////// obsah / contents //////////////////////////////////////

////// tematická studie / thematic articles ////////////////////

PHILOSOPHICAL TOYS TODAY

Abstract: *The article introduces a thematic issue of the journal Theory of Science that attempts to revive the category of "philosophical toys" – objects and instruments designed for experimental scientific research that simultaneously played crucial role in the creation of the modern visual culture. It claims that to fully understand their nature and the kind of experience philosophical toys induce, it is necessary to situate their origins in eighteenth-century experimental science and aesthetics and proposes to approach them as perceptual and cognitive extensions.*

Keywords: *philosophical toys; scientific instruments; modern visual culture*

Filosofické hračky dnes

Abstrakt: *Studie uvádí tematické číslo časopisu Teorie vědy věnované aktualizaci koncepce „filosofických hraček" – předmětů a přístrojů určených k experimentálnímu vědeckému zkoumání, jež zároveň výrazně ovlivnily utváření moderní vizuální kultury. Abychom plně porozuměli povaze těchto přístrojů a typu zkušenosti, již sebou přinášejí, je třeba jejich původ situovat do experimentální vědy a estetiky osmnáctého století a chápat je jako percepční a kognitivní extenze.*

Klíčová slova: *filosofické hračky; vědecké přístroje; moderní vizuální kultura*

TOMÁŠ DVOŘÁK
Kabinet pro studium vědy, techniky a společnosti
Filosofický ústav AV ČR, v.v.i.
Jilská 1, 11000 Praha 1
email / tomdvorak@flu.cas.cz

Tomáš Dvořák

The term "philosophical toy" was used in the first half of the nineteenth century to designate a specific family of artifacts with a dual ambition: to examine various phenomena experimentally and to provide popular amusement. They were mostly simplified or derivative versions of scientific instruments that spread among the lay public and became sought-after consumer goods, modern, awe-inspiring curiosities. This issue of *Theory of Science* seeks to analyze the specific position that philosophical toys occupied – at the boundaries of science, arts and popular culture, in between theory and practice, knowledge and amusement – and to describe cultural forms that populate these thresholds in today's culture.

In this introduction, I will attempt to capture the nature and functions of philosophical toys through a combination of perspectives of three contemporary authors from different fields, whom I find most inspiring for both the historical analysis of this phenomenon and its contemporary relevance. Triangulation of these perspectives will reveal some of the distortions they entail; I will try to address them in a seemingly paradoxical maneuver – by descending into the material culture of the science and aesthetics of the second half of the eighteenth century.

Nicholas Wade is a psychologist specializing in research of vision and visuality, both contemporary and historical. He is interested chiefly in optical philosophical toys and their role in the history of experimental physiology and psychology, as well as in their influence on the visual arts. Although Wade emphasizes the fact that unlike "philosophical instruments" (instruments of the natural philosophy of the seventeenth and eighteenth centuries that served the purposes of demonstration and experimental analysis) philosophical toys are meant to be also amusing and accessible to the broader public, his accounts are essentially limited to the development, use and interpretation of these contrivances within the scientific realm: they constitute a neglected chapter in the history of science. By "public" Wade typically means artists, namely painters, for whom questions of vision are also essential. His contribution rests primarily in his detailed account of philosophical toys (such as the kaleidoscope, thaumatrope, phenakistiscope, stroboscope, stereoscope, tachiscope...) and their roles in nineteenth-century scientific research on the perception of colors, space, depth, movement or time.[1]

[1] Nicholas J. WADE, "Philosophical Instruments and Toys: Optical Devices Extending the Art of Seeing." *Journal of the History of the Neurosciences*, vol. 13, 2004, no. 1, pp. 102–124 and Nicholas J. WADE, "Toying with Science." *Perception*, vol. 33, 2004, no. 9, pp. 1025–1032.

A very similar set of devices is discussed by Jonathan Crary, a historian of art and visual culture. In his Foucaldian attempt at rewriting the traditional historiographies of art and media, Crary introduces a radical historical break, a discontinuity between the classical and modern regimes of vision, between the classical and modern spectator. The period of seventeenth and eighteenth centuries is characterized by the camera obscura as both a material device and a discursive figure: it is a concrete technical artifact and a dominant epistemological model (embraced by empiricists as well as rationalists) that defined the status and capabilities of a perceiving subject. The camera obscura model was based on a radical differentiation of the inside from the outside, on the separation of the dark interior of the human mind from the luminous outside world that penetrates inside through the aperture of the senses and so depicts its own image. The outside model and its inside copy correspond to each other, and it is the mechanism of the camera obscura and its physical principles that guarantee the objectivity of the projection. Experimental physiology developed in the early nineteenth century breaks with this model in an essential way when it begins to conceive of vision in terms of bodily and temporal processes. Goethe's or Purkinje's investigations of afterimages begin to delineate the conception of subjective vision, imagery produced by the human body that lacks any correlate in the outside world. It is the various optical apparatuses that according to Crary play crucial role in research and control of such visual experience. Thanks to them the referential illusion could have become the subject of popular entertainment as well. In the simplest form we can find it in a thaumatrope, a device that utilizes the persistence of vision: two different yet complementary images are painted on the front and reverse side of a paper disc (such as a bold head and a wig, a bird and a cage ...), which is attached to a stick or two pieces of rope and by twisting them fast enough the two images combine. This way anyone could realize that the resulting visual impression is not really what is in front of us, that the human senses generate optical illusions thanks to their "fallibility". Crary devotes most attention to the stereoscope, the "quintessentially nineteenth-century device" and the source of the most realistic effect in the mass culture of that time. The principle of stereoscopy is "based on a radical abstraction and reconstruction of optical experience",[2] it is the result of the separation and isolation of individual senses, their

[2] Jonathan CRARY, *Techniques of the Observer. On Vision and Modernity in the Nineteenth Century*. Cambridge, MA: MIT Press 1990, p. 9.

scientific analysis and targeted and controlled irritation by mechanical instruments.

Film historian and theorist Tom Gunning published several brilliant studies about (again, particularly optical) philosophical toys. I regard these studies as the most inspiring contributions to the topic so far, because they actually situate the toys within the realm of popular culture (Crary's account follows mainly shifts in the conceptualization of vision in the works of intellectual elites, philosophical toys being their secondary illustrations) and also regard them as a constitutive moment of modern and contemporary media culture, a tendency still present and effective that intersects with and supplements other visual forms and conventions. The starting point for Gunning's interest in these proto-cinematographic devices is his radical reassessment of early cinema, expressed in the conception of "the cinema of attraction" from 1986. Until then, the historiography and theory of film were dominated by a narrative understanding of film that was unable to adequately grasp its early phase (until about 1906), which was taken to be a groping, undeveloped, primitive film form still in search of its true media-specific narrative nature. However, according to Gunning, the cinema of attraction is guided by very different principles, it is based on making images seen, harnessing visibility and exhibiting both the filmic illusion and the film technology. He sees early cinema "less as a way of telling stories than as a way of presenting a series of views to an audience, fascinating because of their illusory power [...] and exoticism."[3] It is necessary to point out that this exhibitionist impulse does not evaporate from cinema even after the classical, narrative form takes over; it rather becomes a kind of submerged stream that feeds avant-garde film and often surfaces into mainstream cinema, just like today in the form of special effects or so-called 3D, 4D, and 5D cinema. Later, Gunning searches for these aspects of film understood in terms of a fair attraction or a parlor trick in the popular visual culture of the nineteenth century. Philosophical toys and their "technological images" based on the manipulation of human perception through mechanical devices give rise to the modern image culture, at once profoundly technological and perceptual. Thanks to its simplicity, thaumatrope serves as Gunning's first and foremost example of this new phenomenon:

---

[3] Tom GUNNING, "The Cinema of Attraction: Early Film, Its Spectator and the Avant-Garde." *Wide Angle*, vol. 8, 1986, no. 3–4, p. 64 (63–70).

> We see this image not simply as a representation of something, but as an event, a process, an almost theatrical turn in which the image behaves in an unexpected manner, calling attention to its own production, making its appearance into a performance of image-ness, of becoming visual, of *appearing*.[4]

Similarly, later devices such as the phenakistiscope – a rotating disc with a series of movement phases – "do not represent motion, they produce it."[5] While producing visual illusions, philosophical toys, according to Gunning, at the same time demonstrate the process that generates them and make it possible for us to understand how our senses function and how they interact with the environment: they provide us with "rational entertainment." Gunning adopts Crary's historiographical model, situates the moment of emergence of the modern visual culture in the 1820s and exemplifies it with the thaumatrope. I am convinced we must look deeper than that.

Gotthold Ephraim Lessing wrote his short but remarkable fragment "That more than five senses are possible for human beings" at the very close of his life, most likely in 1780. In several paragraphs, he outlines a conception of human development from simple forms to complex and advanced ones: human sensory apparatus is not fixed once and for all but evolves towards greater refinement and complexity. Our present stage of five senses was achieved through combinatorics of individual ones: "If nature nowhere makes a leap, the soul will also have progressed through all the lower stages before it reached the stage at which it is at present. It will first have had each of these senses singly, then all ten combinations of two, all ten combinations of three, and all five combinations of four before it acquired all five together."[6] The present combination is not, however, the final stage of development: senses determine the limits of the soul's representations, they are their order and measure and the way the soul is conjoined with matter – the senses are themselves material. Matter, however, is not monolithic; it contains homo-

---

[4] Tom GUNNING, "Hand and Eye: Excavating a New Technology of the Image in the Victorian Era." *Victorian Studies*, vol. 54, 2012, no. 3, p. 510 (495–516).
[5] Tom GUNNING, "The Play between Still and Moving Images: Nineteenth-Century *Philosophical Toys* and Their Discourse." In: RØSSAAK, E. (ed.), *Between Stillness and Motion. Film, Photography, Algorithms*. Amsterdam: Amsterdam University Press 2011, p. 38 (27–43).
[6] Gotthold Ephraim LESSING, "That More than Five Senses Are Possible for Human Beings." *Philosophical and Theological Writings*. Cambridge: Cambridge University Press 2005, p. 180 (180–183).

geneous elements or masses that correspond to particular senses.[7] Because we know that there are more than five homogeneous matters (although we cannot know for sure how many there are in the world altogether), we can assume more senses are possible:

> Thus, just as the sense of sight corresponds to the homogeneous mass through which bodies attain a condition of visibility (i.e. light), so also is it certain that particular senses can and will correspond, e.g., to electrical matter or magnetic matter, senses through which we shall immediately recognize whether bodies are in an electrical or magnetic state. We can at present attain this knowledge only by conducting experiments.[8]

Lessing illustrates his thesis with the classic motive of sensory impairment: if we lacked vision, for example, we would not be able to form any conception of it. After gaining sight, a "whole new world will suddenly emerge for us, full of the most splendid phenomena." In the same way, we are aware (thanks to scientific research) of the existence of electrical or magnetic powers but we cannot perceive them because we haven't developed special senses for them yet. Human perception is dependent upon psychophysical constitution, which is not invariable.

Of course, Lessing does not speak in terms of purely biological evolution; his system is "the oldest of all philosophical systems," the system of the soul's pre-existence and of metempsychosis. The idea of a process in which an immortal soul migrates into new complex beings was very popular in Lessing's times and he himself developed it further in some of his other, later texts. Aside from a rich tradition of metempsychosis speculation, Lessing was most likely inspired by Charles Bonnet's theory of palingenesis.[9]

Bonnet was one of the first authors to use the term evolution, although in a different manner than it is known to us from the nineteenth century. His Leibnizian approach to evolution was marked by a belief in preformation, according to which every living being encapsulates in itself a primordial seed, an unchanging miniature replica of itself that is activated at fertilization and

---

[7] In this regard, Lessing draws on the traditional assigning of particular senses to different elements and simultaneously radicalizes his earlier and more famous notion of a "suitable relation" between signs, their referents and modes of perception that will be discussed below.
[8] LESSING, "That More than Five Senses Are Possible." p. 181.
[9] Such is the contention of H. B. Nisbet in his introduction to LESSING, *Philosophical and Theological Writings*, p. 14. The influence of Lessing's close friend Condillac and his discussion of the senses in the 1754 *Treatise on the Sensations* needs to be acknowledged as well; however, it is the progressive development found in Bonnet that provides the relevant framework.

develops into new identical organisms. At the creation of earth, all future generations of living beings were embodied in these primordial germs and the breeding of new creatures is essentially the production of endless series of copies of a given species. Preformationism excludes change or variation in the later evolutionary sense. It is not, however, an entirely static system. In his *Philosophical Palingenesis* from 1769, Bonnet delineates an image of catastrophic revolutions that radically alter living conditions on Earth and lead to new rebirths. The physical bodies of organisms are destroyed during these periodical catastrophes, but their germs survive and are born again into new worlds. These new worlds bring about different living conditions from the preceding ones, which is the reason why organisms acquire new forms corresponding to these new environments. "I conceive that the germs of all organized beings were originally constructed or calculated with a determinate correlation with the diverse revolutions which our globe was to undergo."[10] Catastrophic revolutions are predetermined just like the forms of the living are and they allow organisms to evolve towards greater biological complexity and higher spiritual perfection.

Bonnet's temporalizing of the chain of being does not involve the gradual transformation from simple to complex forms but proceeds rather by discontinuous leaps, a general shifting of all living beings and their hierarchical arrangements. During these phases, living beings constitute a continuous series, an uninterrupted chain of being that develops through sequential revolutions of time:

> The series of events, however, is quite distinct from these spatial configurations, each of which describes the taxonomic continuity in its own way; the series of events is discontinuous, and different in each of its episodes; but, as a whole, it can be drawn only as a simple line, which is that of time itself (and which can be conceived as straight, broken, or circular). In its concrete form, and in the depth that is proper to it, nature resides wholly between the fabric of the *taxinomia* and the line of revolutions.[11]

Late eighteenth-century natural history historicizes nature by integrating a consecutive series with the continuity of living beings: "evolution" is still both a scientific and a theological term. It has to be reconciled with the be-

---

[10] Quoted in Arthur O. LOVEJOY, *The Great Chain of Being. A Study of the History of an Idea*. Cambridge, MA: Harvard University Press 1936, p. 285.
[11] Michel FOUCAULT, *The Order of Things. An Archaeology of the Human Sciences*. London – New York: Routledge 2002, p. 163.

lief in the immortality of the soul and preformation. The inner hierarchical structure is not affected by time; time is not the principle of the evolution of organisms and their organization in the sense of later evolutionism and transformism. For Bonnet, evolution is the unfolding of a pre-programmed course that determines the nature of organisms, their mutual relationships, as well as revolutions of the environment they inhabit.

Lessing's fragment falls within this evolutionary framework, the development of the senses is understood as a combination of individual senses and their aggregates, not as their gradual perfection. However, his examples of existing matter (electrical or magnetic), which cannot be im-mediately perceived yet, must bring us to a halt. We gain knowledge of them by conducting experiments. It is due to scientific experiments that invisible processes, powers and matters become manifest in various effects – and we can register these effects with our senses or detect them with diverse (mostly measuring) instruments. The discoveries of electrical, magnetic or galvanic phenomena in the eighteenth century were still closely connected to the belief of God's presence in the world and they inspired radical changes in the understanding of the relationship between the body and soul or matter and spirit, when they replaced the traditional medieval metaphysics of light: "Magnetism and electricity emerged as the most palpable manifestation of the hidden presence of divine power in the world and its objects – as the concealed power that creates life, movement and warmth; that permeates the entire universe ..."[12]

Joseph Priestley, the author of a seminal survey of historical and con-temporary electrical research from 1767, emphasizes the role causality plays in human cognition:

> One of the most intimate of all associations in the human mind is that of *cause* and *effect*. They suggest one another with the utmost readiness upon all occa-sions; so that it is almost impossible to contemplate the one, without having some idea of, or forming some conjecture about the other. In viewing the works of nature, we necessarily become first acquainted with appearances or effects.[13]

Appearances and effects are extremely diverse; therefore, it is necessary to search for analogies among them and so explain them by a small number of

---

[12] Ernst BENZ, *The Theology of Electricity. On the Encounter and Explanation of Theology and Science in the 17th and 18th Centuries*. Allison Park: Pickwick Publications 1989, p. 2.
[13] Joseph PRIESTLEY, *The History and Present State of Electricity, with Original Experiments*. Vol. II. London 1775, p. 11.

causes. An effect can become a true scientific phenomenon when it ceases to be only a particular event and becomes a regular and regulated one instead: it has to be made to appear every time under given circumstances and only then becomes a stabilized, observable phenomenon. Searching for analogies between appearances and producing them under identical and controlled conditions are the ways in which one establishes relationships between the large number and variety of visible effects and the few simple invisible causes. This principle is particularly distinct when studying electricity:

> Indeed, no other part of the whole compass of philosophy affords so fine a scene for ingenious speculation. Here the imagination may have full play, in conceiving of the manner in which an invisible agent produces an almost infinite variety of visible effects. As the agent is invisible, every philosopher is at liberty to make it whatever he pleases, and ascribe to it such properties and powers as are most convenient for his purpose. And, indeed, if he can frame this theory so as really to suit all the facts, it has all the evidence of truth that the nature of things can admit.[14]

The first experiments, which most commonly produced static electricity by friction, explained it in terms of gravitation, as a kind of attraction or repulsion intrinsic in specific bodies. "But when electricity began to show itself in a greater variety of appearances, and to make itself sensible to the smell, the sight, the touch, and the hearing: when bodies were not only attracted and repelled, but made to emit strong sparks of fire, attended with a considerable noise, a painful sensation, and a strong phosphoreal smell; electricians were obliged to make their systems more complex, in proportion as the facts were so."[15] In the last decades of the eighteenth century, electrical phenomena became even more complex when animal electricity was added to the register. Investigations of the nature and specificity of animal electricity and its similarity to static electricity produced artificially in laboratories (as we know them primarily from the Galvani–Volta dispute) were simultaneously an arena for speculations about the roles of analogy and metaphor in scientific research.[16]

---

[14] *Ibid.*, p. 16.
[15] *Ibid.*, p. 18.
[16] *Cf.* Marcello PERA, *The Ambiguous Frog. The Galvani-Volta Controversy on Animal Electricity.* Princeton: Princeton University Press 1992 and Laura OTIS, "The Metaphoric Circuit: Organic and Technological Communication in the Nineteenth Century." *Journal of the History of Ideas*, vol. 63, 2002, no. 1, pp. 105–128.

Take the example of the electric shock that can be delivered by a torpedo fish or an electric eel. In the Renaissance, it was still an inexplicable, occult phenomenon. In early modern times, it became the subject of more focused research and acquired mechanical explanation. Thanks to the invention of the Leyden jar in 1745, a condenser able to store static electricity, one could perceive some similarity between the two effects and consider the torpedo shock as electrical. Electricity, however, permeated the organic realm much more intensively once it began to be understood as a possible medium of communication in the nerves and when the emerging neurophysiology was still closely connected with physical and technical research. Even though explicit parallels between organic and technological systems would become commonplace in the next century, the preconditions for their intersections and interfacing (both conceptual and technical) emerged in Luigi Galvani's lab, on a table full of wires, condensers and dissected frog legs, which he himself regarded as the finest existing electrometer. Scientific apparatus and the instrumental arrangements do not just serve the purpose of displaying the nature and functions of the subject matter; they also help to formulate the conceptual models and metaphors used to interpret these phenomena.[17]

> The core element of modern electrophysiology, beyond the more or less technical terms and concepts it makes use of, consists of the fact that the membrane of nerve and of muscle fibers is actually a "machine," which produces and utilizes the electricity necessary to encode and transmit information to the excitable tissues.[18]

The nature of electricity is revealed through its effects and the phenomena produced must be stabilized in certain ways so they can be compared one to another. One way is to measure them. A different method was discovered in 1777 by Georg Christoph Lichetnberg, who found by chance another sensitive "tissue" that could be affected by electricity. While working with his electrophore, Lichtenberg noticed how resin dust would settle in its base forms into peculiar patterns and he started to examine this more systematically: radial or circular patterns were thought to be the result of positive or negative electrical fluids. Lichtenberg compared them to macroscopic images – stars, milky ways, suns – or to the images brought forth by the frost on window-panes and referred to them as "projections." He was also able to

---

[17] See Tomáš DVOŘÁK, "Scientific Instruments and Epistemology Engines." *Theory of Science*, vol. 34, 2012, no. 4, pp. 529–540.
[18] Marco PICCOLINO – Marco Bresadola, *Shocking Frogs. Galvani, Volta, and the Electric Origins of Neuroscience*. Oxford: Oxford University Press 2013, p. 320.

preserve them by spreading an adhesive substance on a sheet of black paper, thus discovering the principle of xerography.

The electrophore generated an electrical charge and served as an auxiliary instrument for charging a Leyden jar – Lichtenberg decided to build a much larger version (with a diameter of over 2 meters, his older model's diameter being around 45 centimeters) because "executing experiments with larger instruments is tantamount to observing the exhibited phenomena under a microscope: what went unnoticed beforehand to the most acute eye even with greatest scrutiny, can no longer remain forever unnoticed even by the sloppiest and most inconsiderate observer with the dullest sense once it is enlarged in this manner."[19] Thanks to this substantial magnification of the power to visualize an electrical charge (Lichtenberg was able to produce 40-centimeter-long sparks), the electrophore became a much more sensitive instrument of detection and display that allowed even for "drawing" patterns or letters: a new kind of secret language allowed nature to make itself manifest. At the time, electrostatic figures captured the attention of the public as analogies of atmospheric charges, thunderbolts harnessed and domesticated. Smaller versions of Lichtenberg's instrument were soon on sale, philosophical toys that were meant to demonstrate and explain the emergence of frost patterns. The principles behind these invisible processes were still unknown but thanks to the instrument they could be made visible, and release a lasting image of their transient state, a pregnant moment of their potentiality: "In the frozen state of a single image, the world is expressed as a specific state of tension."[20] Lichtenberg's figures are nature's explosive gestures, indexical images that allow nature's hidden forces to surface by means of the apparatus and to translate the haptic sensation of electric shock into a visual one. They are simultaneously beautiful and true ciphers, not yet fully understood but nevertheless able to insert certain degree of certainty into theoretical confusion and controversies. These sonograms of modernity inaugurate an era of mediation that are characterized by the dialectical tension between movement and stillness and would develop into the forensic imagination we indulge in today.

It might seem surprising that Lichtenberg did not pursue a more thorough explanation of his figures or attempt to situate them within the system

---

[19] Quoted in: Davis BAIRD – Alfred NORDMANN, "Facts-Well-Put." *The British Journal for the Philosophy of Science*, vol. 45, 1994, no. 1, p. 46 (37–77).
[20] Siegfried ZIELINSKI, "Show and Hide: Projection as a Media Strategy Located between Proof of Truth and Illusionising." In: ZIELINSKI, S. – WAGNERMAIER, S. M. (eds.), *Variantology 1. On Deep Time Relations of Arts, Sciences and Technologies*. Köln: Walther König 2005, p. 97 (81–100).

of knowledge of the time. It was as if they could speak for themselves. Such an approach resonates with his other scientific and literary work: Lichtenberg favored experiment over theory as well as aphorism over novel. His method of presentation was based on a graphic and immediately effective apparition, shocking rather than contemplative. His anti-systematic approach led to the demonstration of knowledge in a condensed and concentrated form, not in a gradual and detailed interpretation or theoretical explication.[21]

When Lichtenberg introduced his electrostatic figures to the public in 1778 and when two years later Galvani began his series of experiments with dissected frogs, exposing them to static or atmospheric electricity, they contributed yet another fascinating images to the rich repertoire of electrical imagination of the eighteenth century.[22] This imagination was not the exclusive property of scientists, rather the opposite: ingeniously elaborated and spectacular demonstrations of electrical phenomena accompanied scientific lectures but also attracted customers to instrument shops, and became fashionable parlor tricks and domestic amusement and were discussed in the periodical press as sensational events.

> [N]atural philosophers could use their control over active powers to construct a *theatre* with all the appeal and all the dangers that implied. The theatrical image, as an analogy for the world which was to be investigated, was common. The Linnaean disciples wrote of "the theatre of this life" and of the naturalist as "the eye and spirit of the Earth, attentive to gaze with astonishment upon the economy of the Creator". They emphasized that "one finds in Man two properties of which all other animals are deprived: *astonishment* and *language*."[23]

---

[21] The relationship between Lichtenberg's scientific and literary work is discussed in Jürgen TEICHMANN, "Georg Christoph Lichtenberg: Experimental Physics from the Spirit of Aphorism." *Nuova Voltiana. Studies on Volta and his Times*, vol. 5, 2003, pp. 15–30 and Jeremy ADLER, "Klikatá čára. Vizuální narativní metoda: Sterne, Lichtenberg, Novalis." *Kritický sborník*, vol. 19, 1999/2000, pp. 65–82.

[22] It is worth noting that both these discoveries, as well as many others at the time, are regarded as having occurred "by chance." This interpretation stemmed from the lack of theoretical explanations for them and from the understanding of an experiment as a test of a theoretical hypothesis, which denies any kind of epistemological gain on the side of instrumental arrangement. In fact, similar discoveries occur only thanks to experimental systems that are not simply tools for generating answers but rather materialize questions and produce material entities along with concepts and theories; see Hans-Jörg RHEINBERGER, *Toward a History of Epistemic Things. Synthesizing Proteins in the Test Tube.* Stanford: Stanford University Press 1997.

[23] Simon SCHAFFER, "Natural Philosophy and Public Spectacle in the Eighteenth Century." *History of Science*, vol. 21, 1983, no. 1, p. 14 (1–43). The role of instrument makers and

In scientific experiments, the controlled production of a phenomenon and wonder went hand in hand; eighteenth-century science did not know the future differentiations between professionals and amateurs, academic institutions and market, work and amusement. It was in the next century, when science was "purified" of popular, entertaining, commercial – in short, non-scientific – activities, and this process of purification was a way of legitimizing its new social role and status.[24] Epistemological dramas that were performed in the theatres of nature of the eighteenth century were, above all, entertaining and educational visual spectacles. They accounted for the different regime of visuality that was assigned to the period by authors like Foucault or Jacob: for Foucault, theatre is the model of Renaissance visuality and it is substituted in the Classical period by the table and the catalogue; according to Jacob, the eighteenth century is defined by a search for "visible structure", "reducing a living being to its visible aspect and translating its shape, size, colour and movement into words."[25] Both authors focused primarily on natural history; it is true that public demonstrations were dominated by the physical and mechanical sciences, but alongside light, electricity, magnetism and various automata, minerals, plants, corpses and monsters were also put on display. The way they were exhibited was very different from the Renaissance regime of curiosity, because it became a public and commercialized enterprise. Instead of totally displacing theatricality, we should look for moments where both modes of observation overlap and supplement one another while avoiding their subsumption under some monolithic and normative framework: in every period, we can find a number of coexisting heterogeneous scientific cultures with frayed edges. On the one hand, they allow for and inspire mutual exchanges of concepts and metaphors, the sharing of methods of research and instrumental equipment, the creation of analogies between disparate phenomena and hints of universal systems; on the other they also produce moments of cognitive dissonance and provoke discursive, disciplinary or institutional battles.

itinerant lecturers in both the presentation and research of electricity is discussed in Oliver HOCHADEL, "A Shock to the Public: Itinerant Lecturers and Instrument Makers as Practitioners of Electricity in the German Enlightenment (1740–1800)." *Nuova Voltiana. Studies on Volta and his Times*, vol. 5, 2003, pp. 53–67.

[24] See Bernadette BENSAUDE-VINCENT – Christine BLONDEL (eds.), *Science and Spectacle in the European Enlightenment*. Aldershot: Ashgate 2008.

[25] François JACOB, *The Logic of Life. A History of Heredity*. New York: Pantheon Books 1973, p. 45.

