Parole* can be reduced to a series of problems on the plane of stationary bodies.}

Einstein's kinematic principles (137) permit the deduction of an important law with regard to electrically charged bodies in motion anywhere in space, i.e., charge in the moving body remains constant when viewed from the stationary system (Einstein 1905: 137). Einstein then considers the electron at rest in a given epoch relative to its system of co-ordinates

and viewed from the system (Einstein 1905: 137-140).

{Saussure considers *La langue* to represent an epoch (a state) which is to be viewed from within the system and his methodology to be valid for all frames of linguistic reference.}

1.2.2 Review of On the Electrodynamics of Moving Bodies

Almost the entire paper is controlled by the methodological dynamics of TWO, e.g., ... the two cases, the two cases, These two postulates, moving bodies ... stationary bodies (116), Observer at A ... observer at B, "A time" and a "B time," the two clocks, clock at A synchronises with the clock at B (118), These two principles, two systems of coordinates, stationary rod ... moving rod, the following two operations (119), the two ends of the rod, these two points, our two principles, both clocks, synchronization of two clocks (120), the two clocks, two events, two systems of co-ordinates, two systems, two systems, two measuring rods, two systems, two systems, two systems, stationary system, moving system, moving system ... stationary system, stationary measuring-rod ... measuring-rod moving (121), the two other axes (123), the two systems, our two fundamental principles (124), the systems K and K' (125), the Y and Z dimensions (126), the two clocks (127), two velocities, two transformations (128), our two principles (129), the two systems (130).

The major dynamic contrast is that of stationary system (47 times) with moving

system (system moving) (25 times). 'System of values' (3 times) appears specifically with stationary system, linear equations, homogeneity, and independence from time.

1.3 Saussure and the Third Course of General Linguistics (Constantin Cahiers)

The lectures of November 1910 deal largely with dynamic wave theory while those of June 1911 deal largely with stationary linguistics. The wave section covers geographic dynamics while the particle section is concerned with internal order isolated from speech and society in the brain, i.e., the language code.

The anomaly which concerns Saussure at the start of the third course in General Linguistics is the fundamental fact that different kinds, degrees, and scales exist in the diversity of language, i.e., linguistic variation, yet there is apparent similarity, i.e., linguistic unity (Komatsu & Harris 1993: 11-15).

On 15 November, 1910, Saussure introduces a partial Cartesian coordinate system; on 18 November, Saussure discusses how notions of dialect fall apart; on 22 November, Saussure discusses isogloss lines and the impossibility of finding unity; on 25 November, Saussure discusses the curious scalar effect of languages, the lack of precision, isoglossematic waves, and successions of waves; on 29 November, Saussure discusses linguistic waves, the two forces of division and unification, village speech chains, and introduces a Poincaréan four-dimensional geometric

system displaying the first Poincaréan bifurcation in linguistic analysis (Komatsu & Harris 1993: 19-36).

The delimited La langue is homogenous and based on a system of signs containing two parts on one linearity (Komatsu & Harris 1993: 71, 74, 75).

... this extension has one dimension only (Komatsu & Harris 1993: 77).

... acoustic images can be translated into spatial form by a linear representation. A line, because in fact there is only one dimension (Komatsu & Harris 1993: 78).

... acoustic sonority extends in a single dimension. It is as if I were given a single thread to cut. The delimitation will form links along a single line (Komatsu & Harris 1993: 80).

From one angle, we recognize clearly that this relates to the fundamental condition that the language is linear (Komatsu & Harris 1993: 83).

... the signifying element ... extends in time only ... which can be represented only as one dimensional (Komatsu & Harris 1993: 93).

And indeed, theoretically, a language can be considered independently of time (Komatsu & Harris 1993: 97).

The language can be controlled as long as it is not in circulation (Komatsu & Harris 1993: 100).

... when one considers linguistic facts without the time factor, at a single point in time (Komatsu & Harris 1993: 101).

On 2 June 1911 Saussure discusses static linguistics and historical linguistics (stationary and moving systems) (Komatsu & Harris 1993: 102-106). Here he steps outside of time and discusses the fundamental separation between the two sciences, the system of values in itself and the system of values over time. The full Cartesian co-ordinate system is introduced and the time factor is excluded (Komatsu & Harris 1993: 103). In discussing the setting up of a well-defined science Saussure considers that it is necessary to separate the two systems of values noting the disciplines might be compared to the two parts of mechanics (Komatsu & Harris 1993: 104, 106).

On 6 June 1911 Saussure discusses Statics, forces in equilibrium, and Dynamics (Kinematics), forces in movement where the T factor intervenes (Komatsu & Harris 1993: 107-109). He introduces the notion of the MOVING OBSERVER and refers to the nonsense of attempting to combine a SIMULTANEOUS panorama with the synchronic perspective. The static fact and the set of synchronic facts do not belong in the order of diachronic facts (Komatsu & Harris 1993: 107, 109).

