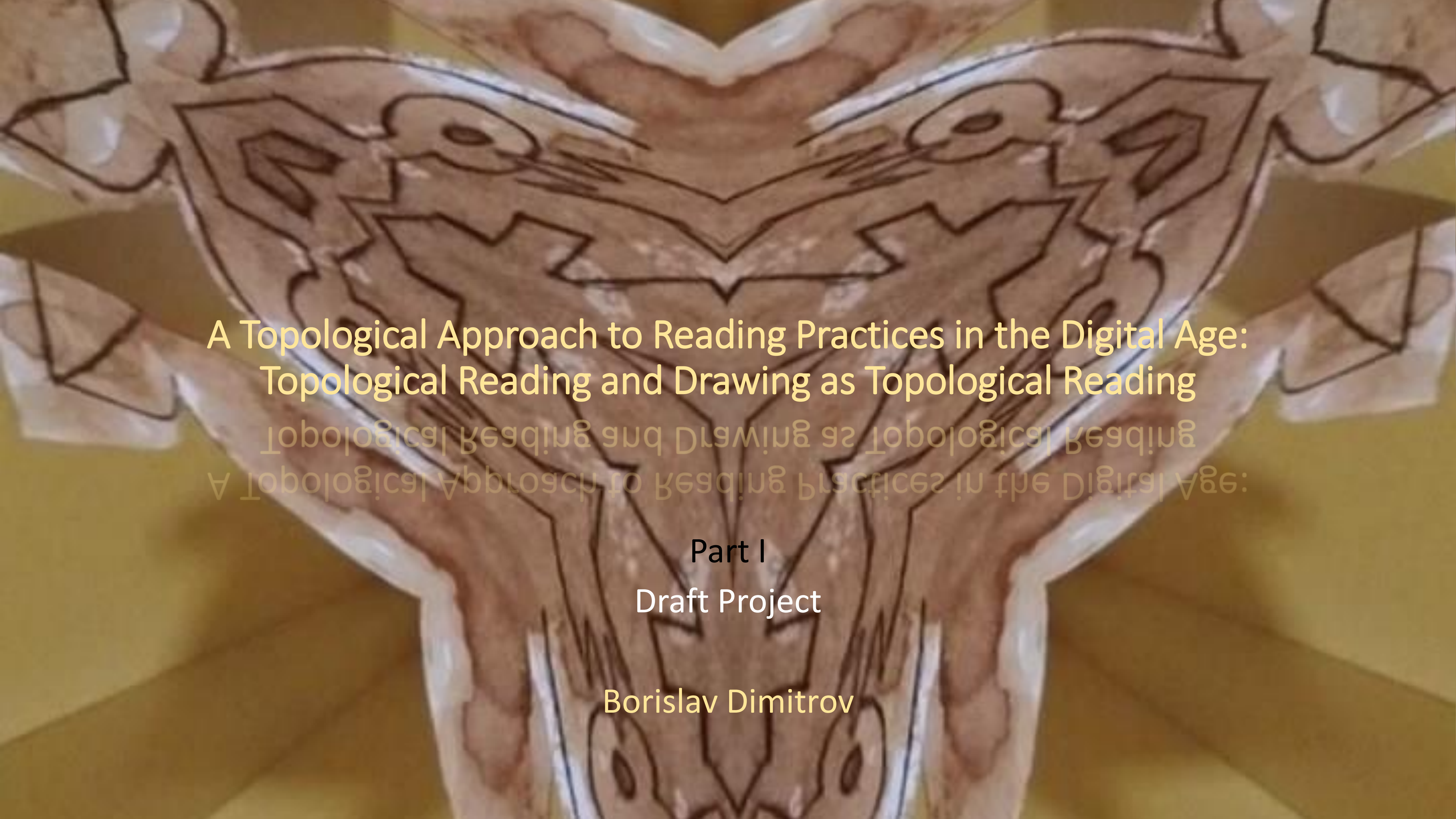


A Topological Approach to Reading Practices in the Digital Age: Topological Reading and Drawing as Topological Reading

Part I

Draft Project

Borislav Dimitrov

Topological Reading and Drawing as Topological Reading

"if topology is defined as the study of those qualitative properties which are invariant under isomorphic transformation, this is exactly what we did in structural linguistics"

Roman Jakobson, Antropology Today, p.311

Topological Reading and Drawing as Topological Reading

"Influence" is no longer the relevant metaphor: we are dealing not with inflow but homeomorphism, the domain of topology, systems of identical interconnectedness. Thus Joyce discerned homeomorphic structures in the Odyssey, Hamlet, Don Giovanni, The Count of Monte Cristo, and his own life. This suggests a grammar of generative plots."

Hugh Kenner, "The Pound Era"

Topological Reading and Drawing as Topological Reading

The theme of 'topological approach to the reading practices in the digital age' elaborates on the 'mathematization" of language . . . following the insights of structuralism - Ferdinand de Saussure, Roman Jakobson, Noam Chomsky, and Rene Thom's topological theory of language and topological syntax, also Angel Lopez Garcia's "topological linguistics", as well as the great French mathematicians (Poincare and Bourbaki), and the great French philosophers who used the structural insight to fight the analytical approach of their Anglo-American colleagues.

It is beyond doubt that French structuralism constitutes one of the most significant philosophical movements of this century, yet If the ways of analytical philosophy and structuralism essentially parted, their recent offspring – post-analytic philosophy and poststructuralism – are no longer antagonistic and indeed are sometimes surprisingly close. (Jaroslav Peregrin) In his work 'Structural Linguistics and Formal Semantics' (1995) Jaroslav Peregrin illustrates how "the meaning assignment is a homeomorphism from the algebra of expression to the algebra of meanings."