Making the invisible visible or rather making the imperceptible perceptible by some sort of mediation is one of the concerns shared across many different fields and disciplines. It was within aesthetics that questions of mediation were posed in the most pronounced and profound ways, especially in the works of Lessing. His *Laocoön* from 1766 is a critique of the classical doctrine of *ut pictura poesis*, an understanding of painting as mute poetry and poetry as a speaking picture. Lessing proceeds from the different ways identical situation is rendered in these media: Vergil's epic poem *Aeneid* and the ancient sculptural group *Laocoön and His Sons* from the first century BC. Laocoön was a Trojan priest, punished for attempting to expose the ruse of the Trojan Horse (according to the most common interpretation). Poseidon sent sea snakes to kill him and his sons and the group of the three suffering figures with snakes wrapped around and suffocating them is taken to be the prototypical icon of human agony. Lessing is puzzled by the expression in Loacoön's face – unlike the poetic rendition, the sculpture does not portray the most extreme moment of pain and suffering because that would have been a violation of the classical ideal of beauty. The artistic medium therefore determines to a certain extent what can be represented and how. We should note, however, that a strong normative claim is present here; in fact it is not the very material limits of individual media, as many interpreters of Lessing the semiotician claim, but rather a required form of expression. Technically speaking, the sculpture could represent the situation in a different way as well but then it wouldn't fulfill Lessing's preferred conventions and ideals. In the same way, the critique of *ut pictura poesis* is directed against excessive descriptiveness and staticness of poetry; "good" poetry should follow its medium-specific principles.

There were many discussions of the relationships between artistic media before Lessing, his originality, however, lies in the reduction of this difference to the fundamental distinction between temporal and spatial principles. The succession of time is the sphere of the poet and space is that of the painter:

> In the first place I presume it will scarcely admit of dispute that the imitations of painting are effected by means entirely different from those of poetry; the former employing figures and colors in space, and the latter articulate sounds in time. Now, as it is evident that the signs employed must bear a suitable relation to the things represented, it follows that those signs which are arranged in juxta-position with each other, can only express co-existent objects, or an object whose parts are co-existent, while those signs which are consecutive, can

only express things which, either of themselves, or in their component parts, are consecutive.[26]

Lessing further distinguishes between primary and secondary or direct and indirect expression: painting can represent actions by intimation, by means of bodies, and poetry may also delineate bodies by means of actions. Thus expressing juxtaposition by poetry or consecutiveness by painting is not impossible, it is only more complicated and strenuous and demands more effort from the recipient. The crucial criterion here is, simply, the effectiveness of generating a full and vigorous illusion. In the ideal situation we even stop perceiving the means that bring it to life:

> The poet seeks to render the ideas which he awakens within us so vivid, that we may instantly fancy we perceive the real and sensible impressions of the objects they refer to; and, in that moment of illusion, we cease to be conscious of his words, that is to say, of the means by which he produces his effect.[27]

If poetry is specifically temporal, it produces its own specific temporality: in that moment of acceleration necessary to generate the desired deception, it breaks up with the pace of human perception, falls below the threshold of consciousness and becomes a machine for producing special effects. When Lessing talks about actions and their consecutiveness, he does not refer only to some general conception of time or movement but rather to human action and the effort, activity, work it entails.

> Those combined effects which the eye perceives at a glance, [the poet] is obliged to enumerate in tedious detail, and it not unfrequently happens that by the time we arrive at the last of his traits, we have already forgotten the first. Nevertheless, it is from these successive traits alone that we can form any conception of the whole. To the eye, the parts contemplated remain constantly present, and may be recurred to over and over again; on the contrary, when the ear is the channel of perception, the parts described are lost, if they are not preserved in the memory. And even supposing them to be all correctly remembered, – what an effort, what an exertion would it require to revive their impressions all in the

---

[26] Gotthold Ephraim LESSING, *Laocoon; or the Limits of Poetry and Painting.* London: J. Ridgway & Sons 1836, p. 150.
[27] *Ibid*., p. 165. The English translation uses the word "instantly" instead of speed or rapidity, which would more precisely translate "die Geschwindigkeit" – thanks to the speed of sensory impressions we believe we perceive the real objects.

> same order and with the same distinctness, and to think them over again with even moderate rapidity, so as to form a tolerable idea of the whole![28]

The effort, exertion and time needed have to be passed on to the mechanism that produces the synthesis for us. Leibniz was pondering the idea that eyes of sufficient acuity might read all the relations in space and time within the "present;" that idea is realized here, although on a much smaller scale, in the appropriately structured artifact and its coordination with the human sensorium: artworks are phantasmagorical projections, we are not aware of the processes that generate illusions because they take place below the threshold of our consciousness.

Lessing's reflections are most fruitful when they focus on possible violations of laid down principles (such as the treatment of indirect, "unsuitable" modes of expression). These moments also uncover the most problematic of his assumptions and his normative requirements. Producing an effective illusion is predicated on two levels of abstraction: the first step is based on the very differentiation between painting and poetry and their respective inner principles, coexistence and sequentiality, space and time. The second one results from what media with such a bias – according to their material limits – may choose to represent from the space-time continuum.

> The painter can only employ, in his compositions of co-existing bodies, one single moment of the action, and he must therefore select, as far as possible, that which is at once expressive of the past, and pregnant with the future.
> In like manner the poet, in his consecutive imitations, can employ but one single attribute of bodies, and must therefore select that which awakens the most sensible image of the body under that particular aspect which he has chosen to represent.[29]

The reality effects postulated by the emerging science of aesthetics are based on the sequential isolation of these elements and their resulting combination. In this respect, Lessing proceeds in union with the methods of natural sciences of the time. "Observation," writes Foucault, "from the seventeenth century onward, is a perceptible knowledge furnished with a series of systematically negative conditions." It advances via reduction and selection of phenomena that can be further analyzed and made generally acceptable: "The area of visibility in which observation is able to assume its powers is

[28] *Ibid*., pp. 166–7.
[29] *Ibid*., p. 152.

thus only what is left after these exclusions [...] This area, much more than the receptivity and attention at last being granted to things themselves, defines natural history's condition of possibility, and the appearance of its screened objects: lines, surfaces, forms, reliefs." Foucault hurries to emphasize that optical instruments such as a microscope fall within such regime of visuality as well: "it was the same complex of negative conditions that limited the realm of experience and made the use of optical instruments possible."[30]

The main difference lies in the fact that the aesthetic sphere is interested in the creation of artifacts that produce anticipated effects. This difference is, however, only a misrepresentation based on our contemporary perspective: we tend to view various spheres of knowledge and experience separately as subject matters of individual fields and under the influence of traditional historiography of science understand the history of knowledge mainly as the history of ideas and theories. In fact, experimental science and aesthetics share many fundamental concerns: recall Lichtenberg figures in case of which any separation of truth and beauty is impossible and pointless. They are not a reflection or a representation but rather a discharge, which would quickly become the prime concern of Romanticism. Romantic aesthetics would treat it first of all in psychological terms, as the excessive pressure of the author's emotions, and thus suppressing its bonds with the ways the world appears in scientific experiments. The more Romanticism wanted to bring forward a critique or an alternative to the experience of rationalization and industrialization, the more it lost the ability to understand this new expressive form in its wholeness and complexity. The "mirror" and the "lamp", the metaphors analyzed by Abrams as the dominant models of mind and creative processes in the Classical period and in Romanticism,[31] are always simultaneously material technologies, cognitive extensions that are located outside of the human body but define it and its abilities and partake in their development. Any conception of a bare human subject and its inner vision is but a strained abstraction. The lamp of Romanticism is an electric lamp and it was electrified decades before Kant or Coleridge. The pivotal aspect of modern explosive aesthetics is then found in Lessing.

> If *apparition* illuminates and touches, the image is the paradoxical effort to transfix this most evanescent instant. In art something momentary transcends; objectivation makes the artwork into an instant. Pertinent here is Benjamin's

---

[30] FOUCAULT, *The Order of Things*, pp. 144–5.
[31] Meyer Howard ABRAMS, *The Mirror and the Lamp. Romantic Theory and the Critical Tradition*. Oxford: Oxford University Press 1953.

formulation of a dialectic at a standstill, which he developed in the context of his conception of a dialectical image. If, as images, artworks are the persistence of the transient, they are concentrated in appearance as something momentary. To experience art means to become conscious of its immanent process as an instant at a standstill; this may perhaps have nourished the central concept of Lessing's aesthetics, that of the "pregnant moment."[32]

Lessing formulates his conception of the pregnant moment in the beginning of his essay, long before the rigid differentiation of time-based and space-based media and modes of perception appears. It emerges when he discusses the problem of Laocoön's facial expression, the question of why the sculpture does not portray the most extreme state of the priest's pain and suffering. It is not just a matter of aesthetic conventions. If the visual arts are to choose one particular moment for depiction, they must select the appropriate one:

> If it be true that the artist can adopt from the face of ever-varying nature only so much of her mutable effects as will belong to one single moment, and the painter, in particular, can seize this single moment only under one solitary point of view; – if it be true also that his works are intended, not to be merely glanced at, but to be long and repeatedly examined; – then it is clear that the great difficulty will be to select such a moment and such a point of view as shall be sufficiently pregnant with meaning. Nothing however can possess this important qualification but that which leaves free scope to the imagination. The sight and the fancy must be permitted reciprocally to add to each other's enjoyment.[33]

Here, the later claim for maximal effectiveness is somewhat denied: it is not a matter of overlooking the image at once, seeing it in one instant, but rather a question of creating an interface in which the viewer is animated by the image and the image animated by the viewer. The last sentence of the excerpt is translated very loosely. It really reads: "The more we see, the more we must be able to imagine; and the more we add in our imagination, the more we must believe we see." In condensed form, Lessing captures the basic principle of the emergence of the illusion, the linking of human sensorium and its extensions that form their coordinated complicity: a specific kind of technical imagination. In the pregnant moment being appears in its process of becoming something, it is both static and dynamic and thus addresses our

---

[32] Theodor W. ADORNO, *Aesthetic Theory*. Minneapolis: University of Minnesota Press, p. 84.
[33] LESSING, *Laocoon*, pp. 28–9.

affective and cognitive processes that simultaneously trust it and let themselves be deceived. Different layers of our minds and bodies participate in this paradoxical tangle of trust, seeing and imagination: the human being is divided into segments that in different ways and in different measures respond to specifically structured stimuli. The doctrine of the separation of the senses is a precondition of the establishment of aesthetics as developed by Lessing or Diderot. The major texts of Enlightenment theory are imminently interested in the capacities and limits of medial transmission and sensory apparatus – that is why various forms of sensory deprivation play such a crucial role in these discussions. Through them, restrictions can be delineated and combinatory possibilities envisioned. It is not a matter of a perfection of the senses but rather of a prosthetic overwriting of their capacities and capabilities, a whole new architecture in which corporeality is provisionally and partially synchronized with various supplements and assistive technologies. This coordinated rearrangement has a specific dynamic that is most pertinently developed in Moses Mendelssohn's reaction to Lessing's *Laocoön*.

Following Jean-Baptiste Dubos, Mendelssohn asks why looking at sorrow, pain and misery can bring us pleasure and satisfaction. Bullfights, racks, insane asylums, bloody scaffoldings for execution, these are his examples of things we would prefer not to feel than to feel – peculiar mixtures of appreciation and rejection. Deficiencies and evils are immediately undesirable but in mediated form can be good and pleasant. If we perceive them, for example, in the form of artworks, our "secret consciousness" (ein heimliches Bewusstsein) reminds us that we have only an imitation before our eyes and thus moderates the strength of the objective disgust:

> It is true, the soul's sentient knowledge and capacities to desire are deceived by art and the imagination is so swept away that at times we forget every sign that it is an imitation and fancy that we truly see nature. But this magic lasts only as long as it is necessary to give our conception of the object the proper vitality and fire. In order to have the most pleasure, we have accustomed ourselves to diverting attention from everything that could disturb the deception and directing attention only at what sustains it. However, as soon as the relation to the object begins to become unpleasant, a thousand factors remind us that we are looking at a mere imitation.[34]

---

[34] Moses MENDELSSOHN, "Rhapsody or Additions to the Letters on Sentiments." In: *Philosophical Writings*. Cambridge: Cambridge University Press 1997, p. 138 (131–168).

In the interest of maximum pleasure the soul plays a specific energetic game in which the controlled experience of immersion, of loosing oneself in the projected world, temporarily dominates, only to be turned off once a critical state is reached. Mendelssohn anticipates Coleridge's concept of the "willing suspension of disbelief" but frames it in a much more sophisticated fashion. In his account, the concept of attention understood in terms of practice and acquired habit is crucial. Not everyone enjoys dramatic tragedies. We have to be accustomed to such experience, for which "a certain refinement is required." Whoever is not accustomed to it feels bored or experiences a conflict – sometimes annoying, sometimes ridiculous – between his reason and his imagination.

For Mendelssohn, the problem of pleasure from sorrowful spectacles is an ethical rather than an aesthetic problem. He recalls Plato's concept of virtue and the difference between speculative and pragmatic knowledge. If virtue is a certain kind of knowledge, it can be learned and acquired by repeatedly practicing skills and habits. It is not a theoretical, verbalizable knowledge, a knowledge we can be aware of, but exactly the opposite: our capabilities are transformed into proficiency only when we cease to be conscious of them. They have to stream through our blood, get under our skin, become automatic, become habitual. The principle of such automation is, again, speed:

> For what causes consciousness to stop? The quickness with which concepts succeed one another. Thus, although the degree of our knowledge is lessened by the lack of consciousness, the quantity of effective impulses remains the same in this case. For what is lost in the degree of knowledge is gained in the shortness of the time or in the quickness.[35]

The effectiveness of representation depends on three factors: 1) the degree of the perfection of the representation; 2) the degree of our knowledge; 3) the speed with which we ponder matters. The less time we need to consider the perfection presented to us, the more pleasant our intuitive knowledge is, and the more passionately we desire to enjoy it. The speed of our intuitive insight compensates for the fact that we are not fully aware of it. "This explains how, without thinking about it, we can perform a number of habitual actions which in the beginning required deliberations and reflection. What array of automatic movements are part of speaking and writing? How slowly and deliberately they proceed in the beginning and how quickly they follow

---

[35] MENDELSSOHN, "Rhapsody," p. 163.

upon one another, often unconscious to ourselves, once we have achieved a proficiency in this regard."[36] Mendelssohn further analyzes the process of automation with the examples of a pianist or a typesetter; it does not just apply to mechanical activities but also fundamentally concerns the modes of perception and cognition mediated by artifacts and the formation of the human subject in modernity as such. Unlike the more or less isolated moments of aesthetic experience in Lessing, Mendelssohn conceives of these intervals and situations as components of the gradual constitution and reconstitution of human nature.

> Virtue is, to be sure, a science and can be learned; but if it be carried out, then it demands not merely scientific conviction, but also artful practice and proficiency. Indeed, anyone who grapples with the highest stage of ethical perfection and strives for the blessed condition of bringing the subordinate powers of the soul into a perfect harmony with the superior powers of the soul, must do this with the laws of nature just as the artist must do so with the rules of his art. He must continue practicing until, in the course of the exercise, he is no longer conscious of his rules, in other words, until his principles have turned into inclinations and his virtue appears to be more natural instinct than reason.[37]

The planes of instinct, intuition or habit are formed by different rules and principles than rational and theoretically expressed convictions are; because they are saturated with material practices and techniques and have to deal with their affordances and relatively autonomous development. If we want to conceptualize the transformation of experience and to historicize forms of perception and cognition, we cannot make do with just the development of philosophical, scientific or aesthetic systems. On the contrary, we need to descend onto levels traditionally regarded as low and subordinate. Just like Walter Benjamin did with his concept of distraction, which essentially refers to habit realized through tactile reception: "For the tasks which face the human apparatus of perception at historical turning points cannot be performed solely by optical means – that is, by way of contemplation. They are mastered gradually – taking their cue from tactile reception – through habit."[38]

---

[36] *Ibid.*
[37] *Ibid.*, p. 166.
[38] Walter BENJAMIN, "The Work of Art in the Age of Its Technological Reproducibility." In: *Selected Writings.* Vol. 4, 1938–1940. Cambridge, MA – London: The Belknap Press of Harvard University Press 2003, p. 268.

In the first paragraph of his seminal essay, Benjamin alludes to the multiplicity and diversity of logics and temporalities of technical and organic segments that continuously combine one with another and rearrange and get used to themselves: lithography, invented by Senefelder in 1796,[39] made it possible to reproduce images in much larger numbers and at a much quicker pace, thus providing an illustrated accompaniment to everyday life. A few decades later, lithography was surpassed by photography, which for the first time "freed the hand from the most important artistic tasks in the process of pictorial reproduction – tasks that now devolved solely upon the eye looking into a lens. And since the eye perceives more swiftly than the hand can draw, the process of pictorial reproduction was enormously accelerated, so that it could now keep pace with speech. A cinematographer shooting a scene in the studio captures the images at the speed of an actor's speech."[40] Manual labor, skilled gestures, machines and instruments, speech, sight, hearing, touch, technical images, sound recordings – apparatus and organs combine and group together in changing clusters and constellations that give rise to historically specific cultural techniques and practices; these provisional arrangements are simultaneously determined by political and economical preferences of the time.

The accounts of philosophical toys mentioned in the introduction agree that one of their characteristic aspects is the disclosure of the processes simultaneously examined and experienced: "A crucial feature of these optical devices of the 1830s and 1840s is the undisguised nature of their operational structure and the form of subjection they entail."[41] Gunning develops this point most thoroughly, in my opinion as a consequence of his effort to debunk the myth of early cinema's passive and helpless audience.[42] The spectators of philosophical toys are entertained yet at the same time actively participate in the process and rationally engage in a quasi-scientific experimental instruction. Scientific curiosity is thus made public and transferred to lay consumers: "in contrast to the traditional magic trick, whose illusion remains mysterious because the secret is kept close by the prestidigitator,

---

[39] Senefelder developed lithography while searching for a cheaper and more effective way of distributing his dramatic works; see Alois SENEFELDER, *The Invention of Lithography*. New York: The Fuchs & Lang Manufacturing Company 1911.

[40] BENJAMIN, "The Work of Art," p. 253.

[41] CRARY, *Techniques of the Observer*, p. 132.

[42] See Tom GUNNING, "An Aesthetic of Astonishment: Early Film and the (In)Credulous Spectator." *Art and Text*, vol. 34, 1989, pp. 31–45.

194

the philosophical toy is a tool of demonstration and demystification [...] The philosophical toy sought to demystify magical effects and unveil the secrets of perception and technology to the masses."[43] I think that this is an overly idealistic interpretation of the technological imagination, which cannot hold up even in reference to the simplest possible devices such as the thaumatrope was.

Gunning vigorously opposes the traditional view that the composite image of the thaumatrope derives from a "fallacy" of the human eye – similar arguments of such deficiency or weakness of human senses surround discussions of later animation devices or cinema: it is because the eye is not capable of perceiving rapid change that we actually see the virtual image instead of a series of still images. Referring to sensory insufficiency, according to Gunning, reveals a prejudice towards perception as a static process. We should rather embrace its mobile possibilities and praise our senses' ability to participate in the creation of similar phenomena. Gunning attempts to resolve this dilemma by embracing a phenomenological standpoint, which, in effect, seems to be more of an evasive maneuver:

> My position is obviously phenomenological; that is, I maintain that perceptions need not be dissolved into their physiological process (I am not against doing this – if we are studying physiology rather than moving images). But my task here is to describe our perception as we experience it. The riddle of the perception of the moving image lies in the fact that no one can explain it purely physiologically and the physiological explanations are still debated. In other words, we have a true challenge to explanation here.[44]

Indeed, we still do not fully understand all the subtleties of the physiological process of perception; so what exactly is it that the viewer of a philosophical toy is instructed about? What kinds of secrets are unveiled, what operational structures are demonstrated? None really. No one can explain this process in purely physiological terms simply because it is not a purely physiological process. If we take seriously Gunning's claim that human perception undergoes a fundamental transformation based on a deep coordination of the perceptual and the technological, we also have to acknowledge the fact that the technological is a relatively autonomous and largely unknown territory – though this in no way precludes us having an intimate relationship with it. We can see without fully understanding our senses and we can also

---

[43] GUNNING, "Hand and Eye," pp. 503, 509.
[44] GUNNING, "The Play between Still and Moving Images," p. 39.

see mediated, virtual images without fully understanding the principles of their genesis. We are happy to delegate time and labor needed for perceptual and cognitive tasks on technological processes that take place below our consciousness or beyond the confines of our bodies. The phenomenological description is obviously a legitimate one, but I believe that the crucial lesson philosophical toys provide us with is the glimpse they offer of the appearance of a very intricate and volatile cohabitation that can be most productively addressed within the framework of extended cognition. This concept seeks to overcome the residual Cartesianism in our understanding of human cognition that draws a dividing line between the "thinking thing" and the "extended thing", criticizes traditional mentalist and propositional conceptions of knowledge, and argues for the inclusion of the material environment into cognitive and perceptual processes and activities. This is not to say only that artifacts, instruments or media somehow amplify human cognition, but rather that the dividing line between human and non-human is redrawn with respect to what constitutes a cognitive process. Such a process then cannot be limited to the human brain or human body since material objects in the environment function as parts of our mind or sensory apparatus and together constitute coupled systems and assemblages that need to be acknowledged on their own if we are to adequately understand our knowledge-making processes. Neural, bodily, material and social resources need to be addressed simultaneously since material artifacts establish an external connection between our motor, visuo-spatial, and conceptual systems, thus creating dynamic experimental spaces within which knowledge and perception is processed and constituted. If we delegate certain tasks to technological agents, we need to acknowledge the fact that we are not able to fully control and often even understand them in a reflexive and rational manner:

> It is a profoundly erroneous truism, repeated by all copy-books and by eminent people when they are making speeches, that we should cultivate the habit of thinking of what we are doing. The precise opposite is the case. Civilization advances by extending the number of important operations which we can perform without thinking about them.[45]

---

[45] Alfred North WHITEHEAD, *An Introduction to Mathematics*. New York: Henry Holt & Co. 1911, p. 61.

////// tematická studie / thematic articles ////////////////////

INSTRUMENTS AS PLAYTHINGS: AN ALTERNATIVE METHODOLOGY FOR THE STUDY OF SCIENTIFIC ARTEFACTS

Abstract: *This article proposes that thinking of scientific instruments as playthings or philosophical toys offers a method for looking at the ways in which we learn from made things and from the act of making in investigating the world. Rather than approaching artefacts as stable objects, definable and categorisable in terms of their function, this method puts forward the instability and mobility of artefacts on several levels: in terms of their movements between hands, social contexts and systems of knowledge, in terms of their physical articulations and of their changing functions, and in terms of the flows and processes of materials at work within and through them.*

Keywords: *historical affordance; scientific playthings; thinking things; variant invariance*

LINA HAKIM
34 Hazlemere Court
26 Palace Road
London SW2 3NH
United Kingdom
email / lina@matchboxflight.com

Přístroje jako hračky: alternativní metodologie výzkumu vědeckých artefaktů

Abstrakt: *Uvažovat o vědeckých přístrojích jako hračkách či filosofických hračkách nabízí specifickou metodu zkoumání způsobů, jimiž se z vytvořených věcí i způsobů jejich vytváření učíme při zkoumání světa. Nepřistupuje k artefaktům jako ke stabilním předmětům, definovatelným a klasifikovatelným na základě jejich funkce, nýbrž zdůrazňuje nestabilitu a mobilitu artefaktů na několika rovinách: jejich pohybu mezi rukama, sociálními konexty a systémy vědění; jejich fyzické artikulace a proměn funkcí těchto artikulací; materiálních procesů působících v nich i jejich prostřednictvím.*

Klíčová slova: *historická afordance; vědecké hračky; myšlení věci; variantní invariance*

Lina Hakim

I begin this article by elaborating an understanding of playthings from multi-disciplinary perspectives that consider their role in the reciprocal constitution of self and world. I then explain how the resistant malleability of playthings, their participation in the explorative and expansive play of thought and the attention to technology and materials during play lead a consideration of scientific instruments into the realm of playthings. I use this to argue that regarding instruments as playthings allows for an ecological approach to artefacts that is more concerned with (embodied) comprehension than knowledge and that takes into account their varying roles and meanings. This allows me to introduce the notion of 'historical affordance' to relate the evolution in what an instrument offers to perception, action and understanding. I finally flesh out this methodology and apply it to the Crookes radiometer as a case study to demonstrate how thinking of instruments as playthings offers scope for 'tuning in' to them.

Playthings

In his 1987 presidential address on "Scientific Toys", science historian Gerard L'Estrange Turner describes the importance of *homo ludens* when "considering how human beings acquire knowledge".[1]

> The way in which yesterday's science so often becomes today's recreation does not make it any less scientific. Indeed, much scientific, and other, knowledge is absorbed consciously or unconsciously through play.[2]

Turner's argument is that learning through play has always been essential to "discovering how the natural world works", which is to say scientific understanding, and he illustrates this through an overview of philosophical apparatus and demonstration instruments from the seventeenth and eighteenth century that passed into recreational use in the 19th century and became toys in the twentieth.

In "Cognitive Objects", psychologist Robin A. Hodgkin, similarly concerned with the relationship between scientific discovery and play, tries to work out the nature of this connection.[3] Building on Jean Piaget's

---

[1] Gerard L'Estrange TURNER, "Presidential Address: 'Scientific Toys'." *British Journal for the History of Science*, vol. 20, 1987, p. 377 (377–398).
[2] TURNER, "Scientific Toys," p. 384.
[3] Robin A. HODGKIN, "Cognitive Objects." *Oxford Review of Education*, vol. 14, 1988, no. 3 (353–362). See also Robin A. HODGKIN, "Making Space for Meaning." *Polanyiana*, vol. 6, 1997, no. 2 (55–71).

framework in developmental psychology and Seymour Papert's theories of cognitive science, he argues that "the key questions" in order to understand this connection

> [...] are not to do with a child's exposure to mechanical ideas in toys, but rather with the many-sidedness and depth of his own involvement in play. Here is the seed bed not only of active science but also of technical craft skills.[4]

The looping structure of play

Hodgkin describes a semi-cyclical and recurrent process of creativity that he visualises as "a looping structure originating in play", which he also uses to show the way in which a plaything oscillates between being toy, tool and symbol; its nature changing as a result of the alternating possibilities of progressing by skill-developing practice on one hand or of proceeding by exploratory "groping and experimenting movements" on the other.[5] His contention is that this cycle is common to all processes of discovery, and that the "cognitive object" or "generative thing-idea" that it involves acts as a "transitional object".[6] This term was introduced by psychologist D. W. Winnicott to refer to a child's first "not-me" possession, which, he contends, enables a mediation between the child's inner and outer world through inhabiting "an intermediate area of experiencing, to which inner reality and external life both contribute", that is by being part of both the subjective and what is objectively perceived.[7] Such objects, according to Winnicott, exemplify the ways in which humans negotiate their relation to the world: their task is to keep inner and outer reality separate but interrelated.[8] Describing archetypes of interaction with "transitional objects" in *Playing and Reality*, he further suggests that "thinking, or fantasying, gets linked up with these functional experiences".[9] This is the insight that Hodgkin picks up on in his

---

[4] HODGKIN, "Cognitive Objects", p.356. It is important to note that while Hodgkin picks up on the revaluation of concrete reasoning in Piaget, he does not cast it, as the latter does, as an inferior stage in the progression towards formal or abstract thinking: for Hodgkin the two modes of thinking always alternate and, moreover, concrete objects play a significant part in both.

[5] *Ibid*., p. 357.

[6] *Ibid*., p. 359.

[7] Donald W. WINNICOTT, *Playing and Reality*. London – New York: Routledge 2008, p. 3.

[8] This also explains how the prospect of the loss of an object is always a part of the love one has for it.

[9] WINNICOTT, *Playing and Reality*, p. 5.

text when he speaks of the "many-sidedness and depth" of involvement in play. Playthings move between the status of tool and symbol, which means that, like transitional objects, they are both sensory and abstract. Playing with things is fundamentally a mediating between material existence and mental operations, a form of search that is essential to science, technology and craft.