On 9 June 1911 Saussure discusses synchronic facts on the horizontal axis, diachronic facts on the vertical axis, the two perspectives, the two systems, the diachronic series, the synchronic series, diachronic facts, the synchronic perspective,

synchronic relations, synchronic acts, the diachronic perspective (Komatsu & Harris 1993: 109-114).

On 13 June 1911 Saussure discusses the equilibrium and synchrony of a game of chess (a system of values), synchronic law, and the synchronic axis (Komatsu & Harris 1993: 114-118).

On 16 June 1911 Saussure rationally separates linguistics from Time (Komatsu & Harris 1993: 118-121). If this separation is to be rational, it must be based on contemporary scientific theory, i.e., Hertz (1894), Einstein (1905).

On 20 June 1911 Saussure, choosing statics, borrows from the language of optics to compare the separation of synchronic from diachronics with the whole part of mathematics concerned with how the projection is made onto the plane, and introduces the notion of the synchronic plane (Komatsu & Harris 1993: 121-125).

On 23 June 1911 Saussure reviews the domain of static linguistics, its synchronic plane, transformations, and epochs (Komatsu & Harris 1993: 125-127).

On 27 June 1911 Saussure discusses the static system, syntagmatic co-ordination, the domain of syntagmatic relations, syntagma extended in one dimension, associative coordination, associative series (beat with rods, constellation), and the associative domain (Komatsu & Harris 1993: 127-132).

On 30 June 1911 Saussure discusses

values defined in terms of a system (Komatsu & Harris 1993: 132-137).

On 4 July 1911 Saussure closes the third course by discussing the synchronic system of values (e.g., sun, star, mass, nebula), the lack of an absolute element, and the fact that values will be entirely relative. The word 'two' is used seven times. Saussure anticipates that the anomalies of linguistic diversity will be limited by a system of values and syntagmatic interconnexion (Komatsu & Harris 1993: 137-143).

1.4 Einstein and Saussure Revisited

The close precision of patterns of lexis in text, the metaphors for text organization, the types of repetition, the repetition nets (Hoey 1991), and the dominating use of Two indicate that Saussure was working almost directly from 'On the Electrodynamics of Moving Bodies' in his development of the Cartesian co-ordinated, homogenous, linear, stationary, synchronic linguistic system of relative values.

Einstein's stationary system consists of rigid standards of measurement based on the methods of Euclidean geometry, and can be expressed in Cartesian co-ordinates. It is a homogenous, linear, synchronic system of values based on two principles. The observer, especially the moving observer, is extremely important in the analysis. The train is an important image, 'Two' is an important organising methodology, and the absolute is dispensed with.

Saussure's stationary system consists of rigid standards of measurement based on the methods of Euclidean geometry, and can be expressed in Cartesian co-ordinates. It is a homogenous, linear, synchronic system of values based on two principles. The image of the moving observer is used to emphasize the importance of the single perspective. The train is an important image in conceptualizing syntagma, 'Two' is an important organising methodology, and the absolute is dispensed with.

Einstein's wave system involves wave-trains from a distant source appearing on the reflective surface of the wave plane (work equal to the product based on the principle of energy). And all problems in the optics of moving bodies can be reduced to a series of problems in the optics of stationary bodies.

Saussure's wave system (La parole - a distant source) appears on the surface of the synchronic plane (work equal to the product based on the principle of energy) with all the problems of La parole being reduced to a series of problems in stationary systems of values (La langue - an epoch or state). Optics and projection are important images in conceptualizing a stationary linguistic system.

'On the Electrodynamics of Moving Bodies' discusses two systems (stationary and mobile), systems of values, the Cartesian co-ordinate system, independence of time, equations of mechanics, equilibrium, kinematics, the moving observer, linearity, synchronics, the X dimension, optics, the surface of the plane, epochs, the language of optics, the end of the absolute, and the

introduction of relativity. 'Two' is an important organising methodology.

The June 1911 section of the *Third Course in General Linguistics* discusses two systems (stationary and evolutionary), systems of values, the Cartesian co-ordinate system, independence of time, equations of mechanics, equilibrium, kinematics, the moving observer, linearity, synchronics, the horizontal dimension, optics, the surface of the plane, epochs, the language of optics, the end of the absolute, and the introduction of relativity. The selection of 'rods, constellation, sun, star, mass, nebula' as illustrating images indicates an associative connection with Einstein's Light. 'Two' is an important organising methodology throughout Saussure's lectures.