Topological Reading and Topological Drawing in Digital Age are related with the invariance. Invariance is the essence of language. The discovery of invariance as against variation is the greatest hallmark of modern structural linguistics. Chomsky reconstructed the language as a formal algebraic structure, yet in the Digital Age Language is not only an Algebra, Language is a Topology.

Topological Reading and Drawing as Topological Reading

Recent arguments asserting a topological turn in social and cultural dynamics also identify a range of topologically informed interventions in philosophy and linguistics applicable to the reading practices in the digital age.

- A Topological Approach to Cultural Dynamics (ATACD) a project funded by EU Framework program (2007-2010), lead by Prof Celia Lury, Warwick, research network based on the mathematical theories of topology, involved 19 university as partners from fields as diverse as semiology, crtificial intelligence, sociology, philosophy and mathematical economics. (Lury C., Parisi L. and Terranova T., 2012) / Lury C., Parisi L. and Terranova T. (2012) Introduction: The becoming topological of culture. Theory, Culture & Society 29(4–5): 3–35.
- The Topology project is developed at Tate Modern in collaboration with NTNU Trondheim (Norwegian University of Science and Technology), Goldsmiths, University of London, Ohio State University, and the Centre for Freudian Analysis and Research, London.
- The Topologies of Social Change is an area of research within the ESRC Centre for Research on Socio-Cultural Change at The University of Manchester, UK, where the theme is introduced as “Topological approaches (that) seek to address the fluidity and elasticity of social life. We approach notions of stability and change through an appreciation of the spatial and material qualities of relations, looking specifically at the more affective, messy, and hybrid aspects of transformative practice.”
- The International Center for Formal Ontology (ICFO), affiliated with the Warsaw University of Technology, Poland, announced the 5th International Ontological Workshop - Topological Philosophy (February 8 – 9, 2016).

Topology and Topological Philosophy

Topology and Topological Philosophy

Topology (Analysis Situs) from Greek τόπος, “place”, and λόγος, “study” is a branch of mathematics, the study of continuity and connectivity, formally defined as the study of qualitative properties of certain objects (topological spaces) that remain invariant under a certain kind of transformation (continuous map), especially those properties that are invariant under a certain kind of equivalence (homeomorphism).

The emergence of an entirely new discipline within mathematics is a rare event in the history of science. The creation of topology – the science of properties of spaces and figures that remain unchanged under continuous deformations – represents a phenomenon of this kind, but of a distinctly modern variety. As a discipline of mathematics, topology has existed for only seventy years, though antecedents go back centuries. (Blackwell, 2004:15)

- Blackwell, Brent M. (2004), Cultural Topology: an Introduction to Postmodern Mathematics http://reconstruction.eserver.org/044/blackwell.htm

Topology and Topological Philosophy

Topology is the mathematics of continuity, where continuity is the study of smooth, gradual changes, the science of the unbroken, and discontinuities are sudden, dramatic, places where a tiny change in case produces an enormous change in effect.

As Ian Steward asserts in his discussion on topology, continuity and discontinuity, "A potter, molding a lump of clay in his hands is deforming it in a continuous fashion; but when he breaks a lump of clay off, the deformation becomes discontinuous. Continuity is one of the most fundamental mathematical properties of them all, so natural a concept that its basic role only become clear a hundred years ago, so powerful a concept that is transforming mathematics and physics, so elusive, a concept that even the simplest questions took decades to answer. Topology is kind of geometry, but a geometry in which lengths, angles, areas, shapes are infinitely mutable. A square can be continuously deformed into a circle, a circle into triangle, a triangle into parallelogram. Topology studies only those properties of shapes that are unchanged under reversible continuous transformations." (Stewart, 1989).

Stewart asks – "What are the archetypal topological properties?" and asserts "To the untutored ear they sound nebulous, abstract, woolly. Connectedness just alluded to, is an example. One lump /of clay/ or two? …It requires new concepts, concepts not part of everyday experience, concepts for which no words exists." (Stewart, 1989).

Topology and Topological Philosophy

The roots of topology can be traced back to Ancient Greek philosophy (Plato and Aristotle). The presence of 'topological' in Aristotle is emphasized by Michael White in his article 'On continuity: Aristotle versus topology?' (1988) and Michael Eldred in his 'Digital dissolution of Being" (2010).

In "Bernhard Riemann's Conceptual Mathematics and the Idea of Space", **Arkady Plotinsky** asserted that "One might argue that the ancient Greeks had philosophical topology, as is suggested by Plato's concept of khora in Timaeus, which may even be seen as already questioning the very concept of spatiality. But they did not have a mathematical discipline of topology; their only mathematical (exact and quantifiable) science of space was geometry. Anticipated by Leibniz's conception of "analysis situs" (the term used by Riemann and for a while after him), topological ideas were gradually developed by Riemann and others, especially Henri Poincaré, whose work was uniquely responsible for establishing topology as a mathematical discipline."

Examining the "The Spaces of the Baroque (with Leibniz, Riemann, and Deleuze)", Plotinsky links the space /topos/ in the Baroque with Plato's khora /Timaeus/.

Topology and Topological Philosophy

Plato's concept of quality of numbers as the concept of Indefinite Dyad, known as "aoristas duas", which is a mathematical explanation of "forms" is implemented in the study of **Aleksei Fedorovich Losev** – "The Classic Kosmos" /Ancient Cosmos and Modern Science, 1927. (Losev 1927).