While I generally agree with this statement, my concern here is not with the broad relationship between play and science. What I would like to draw on instead are aspects of Hodgkin's description of playthings, which, I will argue, offer a useful tool for thinking of scientific artefacts in a way that takes into account, amongst other things, their varying roles and meanings in a phenomenological/ecological framework. Playthings are objects for thought and action that change their 'nature' in a looping movement, which paradoxically both results from *and* enables a reciprocal and constitutive interaction between self and world. A plaything, rather than being defined by a function, embraces varying roles, switches in the categories that it belongs to and is even prone to changes in what constitutes it, all the while still remaining, in some sense, itself. How does this varying invariance operate? What kind of understanding does it present? What kind of engagement does it require? How does it involve the thing that it puts into play?

Familiar and poetic substance

In a short essay on "Toys" in his *Mythologies*, literary theorist Roland Barthes laments complicated "French toys" with which a child can only engage as a user or owner, and opposes them to simple playthings, such a set of blocks, which provide "a very different kind of learning". [10] With these "unrefined" playthings,

> [...] the child does not in any way create meaningful objects, it matters little to him whether they have an adult name; the actions he performs are not those of a user but those of a demiurge. He creates forms which walk, which roll, he creates life, not property: objects now act by themselves, they are no longer an inert and complicated material in his hand.[11]

[10] Roland BARTHES, "Toys." In: Roland BARTHES, *Mythologies*. Translated by Annette Lavers. London: Vintage 2000, p. 54 (53–55).
[11] *Ibid*., p. 54.

In describing playthings coming to life in this way, Barthes is not implying an animistic understanding of toys, but rather identifying a particular kind of contact with the world – one that they offer in the shape of an object which both yields to the player's desires and whims and at the same time informs them. These playthings provide what he describes as "a familiar and poetic substance", something simple that can be deployed intricately and that keeps child and environment in close contact.[12] When built using "an ideal material", such as wood for instance, they "can last a long time, live with the child, alter little by little the relations between the object and hand".[13] It is an attentive and caring relationship that evokes the emotional attachment to "transitional objects" and that likewise develops a sensitive and enquiring approach to the world. It is moreover an immersive experience that understands the need for taking one's time, for putting time into things. The movement it entails, as Hodgkin has suggested, is a loop rather than a straight line: its objective is not to complete a journey or to get somewhere, but rather to cover as much space as it can while retracing itself, to spread out. It is, in that sense, spatial, whence both Hodgkin and Winnicott's reference to an intermediate *space* or privileged *zone* of play. Like the loop, it recursively goes back and forth without crossing over itself, is concerned with versatility rather than economy and has for principle an extension of possibilities, a spread in testing them out. The actions it involves are "those of a demiurge", because they are a kind of composition, a creative act that plays out the different possibilities of the thing put into play. Playing with a thing is a playing out of its affordances, and the ideal plaything offers a wide range of affordance, has a lot of "play".

Thinking things

In "A Philosophy of Fidgets", cultural theorist Steven Connor reflects on the things that seem to call for such looping actions and suggests that they might embody thinking, make it palpable:

> The deeper secret of these objects is perhaps that they are the necessary accessories to thought. Perhaps they are forms of thought themselves. [...] It is as though we were compelled to act out literally the meaning of the word 'reflection', from *re-flectare* to bend back on oneself. Just as we recruit our own bodies

---

12 *Ibid.*
13 *Ibid.*

for these doubling enactments of our own reflective work, so we requisition objects to join the flexing play of thought.[14]

Connor describes such playthings as "accentuating rather than accelerating devices", as instruments "for pervading rather than progress".[15] They are necessary for thought because they give shape to the operations of thinking, they offer thinking an external object with which to think of itself. They are what he calls 'thinking things', "the kinds of thing that draw, drain and detain our thinking, and that make thinking accessible as a kind of thing":[16]

[T]hinking as an adjectival participle and thinking as the name of an action – thus 'things that are thinking' and 'thinking about things'. [...] So thinking things constitute a surrogate way of thinking about the things that thinking takes to itself in order to think about the way it thinks about things…[17]

"Thinking things" are the things with which we interrogate both the world and our thinking about the world, they are the things *of*, *through* and *in* which we think the world. Playthings are what we think *of* in the absorption and intent that playing with them requires. They are what we think *through* when we enrol them in our exploratory activities. They are what we think *within* when they come to stand for the thinking about the world that is thought *through* them as an extension of us into the world and *of* them as a part of the world exterior to us. The plaything, then, shares its play loop with "the flexing play of thought": both join in this flickering between thing and thought, between object and subject, that reciprocally constitutes them both.[18]

---

[14] Steven CONNOR, *A Philosophy of Fidgets* [online], talk given at the Liverpool Biennial *Touched* Talks, 17 Feb 2010. 2010. Available at: <http://www.stevenconnor.com/fidgets/> [cit. 15. 7. 2013], p. 3.
[15] *Ibid.*, pp. 4–5.
[16] Steven CONNOR, *Thinking Things* [online], plenary lecture given at ESSE-9, the 9th annual conference of the European Society for the Study of English (ESSE), Aarhus, Denmark, 25 August 2008 and as the Textual Practice lecture, University of Sussex, 14 October 2009. 2008–2009. Available at: <http://www.stevenconnor.com/thinkingthings/> [cit. 15. 7. 2013], p. 4.
[17] *Ibid.*, p. 22.
[18] CONNOR, "A Philosophy of Fidgets," p. 3.

Evocative objects

This reciprocal constitution of subject and object in play is what motivates essayist Walter Benjamin to call for a "philosophical classification of toys" that would "penetrate to the reality [and] to the conceptual understanding of toys" in several essays on playthings and on "the mysteries of the world of play" into which they lead:[19]

> We experiment early on with basic rhythms that proclaim themselves in their simplest forms in these sorts of games with inanimate objects. Or rather, these are the rhythms in which we first gain possession of ourselves.[20]

Playthings are what sociologist of science Sherry Turkle calls "evocative objects" to emphasise "the inseparability of thought and feeling in our relationship to things". As she puts it, "[w]e think with the objects we love; we love the objects we think with".[21] As both affective companions and "provocations to thought", playthings are at the origin of the "basic rhythms" through which our emotional and intellectual lives are composed.[22] The question then is: how does this work? What makes playthings evocative?

In "The Cultural History of Toys", Benjamin cautions against the common "assumption that the imaginative content of a child's toys is what determines his playing; whereas in reality the opposite is true."[23]

> A child wants to pull something, and so he becomes a horse; he wants to play with sand, and so he turns into a baker; he wants to hide, and so he turns into a robber or policeman.[24]

Here are again the "actions of a demiurge", the creative acts that put things into play; but Benjamin's description reveals an additional and important aspect of this enrolling of things: it is specific to what each thing offers to be

---

[19] Walter BENJAMIN, "The Cultural History of Toys." In: JENNINGS, M. W. – BULLOCK, M. – EILAND, H. – SMITH, G. (eds.), *Walter Benjamin: Selected Writings, Vol.2, Part 2, 1927-1930.* Cambridge – London, Belknap Press 2005, pp. 115–116 (113–116). See also Walter BENJAMIN, "Old Toys: The Toy Exhibition at the Märkisches Museum." In: *Walter Benjamin: Selected Writings*, pp. 98–112.

[20] Walter BENJAMIN, "Toys and Play: Marginal Notes on a Monumental Work." In: *Walter Benjamin Selected Writings*, p. 120 (117–121).

[21] Sherry TURKLE, "Introduction: The Things That Matter." In: TURKLE, S. (ed.), *Evocative Objects: Things We Think With*. Cambridge, MA: MIT Press 2007, p. 5 (3–10).

[22] *Ibid.*

[23] BENJAMIN, "The Cultural History Of Toys," p. 115.

[24] *Ibid.*, p. 115.

done with it, to its affordance. The child does indeed determine the imaginative content of a plaything, but she does so in recognition of and in reaction to the possibilities for action that the plaything presents to her. A toy carriage is pull-able, and in pulling it the child may imagine herself a horse drawing the carriage; sand can be wet into doughy mud and be kneaded, allowing the child to impersonate a baker; but it can also be poured and have her picture herself an hourglass, or be used to build sandcastles making her a kind of architect. It cannot, however, be pulled, or tied, or folded. The imaginative content of playthings is determined by the child but, it also always results of the affordances of the thing for the child: it is part of a particular moment or circumstance and is linked to a desire or query, to something someone wants to do that it presents itself as useful for. This can range from wanting "to pull something", through testing what can be done something and what purposes it can serve, to looking to represent something, or most typically an intermingled combination of several of these.

Ecology and the theory of affordance

The way in which the perception of things is situated and they way in which they are apprehended as possibility for action are the founding principles of James J. Gibson's ecological approach to perception and of his theory of affordance that the methodology I am proposing builds on. In *Ecological Approach to Visual Perception*, Gibson introduces his ecological understanding of the environment as what affords animate life, that is, as what supports perception and behaviour, which are in turn reciprocally related to the ecosystem.[25] He explains his understanding of ecological reality thus:

> The world of physical reality does not consist of meaningful things. The world of ecological reality, as I have been trying to describe it, does. If what we perceived were the entities of physics and mathematics, meanings would have to be imposed on them. But if what we perceive are the entities of environmental science, their meanings can be *discovered*.[26]

Gibson's ecological theory describes things in terms of their organism-indexed significance in relation to living forms as well as in terms of their ecological (shared) objectivity, both of which are understood to be in dis-

---

[25] James J. GIBSON, *The Ecological Approach to Visual Perception*. New Jersey – London: Lawrence Erlbaum Associates 1979.
[26] *Ibid*., p. 33.

continuous and reciprocal (animal-environment) change. Based on this understanding, he elaborates the theory of "affordances", a term he uses to describes "what [the environment] offers animals, what it provides or furnishes, for good or ill", that is, any opportunity or danger within an organism's environment.[27] He further insists that an affordance is neither a subjective nor an objective property or "could be both" and that it "points both ways, to the environment and to the observer".[28] Things, then, have affordances defined by the possibilities for action on a particular environment. This can be thought of as "-ables' as in "movable", "see-through-able", "touchable", "smell-able", "sit-upon-able etc". [29] Affordances are, moreover, perceived in relation to the organism in question: different things afford different meanings and actions to different organisms.[30] Gibson finally notes that, rather than qualities or properties say, affordances are always what we first pay attention to in things.[31]

Following Gibson's ecological framework, affordances, availability, access and the particulars of a given situation play an essential part in the enrolment of a thing in enquiring play. It nevertheless seems that some objects are more evocative than others, that some things are better at leading into "real living play".[32] So what then has the affordance of an ideal plaything? What possesses the resistant malleability required for the exploratory looping of play? What constitutes, in Barthes' words, a "familiar poetic substance" and is that demanded from a plaything?

Clarity of materials and technology

Like Barthes, Benjamin bemoans complex toys and those "based on imitation", which he says lead away from authentic playthings and from "real

---

[27] James J. GIBSON, "The Theory of Affordances." In: SHAW, R. – BRAUSFORD, J. (eds.), *Perceiving, Acting and Knowing: Toward an Ecological Psychology*. New York – Toronto – London – Sydney: John Wiley & Sons 1977, p. 68 (67–82).

[28] GIBSON, *The Ecological Approach*, p. 129.

[29] M. T. TURVEY, "Perception: The Ecological Approach." In: NADEL, L. (ed.) *Encyclopedia of Cognitive Science*. London: Nature Publishing Group 2002, p. 540 (538–541). See also draft article Claudia CARELLO and M. T. TURVEY, *The Ecological Approach to Perception* [online]. Available at: <ione.psy.uconn.edu/~corr/EncCogSci.pdf> [cit. 14. 8. 2013].

[30] GIBSON, "The Theory of Affordances," p. 79.

[31] GIBSON, *The Ecological Approach*, p. 75.

[32] BENJAMIN, "The Cultural History of Toys," p. 116.

living play".[33] Noting how "chaste" children are in their use of materials and how interested they are in the construction and modification of toys in play, he proposes that a "particular clarity" is required that makes genuine playthings:[34]

> In the case of toys simplicity is to be found not in their shapes but in the transparent nature of the manufacturing process. Hence, it cannot be judged according to an abstract canon but differs in different places, and is less a matter of formal criteria, because a number of methods of processing – carving, in particular – can give free rein to their imagination without becoming in the least incomprehensible. In the same way, the genuine and self-evident simplicity of toys was a matter of technology not formalist consideration.[35]

Benjamin, like Barthes, insists that: "however unified and unambiguous the material is, the more it seems to embrace the possibility of a multitude of figures of the most varied sort".[36] But he suggests that the required simplicity is not only to be found in an object's material composition: technological transparency is also essential. Structure and operation must, like materials, be accessible and intimately grasped in order for them to be effectively deployed. It is the clarity of the processes at work in an object that determine its simplicity and its consequent creative potential both practically and allegorically. In the same way that we can only use words to their full poetic or theoretical potential once we've become familiar with the way they work, so can we only put artefacts maximally to play when their technology is "self-evident" to us.

Benjamin, also like Barthes, seems to be giving primacy to wood as a material, but his reason for that is not something to do with an inherent quality of the substance: it is rather to do with the "methods of processing" that it lends itself to, the particular comprehensibility of carving as a method of making. A genuine plaything necessitates an intimate understanding of its inner workings by the person engaging with it. While it is easy for most people to agree with Benjamin that carving is in that sense particularly easy to understand, perhaps we should keep in mind that comprehension is in the eye of the beholder. A technology that seems alien to a person might be

---

[33] *Ibid.*, pp.115–6. He writes that "imitation [...] is at home in the playing, not in the plaything," p. 116.
[34] BENJAMIN, "Toys and Play," p. 119.
[35] *Ibid.*, p.119.
[36] BENJAMIN, "The Cultural History of Toys," p. 115.

another's favoured plaything; a medium that seems opaque to a person could open up a world of possibilities to another.

Skill

This account of playthings puts forward the way in which making things and interacting with them are interrelated rather than opposed practices, and the fact that both are based on an attentive engagement of human beings with elements of their environment.

Artefacts are *made* things and should be thought of as the outcome of the skilful engagement of a maker with elements from his or her environment. In a chapter from *The Perception of the Environment* in which he discusses skill and the construction of artefacts, anthropologist Tim Ingold insists on the importance of doing away with the modern dichotomy between art and technology that separates made things in terms of oppositions between mental/material or semiotics/mechanics, and presents the notion of "skill" as a solution to this split.[37] To describe what he means by "skill", Ingold articulates five critical dimensions of skilled practice: the first is that intentionality and functionality are immanent in it as a synergetic process involving humans, tools and materials rather than being an attribute of one or the other; the second is that it is an ecologically embedded system of relations between the body and the environment; the third is that it is grounded in an attentive perceptual involvement with things requiring care and a haptic dexterity based on a "continual adjustment or "tuning" of movements in response to an ongoing monitoring of the emergent task"; the fourth is that it is handed down practically "by introducing novices into contexts which afford selected opportunities for perception and action, and by providing the scaffolding that enables them to make use of these affordances"; the fifth, related to Ingold's claim that "what we call 'things' too are grown", is that skilled practice precedes design in generating the form of artefacts.[38]

I think that by describing "the transparent nature of the manufacturing process" that makes for an ideal plaything, Benjamin is referring to artefacts

---

[37] Tim INGOLD, *The Perception of the Environment: Essays in Livelihood, Dwelling and Skill.* London: Taylor & Francis Inc. 2000.
[38] INGOLD, *The Perception of the Environment*, p. 345; p. 345; p. 83. See also Tim INGOLD, "Making Culture and Weaving the World." In: GRAVES-BROWN, P. M. (ed.) *Matter, Materiality and Modern Culture*. London – New York: Routledge 2000 (50–71) where he argues we should think of making "as a modality of weaving" [p. 54], meaning that in making "we work from within the world, not upon it" [p. 68].

where the five dimensions of skill articulated by Ingold are visible, that is objects that clearly present the affordances involved in making them as an essential part of those offered in interacting with them – this is the "clarity" that makes something a thing for "real living play".

As components of an ecological environment that unfolds, rather than of a physical/material world that just is, these properties of things, as Ingold puts it, "occur", meaning that they are "processual and relational", that they are "neither objectively determined nor subjectively imagined, but practically experienced".[39] As such, they emerge through a reciprocal and changing engagement between being and environment, which is what leads Ingold to the conclusion that "[t]he properties of materials, in short, are not attributes, but histories".[40]

Destruction

I will elaborate on the necessity of a historical dimension when considering instruments as playthings when I flesh out the principles of the methodology that I am proposing below. Before that however, I would like to address another aspect of the investigative tendency in play that is less concerned with arrangement and composition, a way at getting to the inner workings of a thing in which testing its affordances is pushed to its extreme, where the object is taken to its limit – its destruction. As Connor writes,

> perhaps all play has at its horizon the death of the plaything. When we put something to work, we use it for a particular purpose. In play, we seek not so much to use them as to *use them up*. The point of putting things into play may be to play them out, to see how far they go, how far we can go with the open totality of their affordances.[41]

In "A Philosophy of Toys", the poet and essayist Charles Baudelaire, examining the role of playthings "in the great drama of life", considers the tendency to take them apart.[42] Like Barthes and Benjamin, he begins his essay by describing the genial affordance of things in play, citing the example

---

[39] Tim INGOLD, "Materials against Materiality." In: Tim INGOLD, *Being Alive: Essays on Movement, Knowledge and Description*. Oxon – New York: Routledge 2011, p. 30 (19–32).
[40] *Ibid*., p. 32.
[41] CONNOR, "A Philosophy of Fidgets," p. 3.
[42] Charles BAUDELAIRE, "A Philosophy of Toys." In: Charles BAUDELAIRE, *The Painter of Modern Life and other Essays*. Translated by Jonathan Mayne. London: Phaidon Press 1964, p. 198 (197–203). For further examples of the affordance of playthings see also Charles

of a simple chair that becomes at once carriage, horses and passengers in a game of *diligence*.[43] Baudelaire also underlines the creativity involved in such play, the "poetry of childhood" that unfolds when engaging with "these little inventions".[44] This even has him place playthings at the origin of aesthetic sensibility: "the toy", he writes, "is the child's first initiation to art".[45]

However, for Baudelaire, the "overriding desire" when putting things to play, the principal affordance of playthings, is the opportunity to dismantle them, to dissect them, to break them open in order to "get at and *see [their] soul*".[46] He illustrates this testing of a plaything to destruction, and the "extraordinary agility and strength" applied at it:

> The child twists and turns his toy, scratches it, shakes it, bumps it against the walls, throws it on the ground. From time to time he makes it re-start its mechanical motions, sometimes in the opposite direction. Its marvellous life comes to a stop. The child, like the people besieging the Tuileries, makes a supreme effort; at last he opens it up, he is stronger. But *where is the soul?* This is the beginning of melancholy and gloom.[47]

Baudelaire sees in this impulse to play things out "a first metaphysical tendency", a search concerned with the nature of existence for, as he put it at the text's opening, "is not the whole life to be found [in playthings]?"[48] While the answer to this at first seemed affirmative, it now appears to be "no". Or perhaps Baudelaire is suggesting that things are not that simple, that in a sense all of life it is in playthings yet at the same time not really there at all.

Allegorical objects

It is this paradox that literary theorist Daniel Tiffany picks up on in *Toy Medium* in which he describes the ambivalent matter of playthings, how they are always more and less than what they take themselves to be.[49] He points

BAUDELAIRE, "The Plaything of the Poor." In: SMITH, T. R. (ed.) *Baudelaire: His Prose and Poetry*. New York: Boni & Liveright Inc. 1919 (70–71).
[43] *Ibid.*, pp. 198–199.
[44] *Ibid,.* p. 200.
[45] *Ibid,.* p. 199.
[46] *Ibid,.* p. 202.
[47] *Ibid,.* pp. 202–203.
[48] *Ibid,.* p. 202.
[49] Daniel TIFFANY, *Toy Medium: Materialism and Modern Lyric*. Berkley: University of California Press 2000.

out how the plaything in Baudelaire's text is "*antithetical*, at once philosophical and inimical to reflection, ideal and concrete".[50] The impulse to open up the plaything in the destructive narrative above is in fact evidence of the "metaphysical" world that it represents for the child, the idea of "material things founded on the immateriality of 'the soul' – the allegorical object, in effect".[51] Rather than the "melancholy and gloom" that the spleen-ridden Baudelaire sees in the failure at finding a soul in the plaything, Tiffany argues that it registers the beginning of allegorical thinking: playthings are our first models for our understanding of the world, they are exemplary of the objects we use as structural substitutes in natural philosophical investigations to make the intangible tangible. As Tiffany puts it,

> Inquiries into the nature of material substance rely fundamentally on images that do not bear witness to empirical entities, but rather serve as models of unobservable phenomena. Indeed, the *realism* of modern physics (in contrast to its mathematical foundation) relies, by necessity, on a framework of vivid analogies and tropes, sometimes realized in visual practice. That is to say, the foundation of material substance is intelligible to us, and therefore appears to be real, only if we credit the imaginary pictures we have composed of it.[52]

Tiffany's book is concerned with how poetry "can help to elucidate the sometimes paradoxical bodies conjured by scientific materialism"; and an exploration of playthings winds through his inquiry because the toy, he argues, is the fundamental manifestation of the paradoxical thing suspended between matter and immateriality, "a spectacular device that discloses, in the name of science, the immaterial foundation of the object – the invisibility of the real".[53] In his narrative, playthings represent the "hypothetical modelling of invisible matter", which leads him to write that "[t]he toy divines the invisible substance of things".[54]

When breaking the plaything open to look for its interior mechanism and finding no "soul" in it, we learn that our natural investigations can only yield an imagined interior of things; which is why the plaything, as well as being an abbreviation of the whole world, is the perfect symbol of the methods with which we investigate the world. Perhaps this is the reasoning that

---

[50] TIFFANY, *Toy Medium*, p. 307, note 21.
[51] *Ibid,*. p. 73.
[52] *Ibid,*. p. 3.
[53] *Ibid,*. p. 6; p. 82.
[54] *Ibid,*. p. 52.

has Benjamin conclude his article by saying: "If a modern poet maintains that for each individual there exists an image which engulfs the world, how often does that image not arise from an old toy chest?"[55]

Even testing playthings to their destruction is in a sense constructive to understanding: when they break, playthings simply go from being things with which we understand the world to becoming things with we understand our ways of understanding the world with things – "thinking things" with which we interrogate our thinking about the world.

But breaking playthings open is also practically useful in the quest to understanding them as artefacts, as *made* things: it reveals how they are constituted, not only in terms of material parts, but also, as Benjamin suggests, in terms of the technologies that form them and make them work, which it to say, as Ingold shows, the different dimensions of skill involved in their making, the combined movements of people, materials and tools that bring them to be. When a thing stops to work or is broken open, these movements are made visible through the formation of an understanding of what causes the thing to fail or break. In this sense, breaking a plaything is only part of putting it to play with all the search and learning that such play involves.

Playthings methodology

The methodology I am proposing is concerned with the material culture of natural philosophy and science, specifically with the ways in which we learn from made things and from the act of making in investigating the world. Rather than the "knowledge" we get from instruments, with all the epistemological baggage of truth, justification and objectivity that the term entails, it addresses something closer to the word "comprehension" which finds its Latin etymological root (*comprehend-ĕre)* in the act of grasping at something before actually seizing or comprising it, and the word "understanding" with its source in the German for "to step under" (*understân)* or "to take upon oneself" (*unterstehen),* with the embodied engagement with the world

---

[55] This quote is from Benjamin's "Toys and Play" referenced above, but I am using here Tiffany's translation in *Toy Medium* [p. 81] which, by using the word "engulf" to translate from the German "versinkt", I find closer to the original text: "Wenn aber ein moderner Dichter sagt, es gebe für jeden ein Bild, über dem die ganze Welt ihm versinkt, wie vielen steigt es nicht aus einer alten Spielzeugschachtel auf?" from Walter BENJAMIN, "Spielzeug und Spielen." In: TIEDEMANN-BARTELS, H. (ed.) *Gesammelte Schriften*, vol. 3. Frankfurt: Suhrkamp Verlag 1972, p. 131.

that such actions would involve.[56] My suggestion is that regarding scientific instruments as playthings would allow for a multi-faceted approach to their role in the co-constitution of human perception and understanding of the world.

Following the elaboration on playthings above, let us go through the ways in which the analogy is fruitful for these aims by applying them to the Crookes radiometer as a case study.

The Crookes radiometer

The most common form for a Crookes radiometer (or light-mill) consists of a glass bulb of about 10 cm in diameter, mounted on a stand. It is partially evacuated and contains an anemometer-like structure of four vanes pivoted on a vertical axis. These vanes are usually white on one side and black on the other, and all face the same way. When the instrument is exposed to light, this "fly" rotates with the white sides leading, its spin intensifying with the length of exposure, and slowing down then stopping when the light source is taken away.[57]

In an article published on the centennial of the instrument's inception, historian Clifton W. Draper makes a case for the importance in science education of the device that has "fallen to the unprestigious role of a gift shop knickknack".[58] Besides the fact that its theory "is today still only qualitatively understood", his reasons include the interest of its inventor William Crookes' life and career, its history's wealth in "accidental observations, lengthy and ingenious experimentation, and incorrect conclusion all leading to a not totally satisfying theory" and the ease with which it lends itself to experiments adaptable to different audiences rendering it a very useful classroom tool.[59] Draper's arguments for giving attention to the Crookes radiometer show the breadth of play of the device and explain its particular suitability for the "playthinging" that I am putting forward in this article.

---

[56] "[comprehend, v.]" in: *Oxford English Dictionary* [online]. Second edition, 1989. 2012. Available at: <http://www.oed.com/view/Entry/37847> [cit. 7. 8. 2012]; "[understand, v.]" in: *Oxford English Dictionary* [online]. Second edition, 1989. 2012. Available at: <http://www.oed.com/view/Entry/212085> [cit. 7. 8. 2012].

[57] Crookes names the moving part this way first in William CROOKES, "On Repulsion Resulting from Radiation – Parts III. & IV." *Philosophical Transactions of the Royal Society of London*, vol. 166, 1876, p. 344 (325–376). See image 1.

[58] Clifton W. DRAPER, "The Crookes Radiometer Revisited: A Centennial Celebration." *Journal of Chemical Eductaion*, vol. 53, 1976, no. 6, p. 356 (356–357).

[59] *Ibid*., p. 356.

Although I believe that the aspects that will be teased out through regarding a device as a plaything are true of all artefacts, some devices, for non-noumenal reasons, seem to show them in an extended way: they seem to be made to be transformed and seem particularly prone to fall in the gaps of classification systems, to require and register paradigm shifts that they outlive. The radiometer falls into this category, and that probably explains why it became a toy and is still widely available today.

Image 1: *"Crookes Radiometer," Image by Timeline for* Wikipedia Commons *[online] 2005. Available at: <http://en.wikipedia.org/wiki/File:Crookes_radiometer.jpg> [cit. 2. 9. 2012].*

A good standard description of the device explains that, despite its name, it is a demonstration device rather than a measuring instrument, relates the way in which it grew out of its inventor's recognition of an anomaly when weighing hot samples in vacuum, tells how its theory caused controversy from the time it was first presented in 1874 and how its operation is still considered complicated to this day, recounts some of the big names of science whose interest it attracted, describes the way in which Crookes' investigation of its effects took him in a different direction (generally described as erroneous) to his contemporaries and usually lists

213

the device's contributions to the kinetic theory of gases and to the invention of the cathode ray tube.[60]

Such an account certainly points out the fascinating story of the device but, I would argue, does not capture the array of understanding that the device offers as a material object, the variation in its affordance to action and perception, which is to say its "play". Thinking of it as plaything however, as I will demonstrate below, leads to a more comprehensive account in these respects.