The similarity of so much structure, semantics, and system from 'On the Electrodynamics of Moving Bodies' in the June 1911 section of the *Third Course in General Linguistics* strongly indicates that the stationary system of relative values of General Linguistics was to a significant extent derived directly from the new physics evident in Einstein's 'On the Electrodynamics of Moving Bodies.'

1.5 Conclusion

The Cambridge Companion to Saussure (Saunders, Forthcoming) and the journal *Historiographia Linguistica* may represent the best modern compendiums in English to Saussurean studies. In the meanwhile, *Bibliographia Saussureana* (Koerner 1972) and *Ferdinand de Saussure* (Koerner 1973) present a broad, comprehensive, and

detailed description of the events and influences upon Saussure's *Third Course of Lectures on General Linguistics* (1910-1911). *From Locke to Saussure* (Aarsleff 1982), *Reading Saussure* (Harris 1987), and *Saussure and his Interpreters* (Harris 2001) provide a more recent coverage of the topic. However, such texts are limited by being based upon the posthumous 1916 *Cours de Linguistique Générale*. This planned series of articles aimed at recovering a lost, dynamic, nonlinear Saussure is based on the cahiers of Emile Constantin, a student who actually attended the third course (Komatsu and Harris 1993).

Koerner (1973: 213-242) and Harris (2001: 31-58) describe, in part, the editing, interpreting, reconstruction, and reorganization of Saussure's linguistic theorizing by Saussure's colleagues from the fragmentary lecture drafts and student notebooks in their magnificent compilation of the *Cours*. But Bally and Sechehaye effectively blocked 'any critical appraisal of their editorial work', and it was not until investigation by Godel (1957, 1961, 1966) and Engler (1968) that significant differences between the lectures and the 'textbook' that shaped Twentieth Century Anthropology, Language Teaching, Linguistics, Literary Studies, and Sociology, became apparent. That displacement notwithstanding, Saussure still retains the reputation of a mechanical structuralist.

Bréal, Durkheim, Gablentz, Hegel, Henry (V), Husserl, James (W), Kruszewski, Paul, Seivers, Taine, Tarde, and Whitney are names associated with the theoretical reconstruction of the *Cours*

(Vendryes 1952; Doroszewski 1931; Dinneen 1969; Jakobson 1960; Koerner 1973; Aarsleff 1982: 356-371; Komatsu & Harris 1993: xi). However, a return to primary sources indicates that Bally and Sechehaye edited from the *Cours de Linguistique Générale*, Saussure's application of the arithmetical calculus of the Berlin School, Hertzian Mechanics, the wave theories of Schuchardt, Schmidt, and Einstein, and Poincaréan bifurcations, maps, four-dimensional geometries, and chaotic dynamics.

In commencing the reevaluation of the theories of Ferdinand de Saussure in the history of ideas associated with Modernism, three significant phases are identified, Berlin 1878-1879, Paris 1880-1890, and Geneva 1907-1911. The first phase belongs to Dedekind, Weierstrass, and Hertz, although Hertz did not publish *The Principles of Mechanics* until 1894. The second phase belongs to Poincaré although Poincaré did not publish many of his popular books on science and multi-dimensional geometries until the first decade of the Twentieth Century. While the third phase belongs to Einstein. Paradoxically, it is the third phase which provides the relevant frame of reference by which to contextualize Grassmann, Dedekind, Weierstrass, Hertz, and Poincaré within Saussure's linguistic geometrization

In the movement from Absolute to Relative to Fractal, the reevaluation of Saussurean linguistic theory will lead to a fractal theory of linguistics with the common mechanisms governing linguistic sign, text, and variation being dimensions

6309, 1.2618, and 1.5849. It will be demonstrated that the linguistic system of General Linguistics is a Hamiltonian Hertzian conservative system connected to Einstein's stationary system; that the linguistic sign can be conceived of as a Koch snowflake or Möbius band; and that the linguistic line, actually a Dedekind chain consisting of Dedekind dots within a Dedekind domain, operates as a Cantor Dust. As a consequence of this inherent division of linearity, rather than a vicious circularity (Jakobson, cited in Koerner 1973: 352, 15f) scientific linguistic text displays evidence of Poincaréan chaotic dynamics and strange attractors – a direction in which Saussure had made significant progress – and grammar becomes the indefinite product of wave-trains rather than their static system source. However, in order to move to this nonlinear reconceptualization of Twentieth Century linguistic text, it is first necessary to grasp an understanding of Hertzian mechanics and its place within the Nineteenth Century Berlin movement to arithmetize the calculus. This will be the focus of the second and third papers on the discovery of a nonlinear Saussure lost in history and the indeterminate details explicit in stationary linguistic systems positioned within a general inertial frame.

1.5 Key References

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