Long before the late-period Foucault discovered the relevance of Platonist hermeneutics, and Badiou recognized the necessity of the Platonic gesture, a radical turn towards the Platonic dialectic occurred in the work of Alexei Losev. (Kosykhin 2013)

In Philosophy of the Name, written in 1923 and published in 1927 (roughly the same time as Heidegger's Being and Time), Losev provides the first sketch of his dialectical system. As Losev writes, "I understand the dialectic as the logical elaboration (i.e., the elaboration in logos) of being considered in its eidos" (Losev 1990: 167). (Kosykhin 2013) For Losev, "the dialectic is the theory of the element of thought, which embraces all manner of eide in unified, integral being" (Losev 1990: 168).

Vitaly Kosykhin asserts that "the theory of the interaction of part and whole is this dialectic's constitutive aspect. Hence Losev's theory of topology as the quality of things forming a whole, i.e., the "theory of the eidetic morph, or the perfect space," and of arithmology as the theory "of the eidetic schema, or the perfect number" (Losev 1990: 346). (Kosykhin 2013)

Kosykhin points out that "both topology and arithmology are theories of meaning, which is considered, to quote Losev, in terms of "self-identical difference" in the first case, and "mobile rest," in the second. We see in these expressions a dialectical interaction between the four major ontological categories of Platonism—namely, identity, difference, motion, and rest—which are the supreme forms of ideas in Plato's ontology and immediately follow the idea of being, for whose essential description they are, in fact, meant. In Losev's work, this description is eidetic. (Kosykhin 2013)

Topology and Topological Philosophy

Around 1679, **Leibniz** himself particularly in De Analysis Situs, considers similarity, the ‘qualitative’ aspect of a figure as opposed to its quantitative aspects: “Beside quantity, figure in general includes also quality of forms. And as those figures are equal whose magnitude is the same, so those are similar whos form is the same.” (Leibniz, Philosophical papers and letters, 391 in Giovanelli, 2011:143).

Topology originally initiated with **Leonhard Euler**’s paper on the Seven Bridges of Konigsberg (1736), the study regarded as one of the first academic treatises in modern topology. The term “topologie" was introduced first in 1847 by **Johann Benedict Listing** and the discipline was established in the modern science by **Henri Poincare** with the published in 1895 Analysis Situs.

Topology and Topological Philosophy

In 1871 at Göttingen, **Christian Felix Klein** made major discoveries in geometry. He published two papers On the So-called Non-Euclidean Geometry showing that Euclidean and non-Euclidean geometries could be considered special cases of a projective surface with a specific conic section adjoined.

Next year, in 1872 Klein's synthesis of geometry as the study of the properties of a space that is invariant under a given group of transformations, known as the **Erlangen Program (1872)**, profoundly influenced the evolution of mathematics.

This program was set out in Klein's inaugural lecture as professor at Erlangen, although it was not the actual speech he gave on the occasion. The Program proposed a unified approach to geometry that became (and remains) the accepted view. Klein showed how the essential properties of a given geometry could be represented by the group of transformations that preserve those properties. Thus the Program's definition of geometry encompassed both Euclidean and non-Euclidean geometry.

Topology and Topological Philosophy

In 1880 **Cantor** began arguing for an actual infinity of actual infinities and five years later in 1885, **Henri Poincare** first introduced the term ‘bifurcation’ The same year Poincare published Analysis Situs, introducing the concept of homotopy and homology, now part of algebraic topology. Between 1899 and 1904 Poincare published five supplements to his paper.

In 1909, **Brouwer**, who is considered as the father of modern topology, unified some of Poincaré’s work on differential equations and published the first fixed point theorem in 1909.

In 1897 **Bertran Russell** started his philosophical career with the dissertation The Foundations of Geometry. (Bertrand Russell, The Foundations of Geometry. Cambridge: Cambridge University Press 1897). In the year 1903, Russell’s The Principles of Mathematics apears.

Topology and Topological Philosophy

In the year 1917**, D'Arcy Wentworth Thompson**, who was Professor of Biology at University College Dundee 1885-1917 and Professor of Natural History at the University of St Andrews 1917-1948, published On Growth & Form.

The father of D'Arcy Wentworth Thompson (1860 – 1948) was closest friend with Peter Guthrie Tait during their years at Cambridge.

Structuralism and topology are indisputably linked with D'Arcy W. Thompson, who advocated structuralism as an alternative to survival of the fitnes in governing the form of species. In his classic "On Growth and Form", D'Arcy Thompson analyzed biological form in terms of physical forces. With his famous set of diagrams, Thompson showed family resemblances between species of fish by deforming grids through smooth coordinate transformation, suggesting that topology is basic to the overall plan of an organism. In the last chapter of "On Growth and Form", D'Arcy Thompson's illustrates his "cartesian transformations" of animal forms. Thompson's mappings are referred to as "rubber sheet" mappings. D'Arch Thompson suggested that one should study the change from one biological form to another by examining the unique mathematical object that maps between them in accord with biological homologies.

Topology and Topological Philosophy

In his book “Synergetics: Introduction and Advanced Topics”, 41 in the Chapter 1.13. “Qualitative Changes: General approach”, **Hermann Haken** explores and illustrate the structural stability with an example /figure 1.13, p.434 in Haken/ given by the Scottish biologist, mathematician and classics scholar D'Arcy W. Thompson, the author of the book, On Growth and Form, /1917/. My assertion is that Hegel’s category of qualitative quantity is illustrated with Herman Haken’s citation of D'Arcy W. Thompson. Exploring the invariance in deformation and transformation of the forms against spatial or temporal deformation, Haken wrote:

“Figure 1.13, p.434 /“Synergetics: Introduction and Advanced Topics”/ shows two different kind of fish, namely, porcupine fish and sun fish. According to the studies by D'Arcy W. Thompson of the beginning of the twentieth century, the two kinds of fish can be transformed into each other by a simple grid transformation. While from the biological point of view such a grid transformation is a highly interesting phenomenon, from the mathematical point of view, we are dealing here with an example of structural stability. In a mathematician’s interpretation the two kinds of fish are the same. They are just deformed copies of each other. A fin is transformed into a fin, an eye into an eye and etc. In other words, no new qualitative features such as a new fin, occur. In the following we shall have structural changes /in the widest sense of word/ in the mind.” (Haken, H. 1983)

Topology and Topological Philosophy

Under the illustration set in Figure 1.13, p.434 /"Synergetics: Introduction and Advanced Topics"/, Haken wrote – "the porcupine fish and the sun fish can be transformed into each other by a simple grid transformation. After D'Arcy W. Thompson: On Growth and the Form, ed. By J.T. Bonner, University Press, Cambridge, 1981/." (Haken, H. 1983)

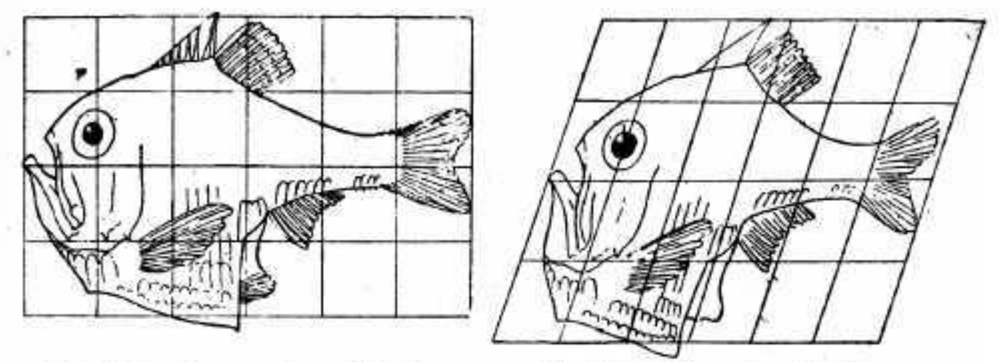


Fig. 517. *Argyropelecus Olfersi.* Fig. 518. *Sternoptyx diaphana.*

Topology and Topological Philosophy

The original Thompson's illustration of the transformation of the fish Argyropelecus olfersi into the fish Sternoptyx diaphana by applying a 70° shear mapping.

Hermann Haken's example we are illustrating here with the original Thompson's illustration of the transformation of the fish Argyropelecus olfersi into the fish Sternoptyx diaphana by applying a 70° shear mapping. The reverse transformation is possible simply with manipulating the grid and shear mapping.

Topology and Topological Philosophy

The example illustrated this transformation actually is a good example of homeomorphism. Two objects are homeomorphic if they can be transformed /or deformed/ into each other by a continuous inverible mapping, continuous one-to-one and having continuous inverse. The two fish are two objects with the same topological properties. They are said to be homeomorphic. There are properties that are not destroyed by stretching and distorting an object.

Topology and Topological Philosophy

D’Arcy W. Thompson’s structuralism influenced thinkers as the anthropologists such as **Claude Levi-Strauss**, **Edmund Leach**, and **Edwin W. Ardener** and the topological philosophy of **Jacques Lacan**, **Jacques Derrida**, **Gilles Deleuze**.

Thompson’s “On Growth and Form” has had a profound influence on present day science, art, architecture, engineering and anthropology.

Thompson was an inspiring visual thinker not just for scientists but also for artists. Major artists and thinkers from **Henry Moore**, **Le Corbusier** and **Jackson Pollock** to **Claude Levi-Strauss**, **Alan Turing** and **Stephen Jay Gould** have drawn on his work. The book's fascinating diagrams have become icons of visual thinking.

Topology and Topological Philosophy

Topological presence in D'Arcy W. Thompson's science, in particular the discussed above transformation sprigs perhaps from the mutual influence shared between Thompson and **Dorothy Maud Wrinch**, mathematician, topologist and biochemical theorist best known for her attempt to deduce protein structure (protein folding) using mathematical principles. Wrinch had been greatly influenced by the ideas of D'Arcy Thompson.

Deeply inspired by D'Arcy Thompson's ideas on form, Wrinch capitalized on topological considerations. She proposed during the mid-1930s a honeycomb-like cage structure, a cyclol, for native globular proteins. That the cyclol consisted of 288 amino acid residues - and thus supposedly offered yet another independent source of evidence for the Svedberg and Bergmann-Niemann units - only served to enhance the 'hypnotic power of numerology." (Kay, 1993)

Between 1918 and 1932 Wrinch published 20 papers on pure and applied mathematics and 16 on scientific methodology and on the philosophy of science. Bertrand Russell had a strong influence on Wrinch's philosophical work. In 1932 Wrinch was one of founders of the Biotheoretical Gathering, an inter-disciplinary group that sought to explain life by discovering how proteins work. Wrinch worked together with Joseph Needham, C.H. Waddington, J.D Bernal.

D'Arcy Wentworth Thompson pioneered the science of biomathematics. His book On Growth and Form is regarded as the first biomathematics treatise that has ever been written. In particular this is the chapter in which Thompson describes how differences in the forms of related animals can be formalized by means of simple mathematical transformations.

Topology and Topological Philosophy

Fred L. Bookstein, who is Professor of Morphometrics, Department of Anthropology, University of Vienna, Group Leader: Bioanthropology, Department of Anthropology, and Professor of Statistics, University of Washington, USA, and Distinguished Research Professor emeritus, University of Michigan, USA is biomathematician, among the small number of scholars seeking to operationalize and extend D'Arcy Thompson's construct.

Bookstein has conducted a research program to reshape the branch of biometry known as morphometrics. Working predominantly in the area of human craniofacial growth, Bookstein has championed the development of his own extensions of Thompson's synthesis with dozens of mathematically complex and often contentious expositions since 1978.