Restoring mobility

A plaything, as we've seen in Hodgkin's account above, is recognised as such through the part it performs in the looping structure of play. It is a material object in constant oscillation along this loop, its nature varying in a recurrent semi-cycle. It seamlessly moves between the status of tool, toy and symbol, is both sensory and abstract and, rather than being defined by its function, embraces change in its role, constitution and classification all the while still remaining itself. Considering a scientific instrument as a plaything means, in the first place, restoring its inherent mobility as an artefact.

Rather than defining the instrument in terms of its function, it means opening it up to the various uses it has been put to, as well to others it might in the future be applied for, whether scientific or not because all thoughtful engagements produce understanding.

In the case of the radiometer, this means that rather than defining it as a demonstration instrument, which creates a phenomenon and provides working knowledge of it, we can also address its inventor's intended function of it as a measuring instrument for radiation (whence its appellation radi-o*meter*), regardless of it fulfilling this function. It also allows us to look into the way it was hypothesised as a model: for action at a distance in Crookes's first interpretation of its behaviour as well as (a not particularly effective one) for the kinetic theory of gases in the accepted explanation of its workings. It gives us access to the tacit know-how informed by its construction as perfected by Crookes and his assistant Charles Gimmingham, as well as to the objective information it offers that passes into the domain of scientific

---

[60] Excellent examples of such an account are two articles by Norman R. HECKENBERG, "Radiometer, Crookes." In: BUD, R. – WARNER, D. J. (eds.), *Instruments of Science: An Historical Encyclopedia*. London – New York: Science Museum & Smithsonian 1998, pp. 510–511; and Norman R. HECKENBERG, "Crookes' Radiometer and Otheoscope." *Bulletin of the Scientific Instrument Society*, no. 50, 1996, pp. 40–42.

and technological knowledge proper. It also admits the subjective under-standing it has offered at various times, including its relevance to Crookes' spiritualist investigations into medium communication. In other words, considering the radiometer a plaything challenges the divisions, definitions and categorisations that would limit what is admitted as understanding in what the device has to offer.

Sensitive and enquiring process

In 1873, Crookes was attempting to determine the atomic weight of Thal-lium, the new element that he had discovered by use of the spectroscope. It was during these "very laborious researches" that he noted the odd behav-iour of the warm samples that he was weighing in an evacuated chamber, and it was this recognition of an anomaly and the desire to stabilise its effect that lead to the making of the radiometer.

Noticing that something is behaving anomalously presupposes a tacit knowledge of the context in which a phenomenon is encountered, that is an attentive sensitivity to the usual workings of a defined environment. It results from directed chance, borne out of a more or less defined course of investigation and necessitating skill and training in order to recognise the significance of the chance encounter; in this case, the anomalous behaviour of heated bodies in vacuum. In *Representing and Intervening*, philosopher of science Ian Hacking suggests that even the most irrational looking course of inquiry can be a tool of discovery. To the question: "must there be a conjecture under test in order for an experiment to make sense?" he answers: "I think not."[61] What is however required are attentiveness, care and practice, which provide the means of understanding and interpreting the effects produced. It is important that Crookes was aware of how things were meant to behave according to the scientific theories of the time and through his experimental experience. Had this not been the case, he would not have distinguished the phenomenon as anomalous. It is also essential that he recognised its meaningful potential. Without this informed curi-osity, experimentation would not have taken place. The recognition of an anomaly in his study of Thallium led Crookes to look at ways of elaborating the striking effect that he believed would be of scientific significance.

[61] Ian HACKING, *Representing and Intervening: Introductory Topics in the Philosophy of Natural Science*. Cambridge – New York – Melbourne: Cambridge University Press, 1983, p. 154.

This inductive process and its various contingencies are brought to the fore when one considers the device as a plaything: the sensitive and enquiring approach to the world that it entails is put forward, suggesting a hands-on and groping approach to understanding, the more embodied and immersed aspect of scientific inductive reasoning. To the enduring philosophical question of whether it is theory or practice that comes first in scientific inquiry, the answer this method presents is an oscillation between the two, a reciprocal constitution of one through the other.

It also brings out the spatial nature of this kind of engagement when all paths are still possible and various options are tested; and helps identify the particular context for this searching activity, an experimental space which, like the privileged zone of play, has its own laws and is in a way extracted from everyday rules. Instruments in the making are like playthings as the things we think *of* in the absorption and open-ended intent that "playing" with them requires.

Evocative objects: things we think with

Instruments are evocative objects for their makers and users. In the case of the radiometer, this is made particularly clear through its inventor adopting the instrument as a symbol for his scientific researches and achievements. When the scientist was knighted in 1897, the most prominent icon in the design of his coat of arms (pictured below, image 2) is a depiction of the radiometer. His chosen motto inscribed on a scroll underneath it is "Ubi crux ibi lux," which translates into: "Where the cross is, there is light." Although this line most obviously refers to the Maltese cross on his cathode ray which features twice at the upper corners of the design, his biographer William H. Brock also reads it as wordplay by the inventor: "Where Crookes is, there is light" – the light of knowledge provided by the radiometer, its whirling vanes representing "the black of scientific ignorance fleeing from the white of a new understanding of fundamental physics."[62]

A 1902 portrait of Crookes holding the radiometer firmly in his left hand while his right hand rests casually in his pocket further demonstrates the symbolic importance of the radiometer for its inventor (see image 3). The fact that he chose to be represented with the device in his hand two decades after he first presented it is significant. The image reveals something

---

[62] William H. BROCK, *William Crookes (1832–1919) and the Commercialisation of Science.* London: Ashgate 2008, p. 222.

of the relationship between the instrument and its maker: Crookes seems confident in his handling of the object held up like a sword. It is the weapon that renders the world knowable and controllable by science, and it becomes an extension of the scientist's body, assimilated by his everyday practice. Scientist and instrument appear bound in a seamless way by a narrative of knowledge and intellectual ascendance. In this narrative, the radiometer plays the part of the key to understanding the world.


Image 2 (left): *"Sir William Crookes (1832–1919)" in* Escutcheons of Science – Armorial of Scientists – Numericana *[online]. Available at: <http://www.numericana.com/arms/crookes.htm> [cit. 28. 6. 2009].*

Image 3 (right): *"Sir William Crookes (1832–1919)" from* Vanity Fair*, 1902, by "Spy" Sir Leslie WARD (1851–1922) [online]. Available at: <http://commons.wikimedia.org/wiki/File:Sir_William_Crookes_1902.jpg> [cit. 16. 5. 2009].*

A tiny otheoscope mounted on a tiepin that Crookes is said to have always worn plays a similar symbolic role. I found a reference to it in a letter to his son where he introduces this new variant of the radiometer under the first name he had given it, "elaunoscope", writing: "I have one about

½ inch in diameter mounted as a scarf pin."[63] I believe it is this accessory that I photographed in a small case at Blythe House (below, images 4 and 5). It can now be found in a case near the entrance of Royal Society's Library in Carlton Terrace, London, along with most of Crookes' radiometers, which he presented to the Royal Society in 1911.
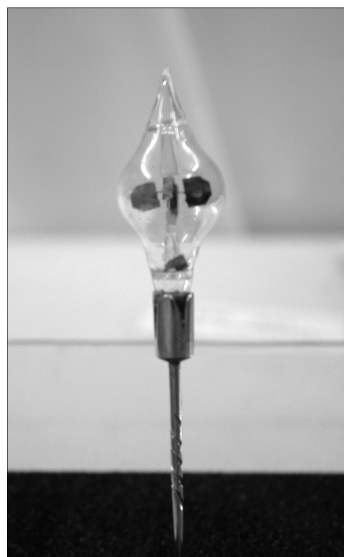
Images 4 and 5: Photographs taken by the author at the Science Museum's storage facility in Blythe House in April 2009.

Recognition of and reaction to affordances

As with playthings, what makes an instrument evocative is a result of the recognition of and reaction to the possibilities of action that it presents to its maker as well as to its users. They result from the affordances of an object and/or environment to a scientist that appear useful to his or her investigative purposes. The "actions of a demiurge" that lead to their making

---

[63] William CROOKES, "Letter to Henry," quoted in E. E. FOURNIER D'ALBE, *The Life of Sir William Crookes*. London: T. Fisher Unwin Ltd. 1923, p. 261.

consist of testing out, modelling with, and refining materials and phenom-
ena in particular circumstances for which they present themselves as useful.
What an instrument offers to be done with it, as with a plaything, cannot
be thought of as separate from the process of making it, from the skilled
practice involving materials and techniques that leads to its emergence.

In "Showing, Doing and the Ontology of Using Scientific Instruments",
philosopher of science Denis L. Sepper proposes the following description
for how an artefact becomes a scientific instrument:[64]

> I would suggest that as a general principle that objects become scientific instru-
> ments (or perhaps proto-instruments) when they display an effect of interest to
> researchers, i.e., within an already well-defined context of investigation. [...] If
> the effect is sufficiently striking and if one also discovers that one can elaborate
> the effect and even do things with it, the object becomes a full-fledged process-
> ing instrument.[65]

Sepper further notes that the transformation of an object into a process-
ing instrument affects the instrumental significance of related objects and
opens up the possibility of developing new compound and more complex
instruments.[66]

Scientific instruments, then, come to be or, more accurately, are made,
within particular contexts of investigation through their association with
particular effects that are enrolled for action and interpretation in these
contexts and that can subsequently extend beyond them. Thinking of in-
struments as playthings brings these contexts, effects and negotiations to
the fore. In that sense, it helps unravel what is referred to as "black-boxing"
in the sociology of science: rather than considering instruments as input-
output devices that unproblematically transmit natural knowledge, it fa-
cilitates the aims of constructive approaches to the history of science which
address scientific practices and socio-political and cultural contexts in order
to unravel the social means through which particular experiments executed

---

[64] Dennis L. SEPPER, "Showing, Doing and the Ontology of Using Scientific Instruments."
In: DRAGONI, G. – McCONNELL, A. – TURNER, G. L'E. (eds.), *Proceedings of the Eleventh
International Scientific Instrument Symposium* [Bologna University, 9–14 September, 1991].
Bologna: Grafis Edizioni, 1994 (29–34).
[65] *Ibid.*, p. 30.
[66] *Ibid.*, pp. 31–32.

by specific experimenters with specific instruments came to produce valid knowledge for particular audiences.[67]

Reverse black-boxing

In the case of the radiometer, this allows an elaboration on Crookes and Gimmingham's experimental work towards stabilising the observed effects of repulsion resulting from radiation into an instrument "which had none of [the] defects [of previous arrangements], whilst it showed the movement of rotation in a very convenient matter".[68] It also allows for a discussion of the scientific context in which the device was presented, the controversy it caused in the interpretation of its effects, the various players involved in its scientific career and its eventual epistemic obsolescence. While the radiometer first caused sensation in the scientific community when it was presented at a Soirée of the Royal Society on April 7th 1875, especially because of its promise of answers about the nature of light and radiation, critics of Crookes theory of its behaviour were quick to emerge. His positing of a pressure of radiation causing the vanes to rotate was criticised by Osborne Reynolds who convincingly argued that the movement of the radiometers' vanes could be easily explained by the presence of residual gas in the evacuated chamber.[69] Reynolds further referred to an experiment by Arthur Schuster, led at his instigation, which gave experimental evidence that "the Force which turns the Mill is not directly referable to Radiation". This consisted in suspending a radiometer with two parallel fibres and subjecting it to a light source. If external radiant light caused the repulsion then, because of the tiny amount of friction in the glass vessel, the whole instrument would turn in the same direction as the vanes. However if the forces were produced within the instrument, then the instrument would rotate in the opposite direction of the vanes in accordance with Newton's third law of motion. The latter was observed and Schuster concluded that: "The motion in the light-mill is wholly due to the forces acting between the revolving mill and

---

[67] See Jan GOLINSKI, *Making Natural Knowledge: Constructivism and the History of Science*. Cambridge: Cambridge University Press 1998, p. 140, definition of "black-boxing".

[68] William CROOKES, "On Repulsion Resulting from Radiation. Parts III. & IV." *Philosophical Transactions of the Royal Society of London*, vol. 166, 1876, p. 339 (325–376).

[69] Osborne REYNOLDS, "On the Forces Caused by the Communication of Heat between a Surface and a Gas; And on a New Photometer." *Philosophical Transactions of the Royal Society of London*, vol. 166, 1876, p. 726 (725–735).

its enclosure."[70] Based on the experiment, Reynolds proceeded with calculations that led to the explanation commonly held to this day.[71] His notion of "Thermal Transpiration" and Maxwell's development on that theory eventually explained the radiometer effect as a result of the difference in temperature between the two sides of the vane causing gas molecules at the edge to slide in such a way as to cause tangential stress on the vanes' surface and thereby produce motion.[72]

Consequent theoretical researches on the behaviour of particles and on the properties of rarefied gas by all involved led to the progressive development of a new molecular kinetic theory of gas, and pushed the radiometer away from the centre of attention as it became reduced to merely a context amongst others in which to test the new theory. By 1880, apart from a few sparse speculations, scientists seemed no longer concerned with the radiometer itself, their attention now directed to the phenomena in rarefied gases that it had contributed to enlighten. [73]

Thingness: materials and technologies

While such an unpacking of black-boxes is now common practice in approaches to the history of science and technology, the plaything methodology adds a dimension that seems to be left out by such historiographies: they seem to overlook what the thing itself does outside of socio-political and scientific discourses, to leave out what the instrument's "thingness", the materials and technologies at work in it, afford to perception, action and understanding.

---

[70] This was later regarded as the "crucial experiment" on the radiometer. Arthur SCHUSTER, "On the Nature of the Force Producing the Motion of a Body Exposed to Rays of Heat and Light." *Philosophical Transactions of the Royal Society of London*, vol. 166, 1876, p. 718 (715–724).

[71] REYNOLDS, "On the Forces," p. 730.

[72] Osborne REYNOLDS, "On Certain Dimensional Properties of Matter in the Gaseous State," Part I-II *Philosophical Transactions of the Royal Society of London*, vol. 170, 1879, pp. 727–845; J. C. MAXWELL, "On Stresses in Rarified Gases Arising from Inequalities of Temperature." *Philosophical Transactions of the Royal Society of London*, vol. 170, 1879, pp. 231–256.

[73] It is worth noting that in 1924, Albert Einstein contributed additional explanation to the radiometer's behaviour that was picked up by M. Knudsen who elaborated on it in 1930. The "Einstein effect" suggested an additional phenomenon at work in the radiometer: that of the excess pressure at the edges of the vane. This would be caused by gas molecules at the edge being held back both by molecules rebounding on the vane one side and, less effectively, by molecules passing the edge to the cooler side.

This attention to technology and materials in play may be the essential aspect that leads a consideration of scientific instruments into the realm of playthings. Scientific instruments are things made with skilful use of techniques and materials (ahead of and informing form), and engagement with them foregrounds the affordances of these in the exploration of the world. Moreover, these affordances, by characterising the looping movement of playthings, are shown to vary over time: what particular materials and technologies offer to perception, action and understanding evolves with respect to context, circumstance and perceiver/actor/interpreter. I use the expression "historical affordance" to refer to this notion which is the main argument for looking at the instruments of science and technology as playthings.

Historical affordance

Gibson's theory of affordance gives leeway for a variation in or evolution of the affordance of an environment or a thing, because the ecological environment, as he presents it, is a blend of permanence and change, what he calls "discontinuous change" rather than "transformation" in order to set variance and invariance as reciprocals in describing the stable and changing relationships between self and world. Affordances, he tells us, are specified in the relative invariants over transformations, and involve a reciprocal process of attunement (as in active and progressive adjustment and equilibration towards harmony) between being and environment ("resonating" to one another), a dynamic reciprocity. Since relative ecological constants and affordances that appear to have the quality of stability and permanence persist to the degree to which these constants persist, the invariance of an affordance is just a matter of differing time scales: what seems stable is just in a different regime of duration, it endures. Affordances, then, are always (semi-cyclically) historical. This "historical affordance" of things that changes over time is the principal notion that this methodology aims to tease out.

By regarding scientific artefacts as playthings, the range of "play" in their affordance is brought to the fore, and these variations in and evolution of their affordances call for an historical approach to register them. A historical account can take into consideration the mobility and transformability of things while keeping the memory of their past affordances and anticipating future ones, it can show that change is occurring yet in a continuous subsisting thing. Just as borrowed or adapted terms conserve their prior layers of meaning, so artefacts retain a memory of their past affordances; and just as

222

terms offer potential poetic uses inspired by earlier ones, so objects suggest further ways of deploying them that extend previous uses and practices. There is always time in things: they are chronic (rather than temporal) because they recurrently change and sometimes disobey what we think is characteristic of them. In order to take this into account, the methodology set out here approaches objects in a historical way, which is not to say that it does so chronologically: history is not considered as a linear progression and no such thing as precedence or a "more real" reality is posited. Like the looping structure of play, it is viewed as a semi-cyclical spatial movement rather than as a matter of succession: sometimes what happens latest in an object's career is what seems more "primary" at the time and place of writing. No such thing as a "more primary" quality or characteristic or role of a thing is therefore posited or assumed, except in relation to a particular perspective/context/etc. Although I will resort to using it in the text, this explains why "declination" is not quite the adequate term to describe what might appear to be the "other" lives of things: it implies that there is a "real" life and an order of precedence, whereas the plaything methodology considers that all manifestations of an object are valid.

By adopting this historiography, the varying affordances of artefacts are brought forward, and any suggestion of pattern or objectivity is understood as the result of a regular recurrence or of repeatedly instantiated sets of relations. The unfixity, uncontainability and irreducibility of the artefacts considered thus foregrounded render them ideal for a "philosophical" and "elastic" understanding of things that is also involved in a thought about its own processes. Instead of stable information and definition, scientific instruments regarded as playthings offer a lot of scope for "tuning in" to them as thinking things, with sometimes the reward of rare moments of "being in tune" with them: they become, in other words, ideal philosophical toys.

The radiometer's historical affordances

The notion of historical affordance as I've described it above brings attention to the different materials and technologies that compose the device as histories, first of each constitutive part separately and then of their particular arrangement and relationships within it.

In the case of the radiometer, this involves looking at the cultural history of glass, its affordance as a material and process, and the problems that its transparency and transitivity generate. Literary scholar Isobel Armstrong reminds us that 19th century glass was blown by artisans, which means that

in using it "you literally looked through, and by means of, somebody else's breath."[74] She explains how as a consequence of its availability and ubiquity in the mid 1800s it came to participate in the formation of consciousness itself and suggests that the epistemological questions raised by glass at the time were about mediation, transitivity and their implications. The dialectic of glass, at once letting through and blocking, or selectively doing one or the other, generated, she writes, "different kinds of epistemological confusion out of the very lucidity of glass."[75] Transparency and mediation are at the heart of this confusion: "Just as the artisan's breath was invisible, so also was the fact of mediation, as the invisible shaped experience."[76]

Attention to glass as substance and process allows us to problematise the radiometer's glass enclosure in laboratory practice in terms of surfaces, membranes and boundaries. It also brings attention to technologies of containment, and leads us to the next material constitutive of the device: the vacuum (though later understood as partial) that it is a necessary vessel for.

The radiometer was for the scientist James Clerk Maxwell first and foremost a device that allowed, by means of a glass globe both impermeable and see-through, for the sealing and observation of vacuum, or at least of a condition or medium "much nearer to nothing" than had previously been achieved.[77]

Interrogating vacuum, which only became an experimental object that could be made and manipulated in the late seventeenth century, opens up discussions about the hypothesised subtle medium called "ether" and its use as a trope for natural philosophical investigations. It crucially allows us to look into its affordance to Crookes' spiritualist investigations: this attenuated environment held for him the possibility of revealing the effects of parapsychological transmissions, its conductive capability mirroring that of the sensitive mediums of nineteenth century séances – the radiometer, for Crookes, could render spiritual energy phenomenal.

---

[74] Isobel ARMSTRONG, "Technology and Text: Glass Consciousness and Nineteenth-Century Culture." In: FLINT, K. – MORPHY, H. (eds.), *Culture, Landscape and Environment: The Linacre Lectures 1997.* Oxford: Oxford University Press 2000, p. 149 (149–175). See also Isobel ARMSTRONG, *Victorian Glassworlds: Glass Culture and the Imagination.* Oxford: Oxford University Press 2008.

[75] *Ibid.*, p. 149.

[76] *Ibid.*

[77] Letter from Maxwell to Robert Cay, 15 May 1876, quoted in S. G. BRUSH and C. W. F. EVERITT, "Maxwell, Osborne Reynolds, and the Radiometer." In: MC CORMMACH, R. (ed.), *Historical Studies in the Physical Sciences, Volume 1.* Philadelphia: University of Pennsylvania Press 1969, p. 112.

It can then be studied as a device for explicating an environment where different laws of nature operate, its magical potential heightened by the suggestion of perpetual movement in the rotation of its vanes.

Artistic declinations

Furthermore, the plaything methodology allows us to look at artistic practices that put the instrument to use, bringing alternative affordances to view and suggesting future ones. Various artworks can be considered as material "declinations" of an instrument in a chain of connection that links objects to one another.[78] An attention to artworks is particularly fruitful in uncovering an object's affordances outside of its designated function because of the way in which artists put things maximally to play in their investigations, processes and productions. Three brief examples demonstrate how this is the case with the radiometer.

The artist Francis Picabia's 1913 watercolour *Mechanical Expression Seen Through Our Own Mechanical Expression* shows an abstracted radiometer that he uses to represents the dancer Stacia Napierkowska.[79] The analogy puts forward the empathetic affordance of the radiometer's performance, inversing the usual trope in his title so that it is human movement that promises to reveal the inner working of the device.

In *Northern Lights*, the novelist Philip Pullman alludes to the radiometer when describing the magical effect of a scientific instrument:

> Then it became clear: a little thing like a weathervane, with four sails black on one side and white on the other, began to whirl around as the light struck it. It illustrated a moral lesson, the Intercessor explained, for the black of ignorance fled from the light, whereas the wisdom of white rushed to embrace it.[80]

Pullman's account puts forward the device's resonance as a holy object and sheds light both on Crookes' adoption of it as a symbol of his epistemic virtue and on the reasons for which it seems to promise a link between the physical and the metaphysical.

---

[78] The word "declination" is taken from Christopher PINNEY, "Things Happen: Or, From Which Moment Does That Object Come?" In: MILLER, D. (ed.), *Materiality*. Durham – London: Duke University Press 2005 (256–272). In this article he suggests that networks of objects might offer an alternative method of engaging with things.
[79] Francis PICABIA, *Mechanical Expression Seen through Our Own Mechanical Expression*, watercolour and pencil on paper, 1913. New York, Collection Lydia Malbin.
[80] Philip PULLMAN, *Northern Lights*. London: Scholastic 1995, p. 149.

More recently, artist Luke Jerram's chandeliers, made of hundreds of radiometers (665 for a 5m tall chandelier), multiply the device's aesthetic effect in a spectacular demonstration of its flickering play with light, bring forward the sensitivity of its responsiveness to environmental light and heat and seem to point to an infinity of atmospheric enclosures each contained in an ever larger one.[81]

While I cannot expand on these examples within the scope of this article, these brief sketches demonstrate how productive the study of artistic declinations of instruments can be. Once regarded as playthings, they are found to share the aesthetic inspiration of artworks that put them to play.

I have elaborated in this article a phenomenological/ecological understanding of the plaything in order to argue that considering scientific instruments as playthings is a generative methodology that restores their mobility and inherent transformability, takes into account the skill required in making them as well as their historical affordances and allows for their consideration alongside objects from different fields with which they resonate. I hope that in doing so I have made a convincing case for reviving the category of philosophical toy in studies of science and technology.

---

[81] Luke JERRAM, *Chandeliers* (undated). See project page on the artist's website available at: <http://www.lukejerram.com/projects/chandeliers> [cit. 13. 4. 2013].

////// tematická studie / thematic articles ////////////////////

THE TOYS OF ORGANIC CHEMISTRY: MATERIAL MANIPULATIVES AND SCIENTIFIC REASONING

Abstract: *Chemical visualizations and models are special kinds of media for thinking. In this paper, I examine several historical case studies—an archive of images from museums, special collections, and popular magazines—as examples of emergent practices of physical modeling as theoretical play which became the basis for molecular biology and structural chemistry. I trace a legacy of visualization tools that starts with Archibald Scott Cooper and Friedrich Kekulé in the late 1800s, crystallizes as material manipulatives in Van't Hoff and his folded paper "toys," is legitimized in the California lab of Linus Pauling, and is glorified in the popular imaginary with James Watson and Francis Crick's model of DNA. My tracing then follows several threads into contemporary modeling practices. I ultimately argue that modeling play, originally outside of the boundary of deductive, positivist science, is now an accepted mode of reasoning in these related chemical fields.*

Keywords: *epistemology; manipulative models; materiality; toys in science*

Hračky organické chemie: materiální manipulativy a vědecké uvažování

Abstrakt: *Chemické vizualizace a modely jsou zvláštními druhy médií myšlení. Tato studie zkoumá několik historických případových studií – archív obrazů z muzeí, specializovaných sbírek a populárně-vědeckých časopisů – emergentních praktik materiálního modelování coby teoretické hry, jež se staly základem molekulární biologie a strukturní chemie. Sleduji dědictví nástrojů vizualizace počínaje Archibaldem Scottem Cooperem a Friedrichem Kekulé na konci 19. století, jejich vyústění do materiálních manipulativů Van't Hoffa a užití jeho skládaných papírových „hraček" Linusem Paulingem i jejich následné pronikání do populární obraznosti díky modelu DNA Jamese Watsona a Francise Cricka. Sleduji dále jejich vliv na současné praktiky modelování a zdůrazňuji, že materiální modely, jež tradičně stály za hranicemi deduktivní, pozitivistické vědy, jsou nyní v těchto oblastech chemie akceptovány jako způsob vědeckého uvažování.*

Klíčová slova: *epistemologie; manipulativní modely; materialita; hračky ve vědě*

KATE MADDALENA
Department of Communication, Rhetoric and Digital Media
North Carolina State University
Campus Box 7579 // Raleigh, NC 27695 // USA
email / skmckinn@ncsu.edu

227

Kate Maddalena

Introduction

In an iconic image of Nobel Prize winners James Watson and Francis Crick, the pair pose with their famous model, a spiral staircase made of delicate metal pieces. Crick gestures to the model, while Watson looks up. The men are young and unequivocally triumphant; the image thinly disguises its subjects' smugness, their slightly arrogant attitude towards their artificial poses. Historians have made much of the personalities of these two: unconventional, flippant, perhaps immature, and most certainly playful. The popular mythology that has developed around them would have us believe that they were boys playing with toys. But a critical consideration of epistemology in action must recognize that those were some pretty powerful toys. What is that model made of? How did they decide to put it together, and, more importantly who (or what episteme) taught him (or them) to do it? How did "playing with toys" come to be recognized as Nobel-worthy science?

Evelyn Fox Keller's book *The Century of the Gene* tells the story of the conceptualization of the gene—the irreducible unit of molecular biology—as a myth of simplicity that contemporary genetics is still struggling to escape with more robust and complex explanations. The crux of her criticism is the biologist's linguistic tools for representation and argumentation; the gene as a name and unit, she argues, has "simplicity and allure," but the tests of such a simple catch-all (gene as code and gene as driving action) have not born out. Keller ultimately claims, among other things, that "biologists who seek to make sense of [new developments in epigenetics and the like] will have a considerably expanded array of conceptual tools with which to work."[1] In a related version of the history of the gene, Philip Thurtle traces the cultural forces behind what he calls a "genetic rationality".[2] His argument focuses on the intersection of technologies and political ideologies[3] that animated the 20th century's uptake of the encoded "living material" approach to inheritance, eugenics, population and, more broadly, a genetic way of seeing life itself.

Though both of these approaches touch upon what I might call material and visual rhetorics, they really focus on the verbal and conceptual

---

[1] Evelyn Fox KELLER, *The Century of the Gene*. Cambridge: Harvard University Press 2000, p. 10.
[2] Philip THURTLE, *The Emergence of Genetic Rationality*. Seattle: University of Washington Press 2007.
[3] Thurtle is less concerned with an "internalist" view of epistemology (as I am here), but rather with how knowledge functions as power in society large.

aspects of explanation and argumentation. But the epistemic practices of molecular biology and structural chemistry are often dependent upon embodied, material and spatial conceptualization; they require understanding of molecular architecture that natural spoken languages are ill-equipped to manage. Much of what scientists in these fields do is manipulate material (a model) which ostensibly represents the thing-in-itself (a molecule). Such epistemic work may be discursive, certainly, on one level, but its materiality calls for a different sort of frame with which to describe it. Keller's request for new "conceptual tools" for geneticists begs, from the historian, a detailed understanding of the conceptual tools that have existed to this point, a materialist media history of things we think with. Historians and philosophers of science—and particularly those who wish to treat structural chemistry, molecular biology, genetics and the like—must become historians and philosophers of media and technology.

The pages that follow are an example of a project to that end. In them, I briefly examine a few of the practices of physical modeling in organic chemistry that enabled the kind of material-theoretical play that, in turn, enabled James Watson and Francis Crick to conceptualize DNA and the modern world at large to conceive of the material replication of life as a primarily structural-chemical affordance. First, in a brief review of scholarly literature, I describe some current conversations in science studies that such a tracing might inform. Then I historicize the development of what Linus Pauling calls "spatial models" in molecular biology. My story isn't an unbroken historical line; it is rather an archaeology – a series of related snapshots, starting with the simultaneous innovation of drawing the valence structures of organic compounds by Archibald Scott Cooper and Friedrich Kekulé in the late 1800s. I trace those innovative visualizations into the toylike manipulatives used in labs like Linus Pauling's – the concepts made concrete that afforded the paradigm-establishing, now-iconic "model," then into the generally accepted, public scientific way of knowing as evidenced by mass-produced modeling kits that were sold as toys and used as pedagogical tools. Ultimately I'll argue, from the perspective of media theory, that the unique affordances of what I call "material manipulatives" – the tinkertoys of Linus Pauling's spatial models –were as important to the discovery of DNA's structure as the social and rhetorical situations that have already been so thoroughly historicized. The ongoing contemporary remediations of such methods also imply that the chemical spatial model persists as part of a now-unquestioned, arguably "invisible", epistemic practice in molecular biology.

229

Kate Maddalena

Studies of inscriptions, visualizations, and modeling technologies in science

In an entry for the 2012 edition of the Stanford Encyclopedia of Philosophy, philosopher of science John Carroll lists discursivity as a point to be addressed in future scholarship; "more attention," he writes, "needs to be paid to the language used to report what are the laws and the language used to express the laws themselves."[4] I maintain that the equation, the diagram, and the manipulative are a material parallel to that language that is as powerful, or more powerful, than the verbal. Rhetoricians Alan Gross, D. S. Birdsell and L. Groarke would likely agree with Carroll's call to pay attention to inscription. Birdsell and Groarke hit upon the philosopher's "propositionality" and the relationship of the real to the representation of the real when they argue that scientific demonstrations "are inherently propositional because a visual image is used to convey information that is purportedly true."[5] In 2009, Gross wrote "Toward a Theory of Verbal-visual Interaction: The Example of Lavoisier",[6] in which, among other things, he calls for visual and material rhetorics of scientific arguments; he claims that much of science's convincing is done with meaningful images and objects, not words. Gross is careful to distinguish between the "verbal" kind of visualization – images that are symbolic and meaning-bearing, and the mimetic image – a photograph that is seen as empirical evidence in itself. He spends most of his time on the latter, and mimetic images are indeed inscriptions that require their own set of problematic rhetorical questions.

But I am more interested in what he has to say about the former – the more consciously signifying visualization tools. Gross maintains, most notably, that visualizations can allow us to think "with" space in ways that prosaic language cannot: "in the case of natural and artificial languages, internal connections exist among their fundamental components. In contrast, in the case of images, contiguity rules: they and their components are organized spatially into synchronous hierarchies or nested sets." "Unlike words," Gross writes, "images can undergo meaningful spatial transformations and

---

[4] John W. CARROLL "Laws of Nature." *The Stanford Encyclopedia of Philosophy* [online] (Spring 2012 Edition), Edward N. Zalta (ed.), forthcoming URL <http://plato.stanford.edu/archives/spr2012/entries/laws-of-nature/>.
[5] David BIRDSELL – Leo GROARKE, "Outlines of a Theory of Visual Argument." *Argumentation and Advocacy*, vol. 43, 2007, no. 3–4, p. 106 (103–113).
[6] Alan G. GROSS, "Toward a Theory of Verbal–Visual Interaction: The Example of Lavoisier." *Rhetoric Society Quarterly*, vol. 39, 2009, no. 2, pp. 147–169.

230

manipulations, such as superimposition, projection, rotation, magnifica-
tion, and animation."[7] A turn to the visual, non-verbal, and material is in
the making for rhetoric of science. Propositionality becomes even more
embedded in movable material models – as the (empirically discovered)
structural protocols of molecules themselves (angles of attachment, sites of
attachment, mobility and the like) are incorporated into designed materi-
als, each piece and the way it relates to the whole becomes unquestionably
true in the context of the model itself. Manipulatives – Watson and Crick's
model, for example – combine the affordances of natural languages and
visual ones; materials designed to have protocols relate both internally and
spatially. Moreover, the protocols upon which material models depend have
even less potential for the semantic slippage of verbal and visual arguments
– they are, at least potentially, self-evident, obdurate objects in themselves.

The turn to the material is, of course, an ongoing trend in scholarship on
both media and science, though scholars in interdisciplinary science studies
rarely explicitly recognize the implications of their claims for media stud-
ies. Phenomenological accounts of how science thinks with and produces
objects are perennial. Most notably, Hans-Jorg Rheinberger's *Towards a His-
tory of Epistemic Things* discusses how inquiry produces entire systems of
materials –particularly lab-produced phenomena like cultures and protein
replicators – to constitute a given field of knowledge,[8] and Davis Baird's
Thing Knowledge focuses on the design of specialized instruments to ma-
nipulate the same.[9]

Historians who study knowledge-making in genetics are already ex-
amining media, and they are particularly interested in the inscription of
images. Carol Keirns has documented geneticist Barbara McClintock's
practices of "pictorial communication", and Keirns' description hints at
the kind of inscription-reading expertise that Lorraine Daston and Peter
Gallison turn in to a full-blown theory years later: "McClintock taught
close colleagues to 'read' the patterns in her maize kernels, 'seeing' pigment
and starch genes turning on and off."[10] Daston and Galison's 2007 book,

---

[7] *Ibid*., p. 148.
[8] Hans-Jorg RHEINBERGER, *Toward a History of Epistemic Things: Synthesizing Proteins in the Test Tube*. Stanford: Stanford University Press 1997.
[9] Davis BAIRD, *Thing Knowledge: A Philosophy of Scientific Instruments*. Berkeley: University of California Press 2004.
[10] Carol KEIRNS, "Seeing Patterns: Models, Visual Evidence and Pictorial Communication in the Work of Barbara McClintock." *Journal of the History of Biology,* vol. 32, 1999, no. 1, pp. 163–195.

Objectivity,[11] considers more cases like Keirns's, focusing on the materials – mostly machinery – and practices of image-rendering in the life sciences, and the way in which mediation has become a layer between the scientist and object of study. They argue that, though the media layer has been seen to remove the observer from the observed, such a "removal" is almost always more of a gesture – a social action, a convention of the community – than it is an actual separation. On the contrary – Gallison and Daston note that the specialization of inscription technologies makes it so that the expert scientist is even more tied to his or her product, as he or she must make sense of the image or rendering. Different types of inscription techniques and technology, different types of inscriptions themselves, and the resulting, extremely specialized inscription-reading practices become different types of objectivity.[12]

But the treatments of inscriptions I've described so far are all mediations based in visual representations or reproductions, not manipulative models. In their chapter of the same book entitled "Structural Objectivity", Daston and Galison note a scientific trend that paralleled the philosophical move to structuralism, and they say that "[scientists] who identified 'structures' as the core of objectivity understood a great variety of things under that rubric: logic, ordered sequences of sensations, some of mathematics, all of mathematics, syntax, entities that remain invariant under transformations".[13] Scientific structuralism, then, is at the basis of the experience and inscription of Ludwik Fleck's "system of uniformities"[14] – patterns that can become protocols in the recording, communicating, and manipulating of rules (maybe theories, laws), and concepts. Daston and Galison call the dependence on such structures a solution to "the specter of incommunicability in the sciences."[15] (It is no surprise, then, that a popular pre-med textbook is entitled *Organic Chemistry as a Second Language: Translating the Basic Concepts*.) Galison's essay "Ten Problems in History and Philosophy of Science" lists the structures and their inscription apparatus as "Problem number 3":

> *Technologies of Argumentation.* When the focus is on scientific practices (rather than discipline-specific scientific results *per se*), *what are the concepts, tools, and*

---

[11] Lorraine DASTON – Peter GALLISON, *Objectivity*. Boston: Zone Books 2007.

[12] *Ibid.*

[13] *Ibid.*, p. 254.

[14] Ludwik FLECK, *Genesis and Development of a Scientific Fact*. Chicago: University of Chicago Press 1981.

[15] *Ibid.*

procedures needed at a given time to construct an acceptable scientific argument? We already have some good examples of steps toward a history and philosophy of practices: *instrument making*, probability, objectivity, observation, *model building*, and collecting. We are beginning to know something of the nature of thought experiments—but there is clearly much more to learn. The same could be said for *scientific visualization*, where, by now, we have a large number of empirical case studies but a relatively impoverished analytic scheme for understanding how visualization practices work. So, cutting across subdisciplines and even disciplines, *what is the toolkit of argumentation and demonstration—* and what is its historical trajectory? [16]

Given Galison's name for the problem, a brand of scholarship that considers the material manipulatives with which scientists theorize must naturally go into the toolkit.

There are a few notable exceptions to the overall lack of scholarship on manipulative models and knowledge-making: the work of Eric Francoeur is one. In 1997, Francoeur called the "design and use" of physical molecular models a "forgotten tool [...] a constituitive yet overlooked element of chemical practices."[17] Francoeur's analysis of the differences between visual and spatial models and case-study historiography of model design is precisely the kind of work that my own inquiry strives to continue. Stephan Hartmann uses a case study in high-energy physics to define the term "model"; he determines that there are four types of model, and the "toy model" is one. Toy models and developmental models, he maintains, are "considerably useful in the process of theory construction", [18] i.e., toy models are a means of practicing scientific inductive reasoning. Even more recently, Adam Toon has used ethnographic sociology of science approaches to explore modeling. Toon watches scientists use models and interviews them about their attitudes towards them.[19] In two different articles explaining his findings, he uses a theory of make-believe from art studies to describe how scientists "imagine the models to be molecules, in much the same way that children

---

[16] Peter GALISON, "Ten Problems in History and Philosophy of Science." *Isis*, vol. 99, 2008, no. 1, pp. 111–124 [emphasis mine].

[17] Eric FRANCOUER, "The Forgotten Tool: The Design and Use of Molecular Models." *Social Studies of Science*, vol. 27, 1997, no. 1, pp. 7–40.

[18] Stephen HARTMANN, "Models as a Tool for Theory Construction: Some Strategies of Preliminary Physics." Accessed in PhilSci Archive*,* Reprint of a chapter from *Theories and Models in Scientific Processe*s, Amsterdam: Rodopi 1995, pp. 49–67.

[19] Adam TOON, "The Ontology of Theoretical Modelling: Models as Make-believe." *Synthese*, vol. 172, 2010, no. 2, pp. 301–315.

imagine a doll to be a baby".[20] The "make-believe" step between the real and the representation resonates well with my own claim that models—and model pieces—are materially propositional—what Daston and Gallison call "entities that remain invariant under transformations",[21] stand-ins for *what is* that ostensibly behave just like *what is.*

More recently, scholars like Alan Rocke, Peter Ramberg, and the essays featured in a collection edited by Roman Frigg & Matthew Hunter have all treated representation in science and chemistry specifically. Rocke historicizes the drawings that enabled the beginning of modern organic chemistry,[22] and his story is where my own tracing begins. Ramberg takes up stereochemistry as an inscription-producing process.[23] The most pertinent recent scholarship, however, is Soraya de Chadarevian's edited collection that looks "back" on physical models as modeling practices move more and more to digital representations, which are arguably more detailed and less experientially embodied. Chadarevian's own chapter of the volume features the model as critical to the development of molecular biology as a discipline,[24] an argument that I will echo here. The epistemic impact of the "loss" of tanglible, embodied modeling remains to be seen; the arrangement and rearrangement of manipulative models is one well-established way that science reasons with materials.

From visual thinking to material thinking: a tracing
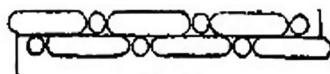
3. Benzine.

Figure 1: *Structure of Benzine as first visualized by Frederich August Kekulé.*
Source: *Friedrich August KEKULÉ, "Sur la constitution des substances aromatiques."* Bulletin de la Societe Chimique de Paris*, vol. 3, 1865, no. 2, pp. 98–110.*

---

[20] Adam TOON, "Playing with Molecules." *Studies In History and Philosophy of Science Part A*, vol. 42, 2011, no. 4, p. 580.
[21] DASTON – GALISON, *Objectivity*, p. 254.
[22] Alan J. ROCKE, *Image and Reality: Kekulé, Kopp, and the Scientific Imagination*. Chicago: University of Chicago Press 2010.
[23] Peter RAMBERG, *Chemical Structure, Spatial Arrangement: The Early History of Stereochemistry, 1874–1914*. Aldershot – Burlington: Ashgate 2003.
[24] Soraya de CHADAREVIAN, "Models and the Making of Molecular Biology." *Models: the Third Dimension of Science*. Stanford: Stanford University Press 2004.
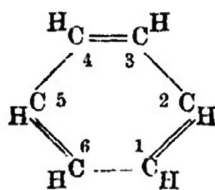
Figure 2: *Kekulé's ring structure as he proposes it at the end of the same paper.*
Source: *Friedrich August KEKULÉ, "Sur la constitution des substances aromatiques."* Bulletin de la Societe Chimique de Paris*, vol. 3, 1865, no. 2, pp. 98–110.*

Most histories of organic chemistry and molecular biology include Frederich August Kekulé, and I will begin with him because he is credited with conceiving of the ubiquitous hexagonal and pentagonal ring structures at the heart of organic chemistry—the shapes that Watson and Crick made into metal plates to "stack" as the base center of their model. While Kekulé was working at the University of Ghent in Belgium, he conceived of the benzene ring in a now-famous dream about a snake swallowing its tail and published a paper postulating that the specific structures of organic compounds were likely as important as their formulae.[25] Kekulé's argument was the culmination of a general movement, caused by molecular theory, to include physics in chemistry—an obsession with discovering how the structure of molecules would predict their behaviors and properties. Kekulé and his contemporaries—most notably Josef Loschmidt and Alexander Crum Brown, who, John Wotiz, Ursula Klein, and Alan Rocke note, were devising graphic formulae four years before Kekulé published the same sort of work—necessarily invented a new notation to represent the structures. The big epistemic turn that Kekulé and his contemporaries made was to conceive of the angles of attachment as key to chemical behavior and interactivity (ultimately allowing for tetravalence and the entire field of organic and structural chemistry).[26] Wotiz maintains that Kekulé's visualizations worked to allow for a different kind of cognition than the (linear, mathematical) formulae that chemists had depended upon until then—the beginnings of a geometric thinking, a realization that what molecules did had much to do with their architecture

---

[25] *Ibid.*
[26] ROCKE, *Image and Reality.*

in space.[27] Spatial reasoning was the basis of structural chemistry, and key to Linus Pauling's methodology (to be described later). Kekulé's work also hypothesized the variety and complexity of organic compounds to be discovered in the coming decades by Pauling and others.

Kekulé's student, Jacobus Henricus Van't Hoff, following Kekulé's assertion that chemicals' spatial arrangements were key to their chemical behavior, was one of the first to use toy-like models to do chemistry (Kekulé himself used "ball and stick models")[28] and the first to publish an argument for spatial modeling as a legitimate scientific methodology. According to Trienke M. Van der Spiek of the Booerhave Museum in the Netherlands, who has extensively historicized Van't Hoff's contributions to molecular modeling, Van't Hoff's argument, a pamphlet entitled *La chimie dans l'espace* (*Chemistry in space*), published in 1874, was before its time, representing "a major schism with the prevailing view of dimensionless molecules."[29] The epistemic context of the pamphlet is difficult to imagine with a contemporary mind; Van't Hoff had to argue against a way of thinking that didn't yet conceptualize objects as small as molecules actually occupying space in a way that was important to how they behaved physically or chemically. That step was a difficult enough paradigm shift for chemistry, but Van't Hoff also proposed new methodology. He began playing with toys – small paperboard triangles cut, color-coded, and folded into triangular solids to represent tetrahedral carbon atoms and their potential surrounding bonds. The models went through several iterations as Van't Hoff came to understand the asymmetrical shape of carbon and that shape's effects on its potential valences.[30] According to Van der Spiek, Van't Hoff's pamphlet described his models as "aids to visualization that made his hypothetical exegesis easier to understand and less strenuous to read"[31]—that is, they constituted a new form of technical communication, a spatial-material semiotic. Van der Spiek also points out that Van't Hoff's models are clearly designed to concentrate on potential attachments (and angles of attachments) around the carbon atoms in organic compounds, rather than being concerned with the location of the

---

[27] John WOTIZ, *The Kekule Riddle: A Challenge for Chemists and Psychologists*. Vienna, IL: Glenview 1993.

[28] Trienke VAN DER SPIEKE, "Selling a Theory: The Role of Molecular Models in J. H. van't Hoff's Stereochemistry Theory." *Annals of Science*, vol. 63, 2006, no. 2, pp. 157–177.

[29] *Ibid.*, p. 160.

[30] Ursula KLEIN, *Experiments, Models, Paper Tools: Cultures of Organic Chemistry in the Nineteenth Century*. Stanford: Stanford University Press 2003.

[31] VAN DER SPIEKE, "Selling a Theory."

central atoms.[32] Van't Hoff, then, was concerned with a way to conceptualize the multitudes of possibilities for carbon-based arrangements – he wanted to imagine as-of-yet unobserved compounds. His models were for theorizing. His paperboard toys were hypothesis-makers for the most complicated chemical questions of the time.

That complexity was, of course, the bread and butter of an entire field of chemistry; for the good part of the next century, organic chemists devoted their careers, in part, to theorizing, finding, diagramming, and naming organic compounds. One product of that work was *The Ring Index: Ring systems used in organic chemistry*, published in 1940 by Austin Patterson and Leonard Capell, a 650-page listing of classes and individual molecular arrangements of known organic compounds, complete with instructions for subtle variations in names and notation – a field guide to organic chemistry's drawn representations. The "historical" section of the book's introduction notes that its compilation began in 1922, when a "Committee on the Preparation and Publication of a List of Ring Systems Used in Organic Chemistry" was formed from the Board of Editors of the Journal of the American Chemical Society. Writing was delayed by the Depression but finally completed in 1938, and the book claims to cover all classes of rings systematized through that year. [33]

Two things are particularly notable about *The Ring Index* for my purposes. The first is that it so clearly answers an exigence for the standardization of a symbolic language that uses known and empirically tested physical attributes of molecular structures to theorize about (and, later, design) the structures of unknown compounds. Secondly, the final and newest classes of ring system documented by the index (in 1938) are Class D1 and D2, simple spiro systems and complex spiro systems, respectively. The "spiro" class of system are the proto-helix—the structures that DNA will ultimately be discovered to have. Here the simple, two-dimensional drawings of the hydrocarbon/nitrogen shapes clearly begins to break down; the notation is cluttered by multiple numbers (to denote the number of atoms between "spiro atoms") and cross-hatched lines to denote bonds at certain angles (bond angles would, of course, be affected by this number). The basic pencil-and-paper notation fails to communicate the "structure" that is so key in structural chemistry and its deployment in molecular biology. At the end of

---

[32] *Ibid.*
[33] Austin M. PATTERSON – Leonard T. CAPELL, *The Ring Index: A List of Ring Systems Used in Organic Chemistry*, New York: Rheinhold 1940.

The Ring Index, the edited appendices offer a suggestion to chemists working with C3 class molecules and above: "In difficult cases it may be advisable to construct a spatial model so as to decide upon the most natural [plane formula and structure]."[34]
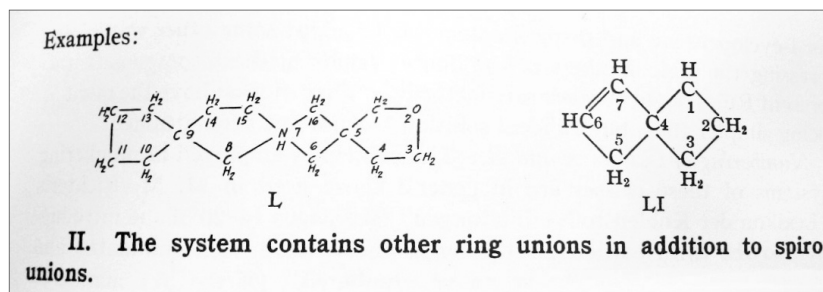

Figure 3: *Image from* The Ring Index: Ring Systems Used in Organic Chemistry *in the Spiro Class section. The notation required to denote the number and angle of attachments is outgrowing the capacity of the two-dimensional representation.*
Source: *Austin M. PATTERSON – Leonard T. CAPELL,* The Ring Index: A List of Ring Systems Used in Organic Chemistry. *New York: Rheinhold 1940.*

The "Complex Spiro Systems" end the book, and the last line of the volume says of these systems: "Rule 24 [The rule pertaining to systems containing other ring unions in addition to spiro unions] has been marked 'provisional' because at some later time it may be thought desirable to give directions for numbering these systems 'straight around,' like the preceding classes. *No simple and certain way of doing this has yet been worked out.*"[35]

At the time of *The Ring Index*'s publication, Linus Pauling sat on the American Chemical Society's Board of Editors; he is credited at the end of the index's "General Introduction."[36] It could easily have been Pauling who made the recommendation I've cited above, as spatial modeling was his preferred method of reasoning. He was known for his models, and many interviews and correspondences attest to the fact that models were his (theo-retical) experiments – his way of thinking. During undergraduate school, Pauling was a machinist – a good one by his own lights, and it would seem

---

[34] PATTERSON – CAPELL *Ring Index*, p. 607
[35] *Ibid*., p. 610 [emphasis mine].
[36] *Ibid*., p. 6

that his skill at space and shapes translated to a kind of material, structural intelligence. He was predisposed to think with models. In a 1964 interview with John Heilbron, Pauling exclaims, "[I have] always [made models], yes! [...] I still have the models [that he and the interviewer are discussing]. Here is the water molecule [showing the model]: the two electrons, here are the two electrons holding the hydrogen atom, these are the two K electrons. They don't need to be at that angle. I made these."[37] A paper Pauling published in the *Review of Scientific Instruments* in 1952, the year before Watson and Crick published the description of their structure, describes his models in detail. "Models representing atoms or groups of atoms built from hard wood to the scale 1 in.=1A are connected by a clamping device which maintains desired molecular configurations," says the abstract. Pauling goes on to say that "[t]hese accurate models have been used as substitutes for calculation in investigations of the probable configuration of the polypeptide chain in proteins. Analogous models constructed of rubber-like plastic to the scale 1 in. = 2A and connected by snap fasteners are designed for qualitative studies of protein structure."[38] Ultimately, Pauling's work with manipulatives won him recognition for a successful alpha model of the helical structure of amino acids – he proposed the structure that Watson and Crick's model was based on. When Watson and Crick proposed the complete double-helical model they had, in Watson's words, "beat Pauling at his own game." [39]

Pauling's "game", of course, was the combination of modeling and X-ray crystallography as the empirical measure to inform the physical protocols of his models. Pauling came up with the alpha helix model by using crystallography to determine the precise angles and architecture of the peptide bonds on a helical carbon chain and the structure of the residual atoms that would stack up against each other and cause the curve of the helix. According to Oregon State's special collections feature on Pauling, Pauling was ill and prescribed bed rest by his doctor when he sketched the molecules he was working with on a strip of paper and folded it along the same bond line, coming up with a helix. When he returned to the lab, he adjusted his model

---

[37] Linus PAULING. "Oral History Transcript." In: *Niels Bohr Library and Archives* [online]. 1964. Available at <http://www.aip.org/history/ohilist/3448.html> [cit. 12. 10. 2012].
[38] Robert COREY – Linus PAULING, "Molecular Models of Amino Acids, Peptides, and Proteins." *Review of Scientific Instruments*, vol. 24, 1953, no. 8, pp. 621–627.
[39] James D. WATSON, *The Double Helix: A Personal Account of the Discovery of the Structure of DNA*. New York: Touchstone 1968, p. 48.

and drew up plans for a more robust, wooden version, which is now housed in Oregon State University's archives.[40]

Across a nation and an ocean, in England, James Watson and Francis Crick followed Pauling's lead and employed a methodology of model play, as well. Watson and Crick's story has been told by the men themselves and their close colleagues, and it has since been retold by historians, rhetoricians, and filmmakers; I do not mean to retell it again, here. But I do want to highlight the model itself – the metal plates and rods that the famous pair used as their primary, concrete argument – as a key character in the story. In some ways, the models Watson and Crick constructed were a way of responding to social constraints on their lab materials; they didn't have access to equipment or experimental, empirical data. Watson's account gives a scientist's rationale for his decision to use self-fashioned manipulatives: "I was soon taught that Pauling's result was a product of common sense, not the result of complicated mathematical reasoning [...] The key to Linus' success was his reliance on the simple laws of structural chemistry [...] the main working tools were a set of molecular models superficially resembling the toys of preschool children."[41] But Watson's description of his relationship to Wilkins' lab and Rosalind Franklin in particular imply the much more circumstantial reasons for his choice: he was a failure at growing myoglobin crystals, he was bad at math, X-ray analysis bored him, and, most importantly, even after he and Crick had made good progress on the model, they weren't able to produce the empirical evidence to "prove" their structure; "the crux of the matter was whether Rosy's new X-ray pictures would lend any support for a helical DNA structure [...] clues in constructing molecular models [... but Franklin's] determined mind had set upon a different course of action."[42]

If Watson and Crick were constrained by limited access to Franklin's empirical data, it can be argued that Franklin and Wilkins were equally constrained by their fixation upon it. And while Franklin (according to Watson) openly disdained Pauling's "game": "[t]he idea of using tinker-toy-like models to solve biological structures was clearly a last resort,"[43] Watson

[40] All Documents and Materials, *Linus Pauling and The Nature of the Chemical Bond: A Documentary History*, Special Collections, Oregon State University [online]. n.d. Avaiable at <http://osulibrary.oregonstate.edu/specialcollections/coll/pauling/bond/materials/index.html> [cit. 6. 5. 2012].
[41] WATSON, *Double Helix*, p. 50
[42] *Ibid*., p. 211.
[43] WATSON *Double Helix*, p. 69

and Crick were almost painfully dependent upon it, and at the mercy of the materials necessary to play. About John Kendrew's models—the first manipulatives that Watson and Crick have access to—Watson writes, "[they] would not be satisfactory [...] there existed no accurate representations of the groups of atoms unique to DNA [...] Rapid improvisation would be necessary since there was no time [...] to give a rush order for their construction."[44] Watson goes on to fashion his own stand-in parts out of copper wire, but he also relates the difficulty of theorizing without the proper materials and their inherent protocols: "Unlike the other constituents, [the inorganic ions] obeyed no simple-minded rules telling us the angles at which they would form their respective chemical bonds [...]we had to know the right DNA structure before the right models could be made."[45] In reference to conversations away from the models, Watson speaks of his own "inability to think in three dimensions [without the help of embodied interaction with the physical model],"[46] and the model's end game is fraught with waiting for new parts to come back from the machinist – time in which Watson, ironically, "decide[s] that no harm could come from spending a few days building backbone-out models."[47] In the end, even Maurice Wilkins seemed to understand that the "real" work was being done in the albeit artificial model – he urged Watson and Crick to delay their modeling in order to give his own lab time for the X-ray imaging and only hesitantly agreed to allow them to continue.