In "Biometrics, Biomathematics and the Morphometric synthesis", 'section 3. Biomathematical Studies of Shape Transformation, 3.1. Historical background/, Bookstein wrote:

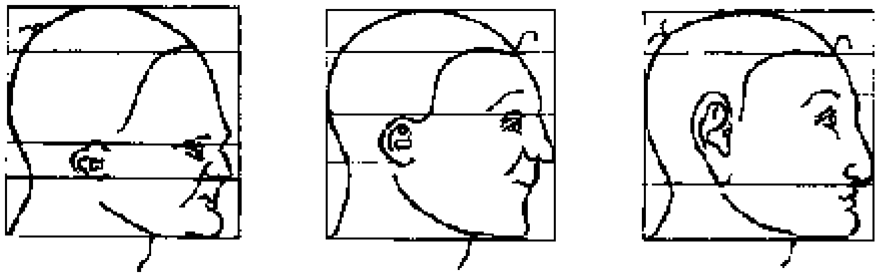
"What we borrow from the biomathematics of shape change is, of course, the visualization by transformation grid. Although this idea is usually associated with the famous treatise On Growth and Form by the British naturalist D'Arcy Thompson (19171, it is actually hundreds of years older than that. The first "transformation grids" reflect efforts of Renaissance artists to comprehend the variability of the human forms that they were just beginning to reproduce realistically. Figure 5, for instance, assembled from **Albrecht Diirer**'s (1528) vier Biicher uon Menschlicher Proportion, explores diverse types of "transformation grid," both affine and localizable, in the effort to explore the limits of normal variation and the strategies of effective caricature. The semiotics is that of geometric perspective, but the information conveyed is wholly different: no longer the effect of a change of vantage-point, but a change of organism.

This formal theme of shape transformation as the explicit object of biometric discussion was most clearly set forth in the famous Chapter XVII of Thompson (19171, "On the Theory of Transformations, or the Comparison of Related Forms." Thompson's goal is distinctly old-fashioned and much too Platonic to articulate with biometrics without severe modification:

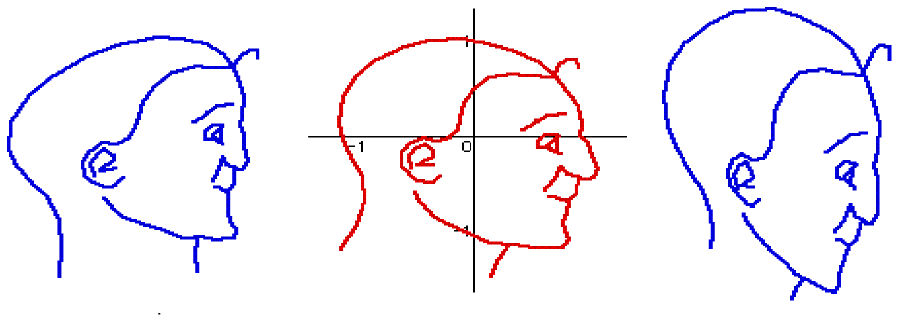
[If] diverse and dissimilar [organisms] can be referred as a whole to identical functions of very different co-ordinate systems, this fact will of itself constitute a proof that variation has proceeded on definite and orderly lines, that a comprehensive 'law of growth' has pervaded the whole structure in its integrity, and that some more or less simple and recognisable system of forces has been in control. . . ." (Bookstein, 1996)

Topology and Topological Philosophy

One set of images used by D'Arcy Thompson was taken from the artist (and mathematician) **Albrecht Dürer**'s treatise on proportion: De Symetria Partium in Rectis Formis Humanorum Corporum Libri... published in Nuremberg after his death in 1528.

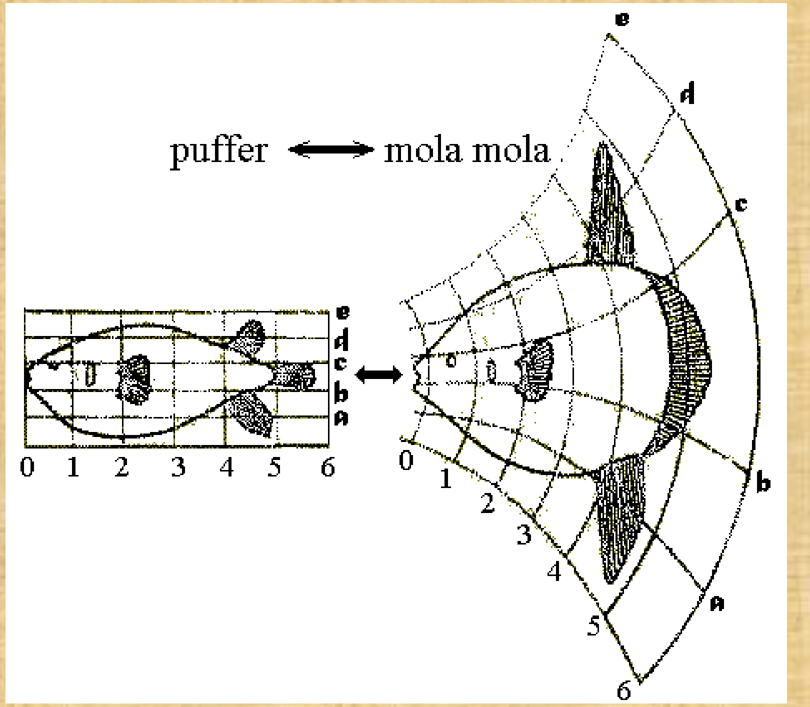


D'Arcy Thompson (after Albrecht Dürer)



Dürer's head and some of the other things one can do to it

Topology and Topological Philosophy



D'Arcy Thompson's classic fish transformation

Topology and Topological Philosophy

In March 2008, Tuns Press and Riverside Architectural Press, Faculty of Architecture and Planning of Dalhousie University, Halifax, Canada, published the book "On Growth and Form - Organic Architecture and Beyond", edited by Philip Beesley & Sarah Bonnemaison.

The book is such a celebration of D'Arcy Thompson. Sarah Bonnemaison and Philip Beesley addressed the issue - Why Revisit D'Arcy Wentworth Thompson's On Growth and Form?   (Beesley P., and Bonnemaison, S., 2008)

The editors, Sarah Bonnemaison and Philip Beesley answered the question with the following:

"D'Arcy Wentworth Thompson demonstrated new working methods for understanding the influence of physical forces in the environment, and the architectural projects in this book owe much to Thompson's research. They explore structural systems that use tension and 'tensegrity', in which forces animate the entire structure. **Digital design tools now allow such complex interactions to be quantified and dynamically modeled, and digital prototyping and manufacturing play important roles in their realization**. Instead of relying on centralized systems that resist environmental changes, new generations of buildings can accommodate shifting forces, distributing loads to better withstand undesirable deformation. Such buildings involve new methods of construction using chains of components and distributed structures." (Beesley P., and Bonnemaison, S., 2008)

Topology and Topological Philosophy

Alfred North Whitehead articulated in several books and articles published between 1916 and 1929 - **Mereotopology**, a branch of metaphysics, and ontological computer science, a first-order theory, embodying mereological and topological concepts, of the relations among wholes, parts, parts of parts, and the boundaries between parts.

In 1929 Whitehead published “Process and Reality”, the work that established the so called process philosophy. The book is a revision of the Gifford Lectures he gave in 1927-28. Whitehead put forward something like a topological philosophy, but it was not more than a sketch and had no infl uence on mainstream analytic philosophy of science.

Topology and Topological Philosophy

In 1927 with The Analysis of Matter, **Russell** was engaged in using topological methods for the “logical analysis” of space and time. Russell’s topological project was by far as the most sustained and detailed one. Russell developed his topological ideas with various degrees of precision and explicitness in several contributions, beginning with Our Knowledge of the External World, later in a more detailed way in The Analysis of Matter, and finally in On Order in Time. (Bertrand Russell, Our Knowledge of the External Worlds as a Field for Scientifi c Method in Philosophy. London: Routledge and Kegan Paul 1914; The Analysis of Matter, op. cit.; “On Order of Time”, in: Russell, Logic and Knowledge. London: Routledge 1956, pp. 347-363 (orig. 1936).

Russell’s talent for dealing with the conceptual tools of topology but his project did not find followers. Worse, no philosopher realized that Russell’s sketch of a topological logical analysis had long been superseded by the ongoing evolution of topology.

Russell’s attempt to introduce topological methods in philosophy of science for the logical analysis of philosophical and scientific notions remained unsuccessful. He wanted to show that the basic mathematical structures of physical space-time – usually conceived of as structured sets of spatial and temporal points (instants) – could be logically reconstructed from ‘crude sense data’, later to be characterized as ‘events’. He credited Whitehead with the basic ideas of this approach.

Topology and Topological Philosophy

Ernst Cassirer considered Klein’s Erlangen Programme as a guide line for the epistemology of his “Critical Idealism” characterizing the task of epistemology as finding the ultimate invariants of scientific knowledge. In Substanzbegriffund Funk tions begriff and much later in The Philosophy of SymbolicForms he dedicated central chapters to concept formation in geometry which he considered as a paradigmatic case for concept formation in science überhaupt. Cassirer emphasized in his philosophy of science the importance of geometry for philosophy of science, but offered only some general, passing remarks on the role of topology.

Topology and Topological Philosophy

- About the time Cassirer's Substance and Function was first published (1910), **Kurt Lewin**, the author of "**Principles of Topological Psychology" (1936)**, was a graduate psychology student at the University of Berlin. He began attending Cassirer's lectures on the philosophy of science which left an indelible impression on him and strongly influenced his subsequent work. After being wounded in the war, Lewin completed his Ph.D. under Stumpf, and, like Cassirer, left Germany in 1933. Unlike Cassirer, however, Lewin went almost immediately to the United States where he became a famous, iconoclastic leader in the field of American social psychology. Lewin says "That correct qualitative analysis is a prerequisite for adequate quantitative treatment is well recognized in psychological statistics. What seems less clear is that the qualitative differences themselves can and should be approached mathematically" (p:31).
- Again, Lewin references Cassirer as one who "points out again and again that mathematization is not identical with quantification. Mathematics handles quantity and quality" (p:30-31).

Topology and Topological Philosophy

Topological elaborations are strongly presented in continental philosophy through the works of **Jacques Lacan**, **Michel Foucault** (the logic of places and interpreted 'heterotopology' as the co-existence of several incompatible spaces in a real place), Topological Poetic of **Gaston Bachelard** (The Ethical Image in a Topological Perspective: the Poetics of Gaston Bachelard), **Jacques Derrida**, **Gilles Deleuze**, **Michel Serres** (Tologies: Michel Serres and the Shapes of Thought , Steven Connor), **Alain Badiou** has introduces his philosophical topology through two works – Logic of Words (2009), as an attempt to rephrase his material dialectic philosophical project in terms of topos theory, and Theory of the Subject (2009). In Theory of the Subject (1982/2009), Alain Badiou states that "In the opening onto a new metaphor, we will say that there is the algebraic disposition and the topological disposition. (Badiou, 1982/2009:208). In 1974 **Derrida** published "Of Gramatology" entitled "Algebra: Arcanum and Transparence" (1974). The genealogy of Derrida's philosophical algebra , especially his algebra of undecidables, could be traced trough Godel back in its roots in Leibniz. Derrida devoted to Leibniz an important section of "Of Gramatology" entitled "Algebra: Arcanum and Transparence" (1974). This work of Derrida deals with the logical algebra …of writing. The strange term is typical for Derrida sense. Leibniz's ideas concerning the possibility of making topology into a rigorous mathematical discipline were among his great contribution to mathematics. In his "The Double Session", devoted to Deleuze's topology, Derrida offers us philosophically geometrical topological perspective on or approach to fold. This perspective is Derida's philosophical algebra, which entails, as Arkady Plotnitsky asserts a certain topology or spatiality.