Francis Crick's memoir, which stretches into the uptake of the double helix into accepted theory and its subsequent growth into the field of molecular biology, discusses the importance of models as a means for theorizing and a way of knowing, as well. [48] He seems especially insistent that working in three dimensions is epistemically different than representation in two dimensions. He complains of having to remediate his work on to paper more than once. "Diagrams of models," he writes, "are often difficult to draw satisfactorily since, unless care is taken, they usually convey more than one intends."[49] The distinction between *thinking* with models and *communicating* with words – perhaps reducible, in rhetorical terms, to a difference in

---

[44] *Ibid.*, p. 197.
[45] *Ibid.*, p. 195.
[46] *Ibid.*, p. 155.
[47] *Ibid.*, p. 158.
[48] Francis CRICK, *What Mad Pursuit: A Personal View of Scientific Discovery.* New York: Basic Books 1990.
[49] *Ibid.*, p. 46.

audience – is a fascinating one. Crick's commentary echoes the concepts that Francoeur describes in his work on particle physics.

In another compelling section of Crick's book, he discusses at length the theoretical "mistakes" that he made when working to develop many of his theories, mistakes that he was able to understand better at the time of writing his memoir, as theoretical and empirical knowledge continued to be built upon the helix as a basic structure for the gene (specifically the role of RNA in replicating genetic information). One of these bears mentioning here because it speaks to the way he thought about the models. He writes:

> It is clear that I thought of the RNA in the cytoplasm [...] as a "template," that is, having a rather rigid structure comparable to the double helix of DNA but probably having one single chain. It was only later that I realized that this was too restrictive an idea, and that "tape" might be nearer to the truth [...] I eventually realized that RNA need not be rigid, but could be flexible, except for the part that coded the next amino acid to be incorporated. Another consequence of this idea was that the growing protein chain did not have to stay on the template but could start to fold itself up as the sequence proceeded, as indeed had been suggested earlier.[50]

The complex process of protein folding and its tremendous impact on the action of proteins has become, of course, the next big problem for material manipulative reasoning to solve in molecular biology and genetics.

Manipulative Models in the Public Imagination: an archive of advertisements and images

At the same time that Watson, Crick, Franklin, Wilkins et al. were doing their work in labs largely inaccessible to the layman, models as ways of seeing and knowing about the sub-visible world were already common to the public imagination, thanks to Kekulé's epistemic legacy. An illustrated *Popular Mechanics* article from 1928 pictures Henry D. Hubbard, then secretary of the U.S. Bureau of Standards, with models designed to depict organic compounds. "One of his sets of models," the magazine tells its lay audience, "depict[s] the formation of carbon nuclei, carbon atoms, and diamonds [...] Strength and hardness are due to the arrangement of the atoms, and clarity to the 'space patterns' which their particular arrangement provides."[51]

---

[50] CRICK, *What Mad Pursuit,* p. 110.
[51] *Ibid,* p. 560.

Hubbard worked for the Bureau of Standards, a position that resonates with Pauling's interest in the Committee for Chemical Nomenclature and the standardizing force of the Ring Index – scientists involved with modeling were acutely aware of the need for a consistent material language.[52]
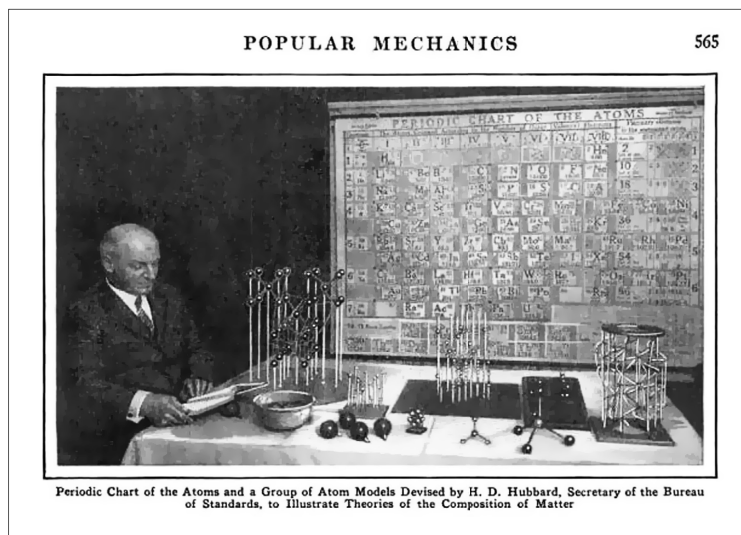

Figure 4: *Image from an article in* Popular Mechanics *from 1928, depicting Henry Hubbard and wooden models of organic compounds.*
Source: Popular Mechanics*, Volume 50.4, October 1928.*

Later, in the 1940s, models like Hubbard's were ultimately marketed to parents and school systems as pedagogical tools, and the propositional materials of manipulative models became their own kind of publicly accepted facts. Probably the most influential of these models was the Fischer-Taylor-Hirschfelder Atom Model Kit. It was used in high school chemistry courses.

[52] For a recent treatment of the intersection of the specific problematics of modeling and issues of standardization, see Adrian MACKENZIE – Claire WATERTON – Rebecca ELLIS – Emma FROW – Ruth McNALLY – Lawrence BUSCH – Brian WYNNE, "Classifying, Constructing, and Identifying Life: Standards as Transformations of 'The Biological'." *Science, Technology & Human Values*, 2013.
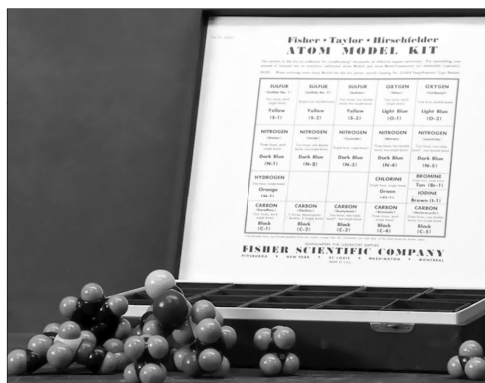
Figure 5: A basic Fischer atomic modeling kit from the 1940s.
Source: "1940s Vintage Wooden Atomic Model Kit." Factory 20 [online]. n.d. Available at <http://www.factory20.com/objects/1940s-vintage-wooden-atomic-model-kit/> [cit. 6. 5. 2012].
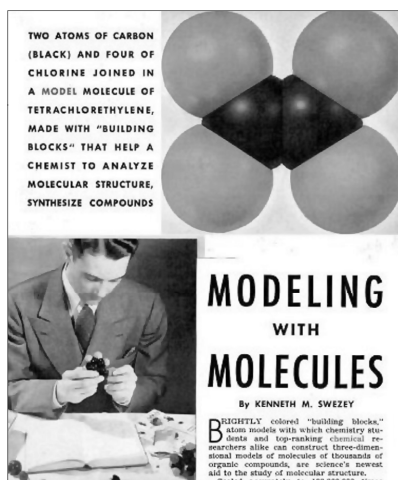

Figure 6: *The same Fischer kit featured in* Popular Science *in 1942.*
Source: Popular Science, *June 1942.*

The most basic kit included five isotopes of nitrogen and five isotopes of carbon, three of sulfur, two of oxygen, and one piece-type each to represent the elements bromine, iodine, and chlorine. Models using the set look like nubby caterpillars with dark blue and black middle bodies – the dark blue being nitrogen, black being carbon. Where the oxygen, hydrogen, bromine, iodine and chlorine pieces are semi-circle bubbles that attach to the flat side of carbon and nitrogen, C and N are triangular wedges that work together to make hexagonal and pentagonal centers – echoes of Van't Hoff's triangular arrangements of carbon. These same models are featured in a story in *Popular Science* in 1942 that explains to its readers exactly how scientists think with models. In it, models are hailed as science's "newest aid to the study of molecular structure." The article, which is a history of modeling practices, even touches upon my own question of the fluidity of scientific knowledge production and the concretized, material propositionality of the standardized wooden models. "Until a few years ago," the journalist writes, "knowledge of the architecture of organic compounds was not sufficiently complete to allow for accurate representation," and models, he claims, were "crude" and vague.[53] Later, the article describes the models' relationship to the basic assumptions of structural chemistry quite well; "Investigation of some 500 compounds by electron diffraction revealed that the different forms of building blocks required to make them were surprisingly few. In fact, most organic compounds could be represented accurately by molecule models built up from less than two dozen kinds and shapes of atom models."[54] Complexity is made up of meaningful combinations and recombinations of very simple elements. The world is a toy sculpture made of structural protocol. With good representational tools for arrangement, the article seems to promise, we can inductively find its structure and even invent new structures that play according to the existing world's rules.

Popular magazines provide evidence that modeling as a pedagogical practice was still flourishing into the 1960s and 70s. In 1963, *LIFE* magazine devoted a whole page and a half to advertising for at-home science kits, including a "Chemcraft Master Deluxe Lab" that boasted an "atomic model kit," along with a centrifuge, molecular balance, and spectroscope.[55] In 1971, Great Britain's *New Scientist* reviewed A. F. Wells's *Models in structural inorganic chemistry (with model building set)*, a text that describes the practice of

---

[53] *Ibid*, p. 42.
[54] *Ibid*, p. 42.
[55] *LIFE* magazine, November 22, 1963, p. 11.

modeling in structural chemistry. According to reviewer Jeffrey Cox, Wells "elaborates the theme that the builder of a model gains a deep insight into the structure it represents."[56] Cox applauds the publisher on its "enterprise [… in including a model in the text] here is a plentiful supply in a single kit for building ball-and-stick, pack of spheres, and joining-of-polyhedra models. Each type of model emphasizes a particular aspect of structure: spatial relationships, steric requirements of ions, and the coordination of atoms. Both teacher and learner can profit from this multiplicity of emphasis."[57] Standardized modeling tools for structural chemistry, then, were taken for granted as thinking and learning tools by the 1970s.

Conclusion: A snapshot in the present

Modeling as efficacious pedagogy is still being studied; I'll briefly describe two examples from the *Journal of Research in Science Teaching*, here. "The use of three-dimensional visualization as a moderator in the higher cognitive learning of concepts in college level chemistry," by Lawerence H. Talley, argues for the use of material models in student labs, not just for teacher demonstration, because modeling is an enhancement of visualization skills essential to higher-level chemistry. [58] In "Effect of Bead and Illustrations Models on High School Students' Achievement in Molecular Genetics", Yosi Rotbain, Gili Marbach-Ad, and Ruth Stavy report the results of an empirical study of pedagogical practices in high school genetics classes and conclude that "it is advisable to use a three-dimensional model, such as the bead model" [59] to engage students in conceptualizing genetic action at the molecular level.

And at the level of knowledge-making in university and private labs, the tools used to design and interact with models are changing and evolving, as well—spatial and material modeling is a living methodology in molecular biology and related fields. The *Foldit*[60] project out of the University of

---

[56] Jeffrey COX, Book Review, *New Scientist*, July15, 1971, p. 159.

[57] *Ibid.*

[58] Lawrence H. TALLEY, "The Use of Three-dimensional Visualization as a Moderator in the Higher Cognitive Learning of Concepts in College Level Chemistry." *Journal of Research in Science Teaching*, vol. 10*, 2006,* no. 3, pp. 263–269.

[59] Yosi ROTBAIN – Gili MARBACH-AD – Ruth STAVY, "Effect of Bead and Illustrations Models on High School Students' Achievement in Molecular Genetics." *Journal of Research in Science Teaching*, vol. 43, 2006, no. 5, p. 525 (500–529).

[60] *Foldit*, University of Washington [online]. Available at: <http://fold.it/portal/> [cit 12. 10. 2012].

246

Washington, for example, employs designers from the UW Center for Game Science to maintain a computer game whose object is protein folding to predict and produce data about the structures of heretofore unknown organic compounds.
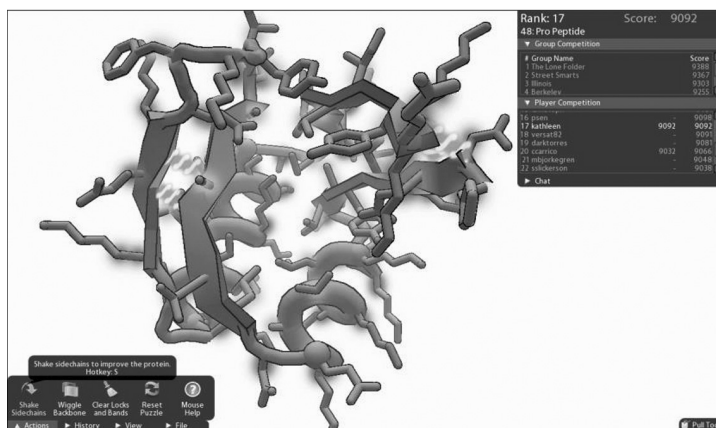

Figure 6: *Foldit's puzzle interface*
Source: Foldit*, University of Washington [online]. Available at <http://fold.it/portal/>
[cit 12. 10. 2012].*

Foldit's interface is a three dimensional on-screen manipulative, but its genre is a multi-player online game; the protocols of the game turn all users—anyone who signs up for an account—into modelers. The game produces data to answer real scientific exigencies: "Figuring out which of the many, many possible structures is the best one is regarded as one of the hardest problems in biology today and current methods take a lot of money and time, even for computers. *Foldit* attempts to predict the structures of proteins by taking advantage of humans' puzzle-solving intuitions and having people play competitively to fold the best proteins. Players can design brand new proteins that could help prevent or treat important diseases" (*Foldit*, About). The website goes on to detail how protein folding and protein design could contribute to knowledge-building about therapies for HIV/AIDS, Cancer, and Alzheimer's Disease. *Foldit* clearly takes the Tinker-Toy ethos to a new and fascinating level – one Linus Pauling would approve of,

I think. *Foldit* and other crowd-sourced approaches to science take Watson, Pauling, and Franklin's idea of model-manipulation as "playing with toys" or "beating [another scientist] at his own game" out of the realm of analogy. The move implies new questions for study of philosophical toys: how does gamification change the knowledge-making process by allowing for the manipulation of "big data"? What new roles does the object-as-model take on when it becomes a multi-player game? And what are the implications of the remediation of the three-dimensional model through digital tools rather than hands-on materials like metal, plastic and wood?

////// tematická studie / thematic articles ///////////////////

GRAND ILLUSIONS: LARGE-SCALE OPTICAL TOYS AND CONTEMPORARY SCIENTIFIC SPECTACLE

Abstract: *The zoetrope, a nineteenth-century optical toy that showcases illusions of motion, has enjoyed an active "afterlife" in the 20th and 21st centuries. Today, zoetropic devices are found in fine art and advertising, and are often much larger than their 19th-century counterparts. Modern-day zoetropes still captivate viewers primarily because of their adjustment in scale. Exploring a range of examples in art, entertainment, and advertising, this article discusses various technical adjustments made to successfully "scale up" the zoetrope, arguing that these new apparatus reconfigure the relationship between audience and device. Large-scale zoetropes revise the traditional conception of the user, who tactilely manipulates and interacts with the apparatus, instead positing a viewer who has less control over the illusion and is often a captive audience surrounded by the animation. It is primarily through their adaptation of scale that contemporary zoetropes successfully elicit wonder as visual and scientific spectacles from their audiences today.*

Keywords: *zoetrope; art; advertisement; large-scale; audience*

Velké iluze: optické hračky velkého měřítka a současný vědecký spektákl

Abstrakt: *Zoetrop, optická hračka 19. století předvádějící iluzi pohybu, oživla v různých podobách ve 20. a 21. století. Dnes ji nalezneme ve výtvarném umění či reklamě a to často v mnohem větším měřítku než ve století předcházejícím. Moderní zoetropy uchvacují své diváky primárně díky tomuto zvětšení měřítka. Věnuji se řadě jejich příkladů z umění, zábavního průmyslu a reklamy a sleduji různé technické úpravy vedoucí k jejich zvětšení. Tyto nové aparáty proměňují vztah mezi přístrojem a publikem, přehodnocují tradiční pojetí jejich uživatele, který s ním zacházel dotykem, a předpokládají naopak diváka, který má nad iluzí méně kontroly a je často publikem, zajatým a obklopeným touto animací. Současné zoetropy jako vizuální a vědecké spektákly dokáží vzbuzovat údiv primárně díky změně svého měřítka.*

Klíčová slova: *zoetrop; umění; reklama; velké měřítko; publikum*

MEREDITH A. BAK
Department of Theatre, Dance & Film / Franklin & Marshall College
415 Harrisburg Ave // Lancaster, PA 17603 // United Kingdom
email / meredithabak@gmail.com

249

Meredith A. Bak

Introduction

In February 2009, Sony debuted a television commercial for its line of Bravia televisions featuring an enormous zoetrope constructed in a city square in Venaria, Northern Italy. Conceived by London-based ad agency Fallon, the zoetrope, which is called the Bravia-Drome, is the ad's central feature. It is comprised of an enormous drum with a series of screens affixed around its perimeter. Each screen displays one still image of a motion sequence, and when a series of shutter blades whirs around the drum in front of the band of illuminated images, they appear to come to life in smooth, fluid movement. Fallon's previous commercials for the ad campaign showcased Bravia's state-of-the-art color display by staging large-scale visual stunts and using labor-intensive techniques. In one, the production crew released a quarter of a million bouncy balls down a San Francisco street and filmed the results. Another featured a series of environmentally friendly paint bombs attached to the interiors and exteriors of buildings, which, when strategically detonated, created a colorful visual symphony. A third commercial was created with stop-motion animation and involved moving colorful large physical models in an urban setting. The Bravia-Drome commercial similarly remains devoted to public spectacle and display by relying upon a large-scale, site-specific installation. Its main thrust focuses not on the Bravia television's color display, and instead highlights its 200hz MotionFlow technology, which offers an unprecedentedly smooth televisual image by "filling in" the gaps between each image frame. Because of its ability to smoothly display rapidly changing images, it is a particularly attractive feature for watching sporting events, and in the commercial, the Bravia-Drome features footage of Brazilian soccer star Kaka juggling a soccer ball.

When devising a way to promote MotionFlow technology, Sony and Fallon gained their inspiration from the zoetrope: a persistence of vision toy first introduced in the 1830s. That Sony and Fallon used an analog technology to showcase a new digital one is perhaps unsurprising, given that new media technologies often bear the traces of earlier forms, which fall out of visibility only to resurface, adapted in other related ways. As the zoetrope resurfaced here, it had grown dramatically in scale, from a domestic table-top toy in the nineteenth-century parlor to a gigantic public display filling a city square in Northern Italy. The histories of media technologies are rarely strictly linear. Despite our tendency to wrestle various technologies and forms into neat causal chains wherein each emerging device improves upon its predecessor in a clean narrative of technical progress, instead, technolo-

250

gies always emerge unevenly across complex cultural landscapes, inspired by, and, in turn, shaping that landscape as they come into being. It is thus difficult to assert that this or that technology was the very "first" of its kind. However, some superlatives are more easily or quantifiably applied, such as proclamations of size. At ten meters in diameter and capable of speeds reaching 50 kph, Sony's Bravia-Drome established its place in history and garnered international attention by being vetted as the *biggest* zoetrope on record, a certification authenticated by a Guinness Book of World Records Adjudicator in December of 2008.[1]

Figure 1: *Bravia-Drome.*
Source: © Neuropsychology: Sony BRAVIA-drome.jpg / Wikimedia Commons / CC-BY- SA-3.0.

---

[1] Darren MURPH, *Sony Sets Guinness World Records with BRAVIA-DROME* [online]. 2005. Available at < http://www.engadget.com/2008/12/21/sony-sets-guinness-world-record-with-bravia-drome/> [cit. 19. 11. 2012].

Meredith A. Bak

Traditionally forgotten as dead, failed, or obsolete media that merely paved the way for more technically advanced cinematic apparatus, optical toys, and particularly persistence of vision devices that showcase illusions of motion have, in the past few decades, enjoyed a robust resurgence of interest in critical, artistic, and popular circles. Much like their nineteenth-century counterparts, the contemporary zoetrope is often celebrated as a scientific spectacle, capable of entertaining and instructing with illusions of motion. However, scant critical consideration has been given to the role that scale has played in the success of contemporary zoetropes. Fine artists and advertisers have scaled up the zoetrope, reconfiguring the relationship between viewer and apparatus, and cultivating new models of spectatorship. The creators of these devices use a range of strategies to make them accessible to increasingly large audiences in public venues, galleries, and in video form. Close examination of such installations challenges the traditional conception of the audiences of these toys, positing captivated viewers in opposition to nineteenth-century users, who were capable of manipulating these interactive media themselves.

The successful afterlives of contemporary optical toys have been predicated on a number of shifts. First, the context of many of these toys has moved from the domestic to the public sphere, either into museum and gallery spaces as works of art, or woven into the everyday experience of public life in places such as the subway tunnel and city plaza. Secondly, whereas optical toys were once mainstays of popular culture, they are now often found across the cultural spectrum, in popular, commercial, and fine arts contexts. Both of these shifts are inextricably linked to the transposition of scale. Optical toys today have "gone big," and while the perceptual and technological principles undergirding their illusions of motion are not new, their monumental size has necessitated a range of technical adjustments and innovations to ensure their functional operation as large-scale apparatus. Just as early optical toys served as parlor amusements and scientific novelties, their colossal contemporary counterparts achieve equivalent status as scientific and visual spectacles because of their commanding size.

As commercial or promotional tools, within the context of fine art, and as public installations, large-scale contemporary optical toys have enjoyed considerable critical attention. In their current iterations, traditional zoetropic effects or illusions of motion are no longer simply conjured by the user, but, rather, are propelled by strong motors or subway trains in motion. The traditional slats through which the viewer peers have been replaced by large architectural features and stroboscopic lights. With these adjustments,

252

the modes of looking and models of spectatorship that these devices encourage have also shifted. In their new modalities, these toys move around the user's body, are presented to them in gallery contexts that draw them in, or work in tandem with other mechanisms that move the viewer past them. At a time when technologies are often praised for growing smaller, lighter, and more mobile, the contemporary optical toy is marked not by its portability, but rather, its status as colossal.

Philosophical toys and their users: From parlor amusement to the animation of everyday life

In their initial contexts, optical toys that showcased illusions of motion were designed to demonstrate and popularize persistence of vision, the theory that if the eye was bombarded by a series of images in slightly different positions rapidly enough, the brain would combine them into a fluid motion sequence. In order for this effect to work successfully, the images would have to be shown rapidly (at least eight per second) and some kind of shutter mechanism (often a slat between each picture) had to separate each one, lest they blur into an indistinguishable continuum.[2] While persistence of vision has subsequently been discredited as an adequate description of how the human sensorium actually processes motion, it is still frequently used to describe the principle mechanism behind the illusion of motion in film, where the standard frame rate is twenty-four images per second. The optical toys that relied upon persistence of vision for their operation such as the thaumatrope, phenakistoscope, and zoetrope, found the most traction as novelties for mixed-aged audiences in the middle-class parlor. These toys, many of which were introduced in the late 1820s and early 1830s, fell into the category of "philosophical toy," which historian of psychology Nicholas Wade has distinguished from a scientific instrument. Wade writes that whereas the assignation of "instrument" might be given to any object "used to examine natural phenomena ... philosophical toys served the dual

---

[2] A variety of frame rate ranges have been discussed in both contemporary and historical literature. In contrast to the standard 24 frames per second for film, early literature on persistence of vision often refers to 8 images per second as a minimum number of frames, while Jimena Canales has identified the increment of one-tenth of a second as gaining new import during the nineteenth century. See Jimena CANALES, *A Tenth of a Second: A History.* Chicago: University of Chicago Press 2011.

function of scientific investigation and popular amusement."[3] They were prominent features in popular science literature for juveniles and amused their users by exploiting an optical phenomenon: the ability to trick the eye into seeing a fluid animated sequence from what was, in reality, a series of still images.

The traditional model of spectatorship associated with such toys advanced by Jonathan Crary in his seminal work *Techniques of the Observer* is fundamentally disciplinary in nature. Crary argues that in demonstrating the eye's tendency to be tricked, these optical toys contributed to the formation of a modern observer, whose subjective vision was standardized into a quantifiable, predictable practice.[4] Departing from this Foucauldian-inspired, predominantly disciplinary view, other scholars have introduced alternative ways of understanding the roles that optical toys have played in cultivating new forms of interaction with visual media. Mary Ann Doane, for example, has challenged Crary's reading, asserting its failure to address the rupture or trauma that may have accompanied these toys as they exploited and revealed the eye's vulnerability to optical deception, while Tom Gunning's recent work on the thaumatrope posits a viewer who actively delighted in the toy as it combined both visual and literary modes of representation in its use.[5] The importance of Crary's work in wresting optical toys from a purely teleological history culminating in the cinema cannot be underestimated, and has enabled subsequent scholarship to incorporate these devices into new historical trajectories, such as Wanda Stauven's theorization that they more rightfully belong in a history of games and interactive media.[6]

Common to many of these formulations is a dual focus on the form rather than the content of these toys, and on their interactive qualities. Users had to arrange their bodies in relation to the toy, to, for example, lean in to peer through the zoetrope's slots. They also maintained the ability to manipulate the toys, to spin the drum forward and backward at varying

---

[3] Nicolas WADE, "Philosophical Instruments and Toys: Optical Devices Extending the Art of Seeing." *Journal of the History of the Neurosciences,* vol. 13, 2004, no. 1, p. 102 (102–224)

[4] Jonathan CRARY, *Techniques of the Observer.* Cambridge: MIT Press 1991, p. 17.

[5] Mary Ann DOANE, *The Emergence of Cinematic Time: Modernity, Contingency, the Archive.* Cambridge: Harvard University Press 2002; Tom GUNNING, "Hand and Eye: Excavating a New Technology of the Image in the Victorian Era." *Victorian Studies*, vol. 54, 2012, no. 3, pp. 495–516.

[6] See Wanda STRAUVEN, "The Observer's Dilemma: To Touch or Not to Touch." In: HUHTAMO, E. – PARIKKA, J. (eds.), *Media Archaeology: Approaches, Applications, and Implications.* Berkeley: University of California Press 2011, p. 148–163.

speeds, as well as to change the animated picture strips. These toys' central feature was their ability to manifest a memorable effect, the illusion of motion, rather than foreground their content. Indeed, while the makers of some of these toys attempted to represent narrative arcs, or combined the signifying systems of words and iconography, as Crary asserts, their most important attribute resided in popularizing a certain understanding of seeing as a subjective practice, through the arrangement of their formal or material attributes. Likewise, as Nicolas Dulac and André Gaudreault have suggested, one of the primary ways of distinguishing philosophical toys from the cinema, instead locating them within narratives of toys, games, or interactive media, has required emphasis on their "toy-like" qualities, such as the ability of the user to change discs or bands, conjure moving images at different speeds and in different directions, and in exhibiting a kind of activity to contrast with the traditionally "passive" cinematic spectator (itself a problematic formulation).[7] However, both of these features: the promotion of form over content, and the interactive qualities of the devices, have radically been altered in the design and exhibition of contemporary large-scale zoetropes. Although much critical interest has arisen in relation to the earliest instantiations of these toys, equivalently thorough consideration of their contemporary counterparts has been scarce, and thus the importance of scale and its attendant influence on the modes of spectatorship these devices encourage has not been explored.

During the nineteenth century, the toy panorama offered a similarly interactive experience for its user. In his book-length study of the panorama, Erkki Huhtamo notes the prevalence of toy panoramas designed (or constructed) for domestic, which were in popular circulation the large public panoramas after which they were modeled. The effect of "scaling down" the panorama configured a new role for the user: "As the device became smaller, the human grew – or at least seemed to grow – bigger." These small versions, Huhtamo suggests, enabled the user to play the role of the exhibitor, affording

---

[7] See Dulac, Nicolas DULAC – André GAUDREAULT, "Circularity and Repetition at the Heart of the Attraction: Optical Toys and the Emergence of a New Cultural Serie." In: STRAUVEN, W. (ed.), *The Cinema of Attractions: Reloaded*. Amsterdam: Amsterdam University Press 2007, pp. 227–244. Dulac and Gaudreault's discussion of Reynaud's praxinoscope theatre highlights the extent to which many early philosophical toys truly possessed "toy-like" interactive qualities; they regard the praxinoscope theatre as less of a toy because its mechanisms of operation are concealed from view.

255

them an opportunity for engagement and control.[8] Although these multiple forms of panorama coexisted alongside one another, the shift from large to small scale is precisely the inverse of the zoetrope's resurgence as a large-scale, public apparatus. In contrast to the move from public amusement to handheld gadget like those so prevalent in the contemporary mediascape, the contemporary large-scale zoetrope represents an interesting shift from private to public; its success is predicated on the construction of a mediated experience over which the viewer typically maintains little control.

The critical formulations that explore the ways in which early optical devices invited interaction from their users do not fully account for the way that large-scale contemporary devices are meant to engage larger audiences. As advertising and promotional tools, contemporary optical toys have relied upon scale to prioritize their products, thus asserting not only the form of the toy as a means of spectacle and novelty, but also prioritizing the content; the product being advertised. Bringing what has traditionally been a domestic entertainment into the public sphere necessarily involves scaling it up in order to equivalently increase the size of the audience able to experience it. Susan Davis has described the ways in which large-scale media advertisements, what she and others have called location-based entertainment, collapse distinctions between public and private spheres, resulting in a media saturated environment that is seemingly undifferentiated from other spaces: "Privately produced collective spaces based on and filled with familiar mass media content can create a kind of seamless world, one in which the home – currently devoted to extensive consumption of conglomerate culture – is tightly knit to and continuous with the outside."[9] Contemporary philosophical toys, particularly those used for advertising or promotional purposes, often punctuate public spaces or become the surfaces surrounding their audiences as they move through space. Their large scale, then, redefines the relationship between people and these installations, framing them as viewers rather than users who control the animations they see. Although these contemporary forms are still dealing with wonder and excitement like the nineteenth-century zoetrope, their principle element of attraction is scale, making the illusion of motion as big as possible within these contexts.

---

[8] Erkki HUHTAMO, *Illusions in Motion: Media Archaeology of the Moving Panorama and Related Spectacles.* Cambridge: MIT Press 2013, p. 368.
[9] Susan G. DAVIS, "Space Jam: Media Conglomerates Build the Entertainment City." *European Journal of Communication,* vol. 14, 1999, no. 4, pp. 435–37 (435–459).

Surfaces and towers: Scalar adaptations of shape and direction

While scale serves as a unifying quality in common among various contemporary philosophical toys, the particular kinds of scalar adaptations they take are more diverse. Whereas Sony's Bravia-Drome and other examples are essentially gigantic versions of the traditional zoetrope, maintaining the cyclical form of the device, other installations shift scale directionally. Deviating from the form of the round drum, other zoetropic works extend in one direction, making them particularly suitable for image sequences that do not rely on repeatability, but instead depict a steady visual progression or short narrative sequences. Linear zoetropes, for example, array their animated sequences along a straight linear path, and the animations are brought to movement not through the device's motion, but as the viewer moves past each screen or "frame." The viewer is thus less in control of the motion sequence as it unfolds. It is fleeting and ephemeral rather than repeatable, and it has a more defined beginning and end rather than a perpetually renewing cycle.

One of the most prominent such installations is Bill Brand's Masstransiscope, designed and first installed in the abandoned Myrtle Avenue subway station in New York City in 1980, and later restored in 2008. Comprised of 228 hand-painted panels set behind vertical bars that act as the shutter mechanism, the installation is found along the B and Q subway lines just as Manhattan-based trains leave Brooklyn. Commercial advertisers have also capitalized on the use of public transit tunnels as prime spaces for promotional content. Already traditional posters, ads, backlit displays, and screen-based content are ubiquitous on trains and in stations, but the darkness of the subway tunnel, combined with the captive audience and movement of the train, make such spaces ideal for animated advertisements. New York-based company SubMedia, which specializes in linear zoetropic subway ads, was founded in 2001. Its first advertisement was in Atlanta's MARTA transit system, and by 2009, the firm had installed over 40 installations in cities around the world. Clients include companies in a variety of industries, and the subway installations promote products ranging from films and television shows to automobiles, airlines, and soft drinks. Since 2008, company, along with Winnipeg-based company Sidetrack Technology, which holds the markets in Boston and L. A., have transitioned to digital displays, enabling content to be changed more rapidly and easily.[10] Each linear zoetrope ad

[10] David GOETZL, "Underground Profits: Submedia's Corrigan Tunnels For Ads." *Media Post* [online]. 2008. Available at: <http://www.mediapost.com/publications/article/92951/un

consists of approximately two hundred individual light boxes that are three feet square. The length of the ad's moving image is dependent on the train's speed. A convincing moving image can be perceived at speeds as low as five miles an hour, and the "resolution" or fluidity of the illusion only increases with faster moving trains. Ads last for approximately fifteen seconds as the train zips by.[11]

The zoetrope's scale both renders it ideal for serving large audiences (particularly in areas where commuting by public transportation is more prevalent than driving), and is striking in that it is the viewer, not the images, that are in motion (though the images appear animated as the viewer moves past). Relying on subway trains propelling viewers along, commercial linear zoetropes assume a captive viewer who becomes activated and engaged as the ephemeral image rushes past, drawn to the backlit display by its contrast to the surrounding darkness. The viewer has no ability to replay or repeat the motion sequence (aside from taking the train again, which some viewers do).[12] In a moment of technological culture where images are endlessly accessible, copyable, and retrievable, the fleeting nature of such linear zoetropes, where images are only brought into motion by the motion of the train, may well contribute to the effectiveness of the advertisement. SubMedia CEO Peter Corrigan noted at least seven studies worldwide that demonstrated audience recall rate at an average of 93%, versus an only 13% retention rate associated with television spots.[13] Such a recall rate may be linked to a sense of urgency associated with the images, over which the viewer has no control to review.

SubMedia's founder, Joshua Spodek, has also installed non-commercial zoetropic art in the New York City Subway. For example, *Union Square in Motion* (2011), a linear zoetrope placed at eye level in Union Square, is a collaboration with students at Parsons the New School for Design.[14] In contrast to linear zoetropes installed along train lines, installations placed along

derground-profits-submedias-corrigan-tunnels-f.html#ixzz2FR7gjBZj> [cit. 11. 10. 2012].

[11] Luis M. BRILL, "Subway Advertising: Outdoor Underground." *Sign Web* [online]. 2006. Available at: http://signweb.com/content/subway-advertising-outdoor-underground#.UNHPbIUjFNY [cit. 11. 10. 2012].

[12] Dana FLAVELLE, "Subway Ads' Tunnel Vision." *The Toronto Star* [online]. 2006. Available at: <http://transit.toronto.on.ca/archives/data/200604100654.shtml> [cit. 23. 10. 2012]. Flavelle describes riders disembarking from their train to go back and re-watch ads in Toronto.

[13] GOETZL, "Underground Profits."

[14] Jen DOLL, "Union Square Subway Station Now Boasts the World's Largest Linear Digital Zoetrope." *The Village Voice* [online]. 2011. Available at: <http://blogs.villagevoice.com/runninscared/2011/09/_josh_--_its_a.php> [cit. 10. 8. 2013].

pedestrian thoroughfares function similarly to the original, hand-spun zoetrope in that the viewer maintains a degree of control in interacting with the illusion, able to stop, and to experience the zoetrope's moving image forward or backward. In scaling up the apparatus, the viewer is forced to arrange their entire body (rather than just their eyes) in relation to the display, thus maintaining the same kinds of playful, interactive qualities of their nineteenth-century counterparts. However, even such interactive linear zoetropes represent a departure from the originals, as their site-specificity mandates that viewers be in the public places where they are installed, and must manipulate themselves while the apparatus remains stationery. *Union Square in Motion* thus has the ability to transform commuters into participants and interactors.

Figure 2: *Union Square in Motion.*
Source: Union_Sq_Zoetrope_2. Photo by Metropolitan Transportation Authority / Rob Wilson, September 2011, CC-BY-2.0.

Within public transit spaces, the ephemeral, site-specific nature of linear zoetropes contributes to their status as memorable features of the built environment. Still other contemporary zoetropes have scaled up verti-

cally, creating impressive towers of animation. Vertically arrayed zoetropic installations challenge the parameters of the form by building upward. Linear zoetropes in public transit contexts are constrained by the existing infrastructures of the systems in which they are installed (for example, the distance of the tunnel between two stations or the length of a particular pedestrian walkway and the way in which foot traffic utilizes the space). Large-scale vertical zoetropes, on the other hand, encounter physical constraints with regard to their weight and volume, and the strength required to keep such apparatus in motion. These objects are heavy, cumbersome, and do not immediately lend themselves to views by large audiences simultaneously. However, they are also often constructed with the express purpose of being filmed, thus their status as enormous, handcrafted apparatus is maintained, even as their animations are recorded onto screen-based media, a highly commodifiable form.

The nineteenth-century zoetrope had to be placed squarely at the viewer's eye level in order to function: the viewer had to see the moving pictures through the slotted drum, as looking from above only produces a blurred image. The zoetrope's common tabletop placement thus primed it for child audiences (for whom the device was at eye level) and required adult viewers to arrange themselves accordingly in relation to it. In contrast, large-scale vertical zoetropes prevent a viewer from apprehending their animated sequences both due to their size, and often, by excluding a shutter mechanism, spinning for a camera to capture the animation to be viewed in video form later. The result is a unique, intricately designed physical object, both rich with details, and also impressively large. As a singular artifact, it is still able to reach mass audiences because it is designed to be animated through video. The act of filming these installations is not merely documentation; rather, the camera's frame rate functions as the shutter mechanism that brings these zoetropes to life.

Such is the case with the zoetrope designed to promote Temperley London's Spring Summer collection in 2010. New York-based transmedia company LEGS, a member of The Milk Group, and fashion firm Temperley London collaborated to design and construct a zoetrope to showcase Temperley's Spring/Summer collection. Construction of the zoetrope took a month, and the video capturing its rotation, directed by **Greg Brunkalla, Georgie Greville** and **Geremy Jasper, showcases the animated bands in fluid motion.** The finished zoetrope is circus-themed, and is topped with a carousel-like roof. It is twelve feet tall and boasts fifteen distinct tiers of animation, each featuring a Temperley look. To record the motion, a camera

was mounted on a pulley system that runs the vertical length of the instal-lation so that each individual tier's animation could be filmed. Although the zoetrope was displayed alongside simultaneous projections of each loop of animation, the animations can only be seen in the video footage, which furnishes the shutter mechanism.[15]

Filmmaker and animator Jim Le Fevre also constructed a vertical zoetrope, which was to be filmed and used in the title sequence of a Tony Roche's BBC docu-drama *Holy Flying Circus.* Le Fevre's piece, entitled "The Holy Flying Circus Phonotrope," is based on his earlier experimentations with zoetropic forms, which he has called phonotropes (early instantiations and prototypes used record player turntables). Le Fevre, a freelancer whose commercial work is is represented by Nexus Productions, designed the phonotrope's animations with the computer program 3D Studio Max, and each individual image or frame was printed out and laser cut to be arranged around each of a series of platters, which were constructed into a single ver-tical tower. The final piece is over two meters tall, and requires ten seconds from start up to achieve its standard speed, and sixteen seconds to go from moving to stationary. When filmed, "The Holy Flying Circus Phonotrope" showcases an impressive 90-second animated sequence, which was used as the basis of the docu-drama's opening credits. Integral to Le Fevre's concept of the phonotrope is the synchronization between the spinning apparatus and the frame rate of the camera used to record its movement. In lieu of traditional zoetrope slats, or even strobe lights to provide the "moment of rest" or shutter mechanism between each individual frame, the phonotrope's illusion can only be seen when recorded and the frame rate.[16]

Both the Temperley zoetrope and Le Fevre's *Holy Flying Circus Phono-trope* address a central problem of the traditional zoetrope: the finitude of an individual band or strip of animation, which has to be switched out and replaced to vary the animated sequence. While the vertical zoetrope does not fully solve such a dilemma (there are physical and material limits to the size and scope of these installations), as a form, it nevertheless affords the opportunity to display multiple simultaneous animated bands, which, in these two cases, are tied thematically and offer a brief, simple narrative. By scaling up the zoetrope's form, these vertical installations prevent the viewer

---

[15] *A Q&A With Legs on the Temperley London Spring 2010 Zoetrope* [online.] 2010. Available at: <http://glossyinc.com/misc/legszoetrope.html> [cit. 26. 11. 2012].
[16] Jim LE FEVRE, *Holy Flying Circus Title Sequence* [online]. 2011. Available at: <http://phonotropia.blogspot.com/2011/10/jim-le-fevre-holy-flying-circus-title.html> [cit. 18. 11. 2012].

from observing the entire animated display at once, and in the absence of a shutter mechanism to distinguish between images or "frames," such as rotating slots or strobe lines, the spinning apparatus does not appear animated at all. Instead, these zoetropes rely upon the video's frame rate to function as a shutter. These vertical zoetropes then both exploit the spectacle of their size as they are prominently displayed in public (the Temperley zoetrope was displayed alongside projected images of its animation; after being filmed for the docu-drama's title sequence, Le Fevre's *Holy Flying Circus Phonotrope* was put on display in the lobby at Nexus), while also recommitting their animated sequences onto screen-based media, thereby reducing their physical, colossal attributes to a two-dimensional surface that can easily be distributed.

Figure 3: *Holy Flying Circus Phonotrope*.
Source: Phonotrope for Title Sequence for Hillbilly Films' 'Holy Flying Circus'
© Fremantle Media/Hillbilly Television/Nexus Productions. In picture: Gordon Allen & Gee Staughton assessing Phonotrope mid-build.

Vertical and linear scalar adaptations of contemporary optical toys, such as zoetropic subway ads and enormous spinning towers covered in intricate animations all engage the viewer not by giving them the agency to manipu-

late the mechanisms of motion, but by offering compelling but limited views of their animated spectacles. Linear zoetropes in public transit spaces appear as bursts of movement in dark tunnels, then abruptly disappear. Vertical zoetropes are unique physical objects that command awe, but which are best seen through a camera, which both serves to animate each image sequence as well as offers the optimum vantage point from which to view the display. The viewer is meant to appreciate the large structure and the human ingenuity that went into its construction, but is also able to enjoy its animation through a more convenient, circulatable form of the screen-based image. The artifactual qualities of these zoetropes also contributes to the production of supplementary media, such as "making of" videos, which similarly call attention to the objects' intricacies.[17] Here, the spectacle of these objects' size is just as important as the spectacle of their moving images. The flatness of this image, along with the smooth linearity of the subway zoetrope, is in sharp contrast to another class of large-scale philosophical toys, which awaken multiple senses as they extend into the physical space of the viewer.

Animated objects and physical frames: Animation extruding into everyday life

Screen-based linear zoetropes and the vertical installations that are ultimately designed to produce screen-based products maintain a degree of versatility or flexibility in terms of how the work can be distributed, updated, or manipulated. SubMedia's digital screen displays, for example, easily allow for content to be changed or varied, while the recorded animations of the vertical zoetropes can be shared and disseminated in as many ways as other video or animation content. In contrast to such work, many fine artists and entertainment companies have instead employed persistence of vision to construct large-scale kinetic sculptures that are most prominently characterized by their material presence and the permanence of their animated forms. Artists such as Brooklyn-based Gregory Barsamian, Peter Hudson of San Francisco, and London-based Mat Collishaw have all constructed large-scale zoetropes comprised of series of three-dimensional sculptures spinning on metal armatures and animated by external shutter mechanisms, often strobe lights. Unlike the Bravia-Drome or commercial linear zoetropes, which represent each animated frame or image on a single screen,

---

[17] For example, the making of Le Fevre's Phonotrope is chronicled in a short video. [online]. 2011. Available at: <http://vimeo.com/30833811> [cit. 10. 8. 2013].

in these artworks, each discrete position in a motion sequence is a single, often intricately constructed sculpture.

Scale has become a distinguishing factor in describing, understanding, and experiencing these sculptures, and many artists who work in this medium foreground scale and monumentality in their discussion of their work. For example, Peter Hudson, whose zoetropes have appeared at Burning Man, describes his piece *Charon* (2011) on his website in terms of its physical complexity and the labor that went into creating it. *Charon* depicts the ferry operator Charon (represented as a full-size skeleton) rowing across the River Styx. In his description, Hudson highlights its specifications and the scale of the construction process. The series of 20 skeleton sculptures (for a total of 20 "frames") are installed as a sequence inside the rim of 34-foot tall vertically mounted wheel, and at over 7 tons, the sculpture required a principle team of 20 fabricators and artists (along with over 80 volunteers) working cumulatively over 6 thousand hours over 6 months to complete.[18] Gregory Barsamian's *Feral Font* (1996), on permanent display at the Museum of the Moving Image in New York City, is seven feet in diameter and nine feet tall, while Mat Collishaw's *Garden of Unearthly Delights* (2009), in the collection of New York's Museum of Arts and Design, is six and a half feet in diameter. All of these examples, much larger than the original zoetrope, create a new relationship between apparatus and viewer. Hudson has curiously called his work life-size, suggesting that such scaling up somehow puts these kinds of sculptures into a frame of reference commensurate with the scale of the human perceptual experience.[19]

Animator George Griffin has offered a formulation of what he calls "concrete animation," which he sees as an emerging form of contemporary animation practice. Concrete animation, Griffin suggests, often occurs in nontheatrical settings, such as gallery, museum, and public spaces, and consists in one incarnation of "object animation which displays physical moving objects arrested in synthetic time by strobe light or shuttering devices (both low and high tech)."[20] Much like the artifactual status of vertically arrayed

---

[18] Peter HUDSON, *Charon* [online]. 2012. Available at: <http://hudzodesign.com/?p=192> [cit. 12. 12. 2012].
[19] The notion of a "life-sized zoetrope" is also evoked in the eponymous short film *The Life Size Zoetrope* (2007) directed by Mark Simon Hewis, in which a series of participants, each holding a single animated frame, are filmed on a rotating amusement park ride. <http://www.animateprojects.org/films/by_date/2007/life_size_z>
[20] George GRIFFIN, "Concrete Animation." *Animation: An Interdisciplinary Journal,* vol. 2, 2007, no. 3, p. 262 (259–274).

zoetropes, Griffin highlights these sculptures' materiality in his discussion. For Griffin, a central feature of this work is that it often calls attention to rather than conceals the way that the illusion of motion is produced. His formulation also includes animated work that the user or viewer is able to manipulate and play, such as flipbooks and mutoscope machines installed in gallery spaces.

While he does not deal extensively with scale in his discussion, Griffin describes stroboscopic and kinetic sculptures such as Barsamian's (and, I would add, Hudson's) as "complex environments and contraptions which are unwieldy, clanky, and not easily portable, designed to investigate the essential mechanisms of perception in motion."[21] In emphasizing materiality, the visibility of the mechanisms of motion, and instances where users are able to control the animation, Griffin's conclusion is that concrete animations offer an opportunity "to return some measure of freedom and control back to the viewer."[22] Unlike many large-scale installations that are not user-operated, such as vertical or linear zoetropes, sculptures such as Hudson's work have the capacity to engage the onlooker as a user or manipulator of the image. However, the kind of interaction or engagement they encourage may have less to do with the tactile exploration associated with the traditional zoetrope (or devices like the mutoscope), instead cultivating a different kind of participatory network commensurate with their size. Peter Hudson's *Charon*, for example, is "user-operated," brought to motion by six pairs of users pulling on ropes to activate the enormous wheel and synchronized strobe light. By requiring a group of users to synchronize with one another to operate the sculpture, the interaction is less about manipulating the illusion (for example, the ability to spin the nineteenth-century zoetrope forward and backward), and more about achieving a goal through teamwork. The zoetrope's operation thus becomes a context-specific performance.

Many large-zoetropic installations displayed in gallery settings do not offer the viewer an opportunity to tactilely interact with the sculpture. Instead, the use of external shutter mechanisms like strobe lights deliver an experimental or exploratory experience to the viewer. For example, Gregory Barsamian's *Feral Fount* (1996) and Mat Collishaw's *Garden of Unearthly Delights* (2009) are displayed with a strobe light on a timer, demonstrating the object as it appears both with and without the strobe-shutter mechanism. The rotating sculpture on its armature never stops turning, though the

[21] GRIFFIN, "Concrete Animation," p. 270.
[22] GRIFFIN, "Concrete Animation," p. 273.

viewer is able to observe it both fully animated (when the strobe light is on and it gives the flickering illusion of objects in fluid motion) and a "behind the scenes" look with the naked eye and no strobe light (when the sculpture just appears as a blurry spinning armature to which many small objects are attached). While the viewer is not actively in control of producing the illusion, presenting zoetropic sculptures in environments with timed strobes permits viewers to compare the two modes of operation. When activated, the strobe light erases the presence of the spinning metal armature, producing a fluid animated sequence out of physical three-dimensional objects, thereby reconfiguring the status of animation, prompting consideration of whether the movement is "real." Thus, although the viewer is not directly manipulating the sculpture, as was the case with the original zoetrope, a similar set of preoccupations emerges from these large-scale versions about how the images are produced. Barsamian's Artist's Statement addresses this mode of engagement: "The images exist in real time and viewers are able to share the same space with them. The illusion creates a conflict between sensory information and logic which suggests the reality of a dream."[23] Such sculptures thus raise the question of whether the motion is real or simulated, though in their rapid rotation, they often generate a breeze or draft that the viewer can feel on their skin, thus confirming that some form of motion is actually taking place.

Conclusion

Although the basic perceptual principles that animated the earliest philosophical toys are still at play in contemporary iterations, they are produced in slightly different ways that enable them to serve larger audiences and display visual spectacle on a much bigger scale. The relationship between audience and apparatus is transformed when optical toys are scaled up; the mechanisms for creating the illusion of motion are less frequently user-controlled, thus producing an audience comprised not of users or interactors, but of viewers. When taking scale into consideration, then, theorizing contemporary optical toys moves away from the critical line of inquiry that positions them within a lineage of interactive media like games, and instead roots them in a tradition of visual and scientific spectacle.

[23] Gregory BARSAMIAN, *Artist Statement* [online]. Available at: <http://www.gregory barsamian.com/> [cit. 26.11.2012].

Fine artists, advertisers, and others have employed a range of creative strategies in the design and construction of contemporary optical toys. Replacing the slotted shutter with architectural features, strobe lights, and the frame rate of a camera, these large zoetropes combine the elements of individual artwork or piece of craftsmanship with the spectacle, wide reach, and visual appeal of commercial work made for mass audiences. The resulting displays thus exhibit an interesting interplay between transience and permanence. On the one hand, in their materiality and physical presence, large-scale zoetropes are inserted into everyday public experiences in places like subway tunnels, museum galleries, and in television commercials. On the other hand, in their site-specificity and tendency to be displayed under controlled conditions (such as on a timed strobe light), their illusions remain fleeting, and unlike many forms of new media, they cannot always be retrieved or repeated at will by the viewer.

Contemporary adaptations of the zoetrope marshal feelings of wonder and awe equivalent to their early precursors and invite consideration of how their visual effects are achieved. However, their reentry into modern public life cannot simply be understood as a resurgence of a long-dormant media form without taking into account the importance of scale as a concept critical to their transformation and recent success. Adaptations in size, shape, and direction have made the zoetropic form into a media spectacle in the twentieth and twenty-first centuries, and have accordingly cultivated new forms of spectatorship as animated displays surround, pass by, and envelop the viewer.

////// tematická studie / thematic articles ////////////////////

THE TURING MACHINE ON THE DISSECTING TABLE

Abstract: *Since the beginning of the twenty-first century there has been an increasing awareness that software represents a blind spot in new media theory. The growing interest in software also influences the argument in this paper, which sets out from the assumption that Alan M. Turing's concept of the universal machine, the first theoretical description of a computer program (software), is a kind of bachelor machine (Carrouges). Previous writings based on a similar hypothesis (Daniels, Baudrillard, Turkle, Ascott) have focused either on a comparison of the universal machine and the bachelor machine in terms of the similarities of their structural features, or they have taken the bachelor machine as a metaphor for a man or a computer (artificial intelligence). Unlike them, this paper stresses the importance of the context (the imitation game of the Turing test) as a key to interpreting the universal Turing machine as a bachelor machine and, potentially, as a self-portrait.*

Keywords: *Turing machine; bachelor machine; Turing test; dissecting table; magic*

Turingův stroj na pitevním stole

Abstrakt: *Od začátku 21. století roste vědomí, že software je slepou skvrnou teorie nových médií. Vzrůstající zájem o software ovlivnil také tezi předkládaného příspěvku. Vychází z předpokladu, že koncept univerzálního stroje Alana M. Turinga je jedním z mládeneckých strojů (Carrouges). Předchozí texty založené na podobné hypotéze (Daniels, Baudrillard, Turkle, Ascott) se zaměřily buď na srovnání univerzálního stroje a mládeneckého stroje na základě jejich strukturálních podobností, nebo užívaly mládenecký stroj jako metaforu člověka nebo počítače (umělé inteligence). Na rozdíl od nich, tento příspěvek zdůrazňuje význam kontextu (imitační hry Turingova testu), který je klíčem k interpretaci univerzálního Turingova stroje jako mládeneckého stroje a potenciálně jako autoportrétu.*

Klíčová slova: *Turingův stroj; mládenecký stroj; Turingův test; pitevní stůl; kouzlo*

JANA HORAKOVA
Masaryk University / Faculty of Arts
Department of Musicology / Theory of Interactive Media Studies
Arna Novaka 1
602 00 Brno // Czech Republic
email / horakova@phil.muni.cz

The software turn

Since the beginning of the twenty-first century, there has been an increasing awareness among humanities scholars that software, the internal structure and the processes performed inside a computer have remained a blind spot in new media studies. Software had hitherto been considered a tool, a thing that merely figures in the realm of a machine's functionality. Now that the bubble of newness of the new media has burst, it is clear that a systematic and critical analysis of the functional features of new media and a reconsideration of them in a historical perspective and in the cultural production context have yet to be done.[1]

Inside the black box

The turn to software in the discourse of new media studies has been motivated by an effort to open up and to analyse the black box of the computer from the inside. The belief now is that it is not the interface but the inner structure and programmability of the computer that defines the medium. Thus, the turn to software marks a shift from interface to the layers of the new media below the surface, which mostly operate unconsciously.

The internal functional features of computers affect a broad spectrum of cultural practices that occur through and around them. The power and influence of computational processes over different cultural practices is even higher because they have remained in the dark, inside the box, for a long time. Thus, the black box of the computer must be opened and examined in the way other cultural products and practices are analysed and interpreted.

From code to context

The paper focuses on Alan M. Turing's concept of the universal Turing machine (also just called the Turing machine), which is the first theoretical description of the computer program (software). The universal machine has already captured the attention of a number of new media scholars. Approaches within software studies are represented by Friedrich Kittler and Mathew Fuller. While Kittler deals primarily with code as the language of

---

[1] For more information on the software turn in new media studies, see: Jana HORÁKOVÁ, "K recepci informatiky v kontextu společenských věd: Obrat k softwaru." In: KLÍMOVÁ, H. – KUŽELOVÁ, D. – ŠÍMA, J. – WIEDERMANN, J. – ŽÁK, S. (eds.), *Hovory s informatiky.* Praha: Ústav informatiky AV ČR v.v.i. 2011, p. 117–135.

programming media, Fuller calls for a broader understanding of the programming and processes that occur through the computer to link technology with its context.