Between 1952 and 1968 **Claude Levi-Strauss**'s "Social Structure" (1952) and Structural Antropology (1968), appeared embedding his topological thinking. Between 1956 and 1960, **Merleau-Ponty** introduced the allusion to "topological space" in The Visible and the Invisible.

In sociology, the so called topological sociology or social topology was developed by **Pierre Bourdieu** and **Gregory Bateson**, and also evident in works of the anthropologist **Edmund Leach**.

Topology and Topological Philosophy

In Contemporary philosophy, **Jeff Malpas** first introduces the issue of 'philosophical topology' in series of papers on **Heidegger**, **Gadamer** and **Husserl**, claiming that "topology is present in Heidegger and, though less explicitly, in Hegel." Malpas discusses essential topological character of Husserl's work, asserting that "the way in which Husserl understands the structure of meaningful experience is in terms of a set of notions that are themselves essentially topological in character, so that the structure of phenomenological presentation is identical with the structure of place." (Malpas, 2011; Jeff Malpas, Self, Other, Thing, http://philevents.org/event/show/13584)

For **Brent Blackwell**, "The post-war work in topology that has spread to nearly every corner of mathematics, moves the discipline in this direction as well: towards a redefining of its own scope….Topology changed the conditions of the game by re-defining what it means to construct, suggesting that perhaps extrinsic properties were no longer sufficient to describe a figure. Since topology analyzes the qualitative properties of figures, it becomes the first branch of mathematics to be in a position to make meaningful, qualitative statements about the "culture" of their realities as well." (Blackwell, 2004:41)

Linguistics, Topology and Topological Philosophy

Linguistics, Topology and Topological Philosophy

In 1934 **Lucien Tesnière** published the article ”Comment construire une syntaxe” which preceded his monumental work on structural syntax, posthumously published in 1959 with the title Eléments d’une syntaxe structurale (Elements of Structural Syntax).

Tesnière’s Elements of Structural Syntax proposes a sophisticated formalization of syntactic structures.

He developed the concept of valency in detail, and the primary distinction between arguments (actants) and adjuncts (circumstants, French circonstants), which most if not all theories of syntax now acknowledge and build on.

Tesnière argued that syntax is autonomous from morphology and semantics. Some of the central concepts in Tesnière's approach to syntax are 1) connections, 2) autonomous syntax, 3) verb centrality, 4) stemmas, 5) centripetal (head-initial) and centrifugal (head-final) languages, 6) valency, 7) actants and circonstants, and 8) transfer.

Linguistics, Topology and Topological Philosophy

Wildgen and Brandt assert that in the developing topological theory of language, Thom is standing on the shoulders of the founding father of modern syntax, Lucien Tesnière (1893-1954).

Lucien Tesnière begins the presentation of his theory of syntax with the ‘connection’, the central concept for him. Connections are present between words of sentences. They group the words together, creating units that can be assigned meaning. Tesnière writes:

"Every word in a sentence is not isolated as it is in the dictionary. The mind perceives connections between a word and its neighbors. The totality of these connections forms the scaffold of the sentence. These connections are not indicated by anything, but it is absolutely crucial that they be perceived by the mind; without them the sentence would not be intelligible. ..., a sentence of the type Alfred spoke is not composed of just the two elements Alfred and spoke, but rather of three elements, the first being Alfred, the second spoke, and the third the connection that unites them – without which there would be no sentence. To say that a sentence of the type Alfred spoke consists of only two elements is to analyze it in a superficial manner, purely morphologically, while neglecting the essential aspect that is the syntactic link."

Linguistics, Topology and Topological Philosophy

The issue of Reading Practices in the Digital Age is unfolded in relation with **Rene Thom**'s topological theory of language and topological syntax.

In 1970, Thom presented sophisticated catastrophe theory model of language. He developed a visual representation of the verbs associated with spatio-temporal activity. This was, Thom would say 20 yars later, a "geometrization of thought and linguistic activity". Thom classified syntactical structures into 16 categories and claimed that "the topological type of the interaction determines the syntactical structure of the sentence wich describes it." According to Thom, meaning and structure were no more independent. Thom constructed a modeling practice which, roughly speaking, used topologically informed means of transformation, biologically inspired raw materials that he adapted to mathematical practice.

These seven are: fold, cusp, swallowtail, butterfly, hyperbolic umbilic, elliptic umbilic, and parabolic umbelic. Rene Thom used transversality as the main tool to prove the existence of universal unfolding. Thom created a mathematically rigorous theory that showed "the true complementary nature of the seemingly irreconcilable notions of versality and stability, that is, preserving identity in spite of development.

Linguistics, Topology and Topological Philosophy

In “Topologie et linguistique” (1970) Thom proposed that the small number of elementary sentence types corresponds to the small number of topological structures underlying events in the exterior world, the so called Versal Unfolding.

According to Thom, meaning and structure were no more independent. Thom contributed to the idea of versal unfolding. (Bruce, B. and D.N. Mond .1999)

The term ‘versal’ is the intersection of ‘universal’ and ‘transversal’, and one of the Thom’s insights was that the singularities of members of families of functions of mappings are versally unfolded if the corresponding family of jet extension maps is transverse to their orbit (equivalence classes) in jet space.” (Peter Tsatsanis, P. 2012: 223-224)

This insight of Thom led him to the Catastrophe theory with identified by him seven orbits of function singularities which can be met transversally in families of fewer parameters – the seven elementary catastrophes, which meant to underlie all abrupt changes (bifurcation) in generic four parameters families of given dynamical systems.

Linguistics, Topology and Topological Philosophy

Rene Thom constructed a modeling practice which, roughly speaking, used topologically informed means of transformation, biologically inspired raw materials that he adapted to mathematical practice.

Angel Lopez Garcia, who introduced the “topological linguistics”, gives a rather critical reading of Thom`s proposals related to verbal semantics and the structure of basic propositions.

Garcia compares Thom’s specific analysis of verbs with the tradition of structuralism (Hjelmslev, Jakobson, Halliday, Chomsky) and the models: “Liminar Grammar” and “Topological Linguistics” proposed by himself. (Garcia, 1990)


verbivicovisual topology
JAMES JOYCE
Joyce without Hegel and Vico without Hegel
PRINCIPJ
SCIENZA NUOVA
GIAMBATTISTA VICO
TOMO I.
IN NAPOLI MDCCXLIV.
"Vico's tetrad" constructed by Plato, Tacitus, Bacon and Grotius
Wissenschaft der Logik
Werke.
JOYCE
TOPOLOGICAL
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Donald Phillip Verene 'tetrad'
Hegel, Cassirer, Vico and Joyce

BORISLAV DIMITROV, LL.M, PhD

Borislav Dimitrov is Visual Artist, Philosopher and Lawyer

https://borislawart.weebly.com/
https://www.behance.net/borisart
https://ariadnetopology.academia.edu/borislavdimitrov

Boris is a lawyer and visual artist, who completed his PhD thesis in philosophy (2016) – 'Topological (in) Hegel', within the PhD Program in Philosophy Taught in English, Faculty of Philosophy, Sofia University "St. Kliment Ohridski", Bulgaria.

He was a Visiting PhD Researcher at Faculty of Social Science, Lund University, Sweden (2014/2015), contributing with lectures on Philosophy of Science for Social Science, introducing his own curriculum on Applied Topological Philosophy and Topological Approaches to Law and Auditing, Phenomenology of Knowledge Spaces, Theory of Knowledge Spaces, and Visualization of Knowledge, Topological Data Analysis.

In 2015, he served as E-Discovery, Document Review Lawyer with Epiq Systems UK, JP Scrafton, and the Institute of Revenues Rating and Valuation (IRRV), London, UK. Borislav has professional interest and well established professional contacts in bitcoin/blockchain applications (decentralized models of communication, market, economy, and law, based on the cryptography) such as smart contracts, crypto law, blockchain application in law and auditing, including IP protection and notary services.

The sources of his artistic influence are literature, philosophy, topological philosophies and topological thinking.

Boris is influenced by Hugh Kenner's claim ("The Pound Era"), that: "Influence" is no longer the relevant metaphor: we are dealing not with inflow but homeomorphism, the domain of topology, systems of identical interconnectedness."

Boris's main project "Icon-o-graphing in visual fable James Joyce' novel "Finnegans Wake" (1999-2014), is in the center of his recent project 'Metalepsis: Topologically Speaking, Seeing, Thinking and Drawing'. He started this project back in 1999 in Toronto, Canada, with few solo art exhibits, and continued the work in Sofia, Bulgaria and Lund, Sweden.

The rest of Boris's art work series includes the artifacts of consciousness, myths and literature, related with the cultural phenomenology of literature like: Orpheus -The Thrace Fabulous (Thracian Orphism), The Epic of Gilgamesh, The Legend of the Golem, Franz Kafka, Samuel Beckett, Hopscotch /Rayuela/ of Julio Cortazar, Vladimir Nabokov, Thomas Pynchon, Herman Melville's Moby Dick, Jonathan Swift…

In addition Boris is interested in blockchain and art relation. With the use of blockchain platforms such as Ascribe and Artbyte (https://www.artbyte.me/members/boriswake/), he introduces limited digital editions of his artwork and paintings embedded in QR/AR Codes, each one with a unique ID and a digital Certificate of Authenticity (COA) to prove provenance and authenticity.

Boris manages Peony Gallery - An Post-physical Exhibition Space – the first crypto art blockchain gallery in Bulgara.

Fourfold of Infinities: The main objective of the present thesis is to demonstrate how Hegel's categories, concepts, language, syntax and semantics, his use of rhetorical power exhibit topological notions and thus the reading of Topological (in) Hegel is open for conceptualization. My assertion with the present thesis is that topological reading of Hegel unfolds true topological system, thus there are reasonable grounds for us to see the doctrine of Hegel, in particular his Science of Logic and Philosophy of Nature as Hegel's Analysis Situs.

Borislav Dimitrov is Visual Artist, Philosopher and Lawyer. PhD thesis in philosophy (2016) - Topological (in) Hegel within the PhD Program in Philosophy Taught in English, Faculty of Philosophy, Sofia University "St. Kliment Ohridski", Bulgaria, Visiting PhD Researcher at Faculty of Social Science, Lund University, Sweden (2014/2015)

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ical (in) Hegel

Dimitrov

Borislav Dimitrov

Topological (in) Hegel

Topological Notions of Qualitative quantity and Multiplicity in Hegel's Fourfold of Infinities

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