Kittler was one of the first media theorists to deal with software in the new media studies perspective.[2] He considers the computer to be a descendent of the typewriter and points to the symbolic and transformative power of the universal Turing machine. In his view, while the typewriter transformed handwriting into a chain of discrete letters of the alphabet, the computer completed the transformation of the symbolic order by replacing letters with a (secret) code of numbers (ciphers).[3] He writes:

> From the Remington via the Turing machine to microelectronics, from mechanization and automatization to the implementation of a writing that is only cipher, [...] one century was enough to transfer the age-old monopoly of writing into the omnipotence of integrated circuits. [...] All data streams flow into a state n of Turing's universal machine; Romanticism notwithstanding, numbers, and figures become the key to all creatures.[4]

According to Kittler, the code of programming languages has become the dominant mode of representation in the computer age.[5] As a result, the historical order, based on narratives, has been replaced by the programmable media order, which involves/is based on the abstract, isolated, and, in its isolation, omnipotent universe of mathematics. At the core of the mathematic order is a seductive concept of general substitution.[6] Thus, the computer can be seen as an isolated universe of symbols within which it is possible to completely represent the world or even to replace a human with a simulation of one.

---

[2] Friedrich A. KITTLER, "There Is No Software." In: KROKER, A. – KROKER, M. (eds.), *C-theory net* [online]. Available at: <http://www.ctheory.net/articles.aspx?id=74> [cit. 12. 8. 2013]. Originally published as Friedrich A. KITTLER, "Es gibt keine Software." *Draculas Vermächtnis: Technische Schriften*. Leipzig: Reclam 1993, p. 225–242.

[3] Friedrich A. KITTLER, *Gramophone, Film, Typewriter*. Stanford: Stanford University Press 1999. Originally published as Friedrich A. KITTLER, *Grammophon, Film, Schreibmaschine*. Berlin: Brinkmann & Bose 1986.
See also Friedrich A. KITTLER, "Code (or, How You Can Write Something Differently)." In: FULLER, M. (ed.), *Software Studies: A Lexicon*. Cambridge: The MIT Press 2008, p. 40–47.

[4] KITTLER, *Gramophone, Film, Typewriter,* pp. 18–19.

[5] KITTLER, "Code," p. 40.

[6] Wendy Hui Kyong CHUN, *Programmed Visions: Software and Memory*. Cambridge, MA: MIT Press 2011.

Mathew Fuller adopted a different perspective. His focus is the programming and other practices that occur around and through computers. It is his belief that in order to know more about the influence programmable media have on our culture we must study not only the media itself, but also the activities that occur through and around them. He writes:

> Software marks another of its beginnings in Alan Turing's desire to chart the computable, [...] within the terms of mathematics. Computation establishes a toy world in conformity with its axioms, but at the same time, when it becomes software, it must, [...], come into combination with what lies outside code. [...] And it is this paradox, the ability to mix the formalized with the more messy - non-mathematical formalisms, linguistic, and visual objects and codes, events occurring at every scale from the ecological to the erotic and political - which gives computation its powerful effects, and which folds back into software in its existence as culture.[7]

Software as a toy

Within the effort to make software a part of culture, there is a complementary ambition to discover new, appropriate, and often subversive methodologies for software studies. Wendy Chun talks metaphorically about the *in media res*[8] perspective, referring to giving up the critical distance of general statements in favour of close readings, microanalyses, and interpretation of particular features and principles of computation.

This paper contributes to the software studies perspective, in which software is seen as being part of wider cultural production and imagination and is treated not as a tool but as a *toy-concept* that we can deal with playfully. The argument is placed within and beyond the formal scientific discourse, as well as within conscious and unconscious parts of human mind activities. The universal machine is treated both as a self-portrait (in the sense that it represents activities of the human mind) and as a symbol of Alan Turing's personal and professional life tragedy. My hypothesis is that the universal Turing machine can be seen as a kind of compiler, which is transcoding the bachelor machine (the symbol of the vain urge for transcendence) into the Turing machine (the symbol of the transformation).

---

[7] Matthew FULLER (ed.), *Software Studies: A Lexicon.* Cambridge, MA: MIT Press 2008, p. 5–6 (1–13).
[8] CHUN, *Programmed Visions.*

The universal Turing machine

Alan Turing's universal (computing) machine (later renamed the Turing machine) warrants special attention because it is the first theoretical explanation of the stored program computer (software), which directly influenced early thinking on the nature of computation and the modern electronic computer's architecture. Moreover, the supposition that Turing based the concept of the universal machine is that any complex operation can be reduced to a series of simple steps described as mathematical functions (add, subtract, multiply, etc.) is what lies at the heart of all programming.

Turing presented the concept of the universal machine for the first time in "On Computable Numbers, with an Application to the Entscheidungsproblem".[9] He explained that the universal machine consists of an infinitely long piece of paper comprising an infinite number of boxes and through these a mathematical calculation, even a very complex one, can be performed by following a series of actions based on the symbols in the boxes. The hypothetical machine was described in the chapter Computing Machines as follows:

> The machine is supplied with a "tape" (the analogue of paper) running through it, and divided into sections (called "squares") each capable of bearing a "symbol". At any moment, there is just one square [...], which is "in the machine". We may call this square the "scanned square". The symbol on the scanned square may be called the "scanned symbol". The "scanned symbol" is the only one of which the machine is, so to speak, "directly aware". However, [...] the machine can effectively remember some of the symbols which it has "seen" (scanned) previously.[10]

As the quotation itself implies, rhetorical figures based on analogies between the human mind and computing machines are applied next to exact mathematical formulations on the paper. One more example for all:

> For the present I shall only say that the justification lies in the fact that human memory is necessarily limited. We may compare a man in the process of com-

---

[9] Alan M. TURING, "On Computable Numbers with an Application to the Entscheidungsproblem." In: *Proceedings of the London Mathematical Society*, vol. 42, 1936, no. 2, p. 230–265. Available online at: <http://www.cs.virginia.edu/~robins/Turing_Paper_1936.pdf > [cit. 14. 8. 2013].
[10] TURING, "On Computable Numbers," p. 231.

puting a real numbers to a machine, which is only capable of a finite number of conditions.[11]

However, the association of the universal Turing machine with man is made not only on the level of metaphor. Explaining the machine's operations Turing refers to the similarities and analogies between a human's and a computational machine's invisible functional characteristics. To enable a comparison and link the concept of a human to the concept of a computer, the model and definition of man must be reduced to an "information processing system".[12] Hayles regards this reduction within Turing's argument as a significant contribution to the discourses of cybernetics and posthumanism.

The mechanical aesthetics of Marcel Duchamp's seminal work *The Bride Stripped by Her Bachelors, Even (The Large Glass)* enables us to compare it with the universal Turing machine. This way we can develop thinking in analogies between the computing machine and the exercises of the human mind to describe their similarities in such features that lie outside the "retinal world". Moreover, both (conceptual) apparatuses refer to the notion of the "bachelor machine" that makes it possible to articulate the dominant image-myth of the mechanical age that has spread through the collective unconscious.[13]

The bachelor machine

Marcel Duchamp coined the term bachelor machine (or machine célibataire) around 1913, when he named the lower glass plate of his seminal work *The Bride Stripped by Her Bachelors, Even* (1915–1923) or in short *The Large Glass*. The bachelor machine referred to the realm of mechanical components, a water paddle, scissors, a chocolate grinder, a sledge, and nine balloon-like pods called the Malic Molds. These Malic Molds represent nine bachelors condemned to eternal longing for the Bride that remains remote in the upper glass plate realm.

---

[11] *Ibid.*, p. 231.
[12] Katherine N. HAYLES, *How We Became Posthuman: Virtual Bodies in Cybernetics, Literature, and Informatics*. Chicago – London: University of Chicago Press 1999.
[13] Dieter Daniels was probably the first new media theorist to see certain resemblances between the functional features of Turing's computing machine and *The Large Glass* by Marcel Duchamp, and elaborated this observation by using the term the bachelor machine. Dieter DANIELS, "Duchamp: Interface: Turing: A Hypothetical Encounter between the Bachelor Machine and the Universal Machine." In: GRAU, O. (ed.), *Media Art Histories*. Cambridge, MA: MIT Press 2007, p. 103–136.

However, later on the bachelor machine acquired the status of a broader concept in the art theory. Michel Carrouges appropriated the term to point out the structural similarities between Marcel Duchamp's *The Large Glass* and different apparatuses described by writers in the second half of the nineteenth and the early twentieth century.[14] For example, a punitive apparatus described by Franz Kafka in the short story *In the Penal Colony* (1919), or apparatuses designated in novels *Impressions d'Afrique* (1915) by Raymond Roussel, or *Le Surmâle* (1915) by Alfred Jarry, and many others.

By deciding to articulate the shared structure of these apparatuses with the term bachelor machine Carrouges pays homage to *The Large Glass*, which is the only visual, and not literary, depiction of a bachelor machine within Carrouges's theory. According to him, all bachelor machines share "the sexual origin of *The Large Glass* mechanics and their signification of death". They assume the form of a blueprint or a diagram made of mechanical and visceral structures, referring both to mechanisms that are "unfinished, unfinishable, and incapable of operating in reality" and to the "mental machines, the imaginary working of which suffices to produce a real movement of the mind". Thus, bachelor machines are usually reminiscent of scientific images or technical drawings, which mediate knowledge about un-presentable and unconscious phenomena and forces. Carrouges interpreted the bachelor machine as a concept that emerges from and refers to the collective imagination and that thus acquires the status of the myth of the man of the mechanical age.

The bachelor machine's anatomy

All bachelor machines share certain structural features. They operate as closed circuits between an upper and a lower part, within which the message from the upper zone is inscribed upon the lower one. Each bachelor machine consists of two overlapping mechanisms, the desiring machine and the suffering machine. It is a kind of diagram made of two overlapping layers, which represents the forces of the vain desire for transgression, both towards love and death, which characterize modern man.

The desiring machine: *The Large Glass*'s apparatus represents the layer of the desiring machine. It consists of two distinct realms, the realm of the bride above and the realm of the bachelors below. There is a vertical boundary between them, which makes impossible their immediate contact. The

---

[14] Michel CARROUGES, *Les Machines célibataires*. Paris: Arcanes 1954.

bachelors in the lower part are imagining and desiring the bride without any possibility of comprehension because the mechanism of communication is frozen into death in the glass.

The suffering machine: A torture apparatus similar in structure to *The Large Glass* is found in Franz Kafka's *In the Penal Colony* and represents the layer of the suffering machine. The apparatus consists of a lower part, the bed, and the upper part, the designer. Between them, there is a section called a harrow, which is a piece of glass in which needles are fixed and that can be moved up and down. The condemned man has to lie on the bed and his offence is written into his back with the harrow. The man is not told of his offence. He must learn it through his body, sentenced to death.

The universal machine: The universal machine shares its functional features with other bachelor machines. It consists of two horizontally separate realms, the upper part called the head and the lower part made of the tape. The head scans, writes, and reads the tape according to its current state. The writing device, in the shape of a needle, writes and erases signs according to its program, while the tape moves back and forth, mediating communication between the upper and lower part.

The bachelor machine in the new media discourse

Dieter Daniels made a comparison of Marcel Duchamp's *The Large Glass* and Turing's universal machine in an attempt to prove that the bachelor machine, which emerged in the world of art, can offer new, illuminating insight into the understanding of computer-mediated communication which has become the dominant means of communication and self-representation in the computer age. He suggested naming the current information and communication technologies "the universal bachelor machine". This neologism embodies his opinion that the most significant articulations of the bachelor machine are no longer found in the world of art but in the realm of new media, which are more and more defining and restricting the ways in which we communicate with other people and experience the world we live in. He wrote, "[the] bachelor machine, having started out as an artistic vision, has turned into a way of embracing and developing technologies".[15]

---

[15] Dieter DANIELS, "Duchamp: Interface: Turing: A Hypothetical Encounter between the Bachelor Machine and the Universal Machine." In: GRAU, O. (ed.), *Media Art Histories*. Cambridge, MA: MIT Press 2007, p. 130 (103–136).

276

Daniels made the most refined contribution to rethinking the bachelor machine concept in new media theory. However, other remarkable examples of applications of the bachelor machine concept or of analogies between computers and *The Large Glass* can be found in the new media discourse. Jean Baudrillard wrote that the bachelor machine represents the artificial intelligence of computers because they are unable feeling pleasure. He insisted that this is the last difference between man and machine. "What will always distinguish the functioning of even the most intelligent machine from man is the ecstasy, the pleasure of functioning [...]."[16] Sherry Turkle, focusing on the computer user, wrote that the geeks, nerds, and hackers who spend nights with computers live in so-called "bachelor mode".[17] Roy Ascott used an analogy between *The Large Glass* and the computer monitor to provide an insightful description of the interface. He wrote that:

> We see in the work known as [...] The Large Glass a field of vitreous reality in which energy and emotions are generated from tension and interaction of male and female, natural and artificial, human and machine. [...] Its subject is attraction [...]. As "ground", The Large Glass has function and status anticipating that of the computer monitor as a screen of operations – of transformations and as the site of interaction and negotiation for meaning.[18]

The universal machine as a self-portrait

The following argument deals with similarities between functional features of the universal machine and the bachelor machine as well. These two concepts are treated as portrayals of the hidden (unconscious) processes that go on beneath the computer desktop in the case of the universal machine, and the unconscious forces inside the mind of a man in the case of the bachelor machine.

The universal machine is seen not as a counterpart of the bachelor machine in the techno-science discourse,[19] but as one of many articulations of

---

[16] Jean BAUDRILLARD, "Videowelt und fraktales Subjekt." In: Ars Electronica (ed.), *Philosophie der neuen Technologien.* Berlin: Merve 1989, p. 130 (113–133).
[17] Sherry TURKLE, *The Second Self: Computers and the Human Spirit.* New York: Simon and Schuster 1984, p. 198.
[18] Roy ASCOTT, "Is There Love in Telematic Embrace?" In: SHANKEN, E. (ed.). *Roy Ascott. Telematic Embrace. Visionary Theories of Art, Technology, and Consciousness.* Berkeley – Los Angeles – London: University of California Press 2003, p. 235 (232–246).
[19] *Cf.* DANIELS, "Duchamp: Interface: Turing".

the bachelor machine. Thus, their relationship is not based on a dichotomy and should rather be ideated as a kind of palimpsest, as a drawing on which one can see at first glance the universal machine description, but upon second glance will see the diagram of the bachelor machine emerge from within its background.

The link between subject of Alan Turing and the concept of the universal machine is constituted by playing with significant slips of the tongue within scientific writings rhetoric. The genre of the universal machine image that is going to be drawn is close to the self-portrait.

The human computer

We can ask what kind of man served Turing as the inspiration for the computing machine. Turing described the man he had in mind in chapter 4, Digital computers:

> The idea behind digital computers may be explained by saying that these machines are intended to carry out any operations which could be done by a human computer. The human computer is supposed to be following fixed rules; he has no authority to deviate from them in any detail. We may suppose that these rules are supplied in a book, which is altered whenever he is put on to a new job.[20]

Thus, the universal machine resembles a human computer, someone who is counting all the time. It could be a bookkeeper, an accountant, or a bureaucrat, simply someone who is "squirreling around in the back office, shuffling through stacks of rigged paper, reading, writing, and erasing numbers in little boxes".[21]

The freak of numbers

However, Turing points to the much better performance and accuracy of the counting done by the universal machine than the man-computer. Thus, we can say that the model is not merely a conscientious bureaucrat, but rather someone who has an extraordinary memory, who is very accurate and persis-

---

[20] Alan TURING, "Computing Machinery and Intelligence." *Mind*, vol. 59, 1950, no. 236 (433–460). Available online at: <http://loebner.net/Prizef/TuringArticle.html> [cit. 12. 8. 2013].

[21] Warren SACK, "Memory." In: FULLER, M. (ed.) *Software studies*, p. 188 (184–193).

tent in his counting, and who is able to solve very complicated mathematical and logical problems. Hence, Mathew Fuller calls precursors of computers "freaks of number"[22] and he refers to computers as the descendants of these eccentric freaks or prodigies, whose talent reveals itself in the form of mono-maniacal, enormously fast, and extremely accurate counting.[23]

The mathematician

We can speculate that it is almost impossible that Turing would be able to avoid any self-reflection while describing the human mind in a state of computing. Therefore, another possibility is to search for analogies between the computational abilities of the universal machine and the excellent per-formances of the mind of its inventor, Alan Turing himself.

Turing's biographer, Andrew Hodges, suggested certain relations between the universal machine concept, in particular the first of its two axioms, its isolation (the second one is its completeness), and the person Alan Turing. He wrote:

> [T]he discrete state machine, communicating by teleprinter alone, was like an ideal for his own life, in which he would like to be left alone in a room of his own, to deal with the outside world solely by rational argument. It was the embodiment of J. S. Mill liberal subject, concentrating upon the free will and free speech of the individual.[24]

The demand for the isolation of the universal machine from the outer world can be interpreted as a decision that belongs in the realm of the cold logic

[22] Matthew FULLER, "Freaks of Number." In: COX, G. – KRYSA, J. (eds.), *Engineering Culture: "On The Author as (Digital) Producer"*. New York: Autonomedia (DATA browser 02) 2005, pp. 161–175. Available on-line: <http://www.spc.org/fuller/texts/freaks-of-number/> [cit. 12. 8. 2013].

[23] Fuller noted the strange but significant structure of the book *Le Calcul simplifié par les procédés mécanique et graphique*, subtitled *A History and Description of Instruments and Machines of Calculation, Tables, Abacuses and Nomograms* by Maurice d'Ocagne published in 1894. D'Ocagne included a list of individuals with exceptional counting skills into the Introduction of a book dedicated to taxonomy of counting tools and machines. Fuller regarded the arrangement as the inaugural moment of the computer age. He wrote: "What is interesting though is that this list of numerical freaks appears at the beginning of a sober text on the means of automating mathematical operations. It is as if it were something that has to be acknowledged, marveled at, but disowned. The chemist describes the alchemists. This shudder of recognition and of admiration passes. The thing is safely out of their clammy hands, but the continuum between these persons and these machines is established." *Ibid*., pp. 163–164.

[24] Andrew HODGES, *Alan Turing: The Enigma of Intelligence*. London: Unwin 1985, p. 425.

of mathematics. However, Hodges's psychological explanation of this demand suggests that the rational purity of mathematical models may be just an illusion. Instead, they should be recognized as being entwined within human desires, fears, and hopes, as well as the human will to control and manipulate the world.

From model to index

Taking the universal machine as a model for the human computer, a prodigy, or a mathematician, means effacing its status as a blueprint for computational machines in favour of treating it as a model for a human. Based on the argument establishing a link between the universal machine and (the person of) Alan Turing, we can refer to the universal machine as a kind of self-portrait. However, we should ask, what is the nature of the relationship between Turing and the universal machine?

It is common to treat the relationship between the model and the original as representation or substitution on the basis of shared features. However, dealing with signs in this way can lead to certain misunderstands and even mistakes. Turing discussed the risk of thinking in terms of analogies between an original and a model in his paper "The Chemical Basis of Morphogenesis"[25]. He wrote:

> [... the] mathematical model [...] will be described. This model will be a simplification and idealization, and consequently a falsification. It is to be held that the features retained for discussion are these of the great importance in the present state of the knowledge.[26]

Turing's words about the weak status of a model express a certain scepticism towards a mathematical model's ability to provide a rich enough representation of the original.

To avoid thinking in analogies between a model and an original, in this case between the universal machine and the person Alan Turing, we shall instead employ the speak in terms of indexical references. While in the first part of the paper the concept of the bachelor machine was introduced as a suitable analogy for the universal machine by listing their structural

---

[25] Alan TURING, "The Chemical Basis of Morphogenesis." In: *Philosophical Transactions of the Royal Society of London. Series Biological Science*, vol. 237, 1952, no. 641, p. 37–72. Available online at: <http://www.jstor.org./stable/92463> [cit. 12. 8. 2013].
[26] *Ibid*., p. 38.

similarities. In the argument below the bachelor machine will represent an indexical relationship between the author, Turing, and the universal machine. This will enable us to interpret the relationship between the person Alan Turing and the universal machine within the structure of the two overlapping diagrams that the bachelor machine comprises. This kind of relationship can help us to avoid the reductionism of a scientific model and be more sensitive to the context or the background of the universal machine. With this approach we can show that the universal Turing machine is both the result of a brilliant exercise in mathematical logic and an index of the person Alan Turing, the conscious and unconscious parts of his desires and will. We could say that below the universal machine will be subjected to a kind of x-ray examination to expose the hidden layers of unconscious and (deleted) embodied experience.

The universal Turing machine on the dissecting table

Dissecting table

Carrouges described the bachelor machine as a "fantastic image that transforms love into the technique of death" that is first of all an "improbable machine", and said that "the determinant structure of these unlikely looking machines is based on mathematics".[27] In the effort to explain the basic principles shared by all bachelor machines, he pointed to its simpler precursor, Lautréamont's formula from *Le Chants de Maldoror* (1869, Chant VI):

> He is beautiful [...] like the chance meeting of a sewing machine and an umbrella on the dissecting table.[28]

Carrouges turns the interpreter's attention away from the heterogeneous setting created by the umbrella as a male symbol and the sewing machine as a female symbol to a third object in the background of the image, the dissecting table. The dissecting table does not figure among the bachelor machine's mechanical and sexual components. However, its importance for understanding the bachelor machine is crucial.

---

[27] Michel CARROUGES, "Istruzione per L'uso / Instructions for Use." In: CLAIR, J. – SZEEMANN, H. (eds.). *Le macchine celibi / The Bachelor Machines*. C*atalogue La Biennale di Venezia*. Venice: Alfieri Edizioni d'Arte 1975, p. 21 (21–49).
[28] *Ibid*. p. 22.

> [The dissecting table] represents a specific function arising out of the system of the two ensembles. Instead of love bed, signifying union and love, the dissecting-table expresses the bachelor machine's specific function, which is solitude and death.[29]

The principal importance of the background, which unites the bachelor machine's components into one system, is confirmed in Marcel Duchamp's response to the letter sent to him by Carrouges, in which he explained the concept of the bachelor machine on the basis of the correspondence between *The Large Glass* and Franz Kafka's short novels *Metamorphosis* and *In the Penal Colony*. Even though Duchamp expressed doubts about using a method based on searching for structural analogies between the upper and the lower part of *The Large Glass* and, for example, between the sewing machine and the umbrella in *Les Chantes de Maldoror,* he appreciated the analogy between the transparent glass plates and the dissecting table. He wrote:

> 6 Feb. 1950
> My dear Carrouges,
> [...]
> I can tell you that the introduction of the ground theme explaining or provoking certain 'acts' of the Mariée and the bachelors, never came into my mind – but it is likely that my ancestors made me "speak" like them [...].
> Celibately yours,
> Marcel Duchamp[30]

The Turing test

Analogically to the transparent glass plates of *The Large Glass*, the crucial role of the background in the universal Turing machine setting is played by the imitation game of the Turing test. Turing explains the rules of the game as follows:

> The new form of the problem can be described in terms of a game which we call the "imitation game." It is played with three people, a man (A), a woman (B), and an interrogator (C) who may be of either sex. The interrogator stays in

---

[29] *Ibid.*
[30] Jean CLAIR – Harald SZEEMANN, *Le macchine celibi / The Bachelor Machines, catalogue La Biennale di Venezia*. Venice: Alfieri Edizioni d'Arte 1975, p. 49. Available online at: <http://www.scribd.com/doc/46775310/The-Bachelor-Machines> [cit. 12. 8. 2013].

a room apart from the other two. The object of the game for the interrogator is to determine which of the other two is the man and which is the woman.[31]

In the second round of the game, one player is replaced by a machine. Turing asks:

[...] "What will happen when a machine takes the part of A in this game?" Will the interrogator decide wrongly as often when the game is played like this as he does when the game is played between a man and a woman? These questions replace our original, "Can machines think?".[32]

However, it is not the rules for the players' actions that plays the crucial role in the experiment but rather the arrangement of Turing test's based on remote, mediated communication. Turing described this as follows:

[...] the answers should be written, or better still, typewritten. The ideal arrangement is to have a teleprinter communicating between the two rooms. Alternatively the questions and answers can be repeated by an intermediary. [...] The new problem has the advantage of drawing a fairly sharp line between the physical and the intellectual capacities of a man.[33]

The magic trick

Katherine N. Hayles has noted the importance of the setting in which Turing's imitation game takes place. She writes:

Like all good magic tricks, the test relies on getting you to accept at an early stage assumptions that will determine how you interpret what you see later. The important intervention comes not when you try to determine which is a man, the woman, or the machine. Rather, the important intervention comes much earlier, when the test puts you into a cybernetic system in which represented bodies are joined with enacted bodies through mutating and flexible machine interfaces.[34]

The Turing test was intended to serve as a means of eliminating the body from the definition of man. Thus it was possible to reduce man to an in-

---

[31] TURING, "Computing Machinery and Intelligence," p. 433.
[32] *Ibid.*, p. 433.
[33] *Ibid.*, p. 433.
[34] HAYLES, *How We Became Posthuman*, p. xiii.

formation processing system and intelligence to the "ability to manipulate formal symbols rather than enaction in the human life-world".[35] While in the first round, the game deals with the performativity of gender, in the second one, it deals with the performativity of intelligence. This way, Turing was able to make his audience/readers accept the comparison and the hypothetical intersubstitutability of a human's and a computational machine's intelligences. Hayles wrote that: "[I]n the push to achieve machines that can think, researchers performed again and again the erasure of embodiment at the heart of the Turing test."[36]

It is significant that Hayles highlighted the ritual and performative quality of the Turing test in the introductory chapter of her book *How We Became Posthuman*.[37] She saw in the imitation game "the inaugural moment of the computer age", for it erased the embodied experience from the model of human and established a close circuit of references between human and machine within a mediated environment. According to Hayles, the Turing test proved that:

> [T]he overlay between the enacted and the represented bodies is no longer a natural inevitably but a contingent production, mediated by technology that has become so entwined with the production of identity that it can no longer meaningfully be separated from the human subject.[38]

The Turing test's setting of mediated communication, as well as the transparent glass plates of *The Large Glass*, or the dissecting table in *Les Chants de Maldoror* are just different examples of the background which unites the mechanical and sexual components of bachelor machines to trigger their meaning production. It is as though the imitation game of the Turing test were taking place on the "dissecting table", where a man is divided into a body and a mind to be transposed onto the level of their symbolic representations. The magic trick of the Turing test allows a human or a machine to be judged by the interrogator on the basis of the communication established through symbolic exchange and on intellectual arguments only.

However, Turing learned first-hand during his judicial proceeding that neither a typewriter nor a computer interface could protect him if he breaks

---

[35] *Ibid.*, p. xi.
[36] *Ibid.*, p. xi.
[37] *Ibid.*
[38] *Ibid.*, p. xiii.

the laws of the society he lives in. The sentence for his "crime" was inscribed deep in his body by his hormonal treatment.

Alan, the Bachelor machine

Alan Mathison Turing was born on 23 June 1912 in London in the district of Paddington, and he died on 7 June 1954 in Winslow in Cheshire. He was an outstanding mathematician, logician, cryptanalyst, and computer scientist. His homosexuality resulted in a criminal prosecution against him in 1952, when homosexual acts were still illegal in the United Kingdom.[39] He was arrested, convicted of homosexuality, and put on trial for "acts of gross indecency" between adult men. To avoid imprisonment, Turing agreed to submit to a one-year course of oestrogen therapy. In other words, he underwent a chemical castration. The treatment caused gynecomastia as a side effect. However, the sentence he was subjected to also had other side effects. He was excluded from all government research projects owing to a loss of confidence in him and his unclean criminal record. Two years later, in 1954, he committed suicide by eating an apple laced with cyanide.[40]

Coming out of "the toy world"

The Turing test's magic power, which lies in its ability to change someone's identity (a man into a woman or a man into a machine) within the setting of the imitation game, was re-enacted by Duchamp and Turing them*selves* later when their work on their bachelor machines was done. In this sense, it was as though *The Large Glass* and the universal Turing machine were just blueprints or sketches for further embodiments of the invisible forces whose traces maps the bachelor machine diagram.

　　Subsequently, Marcel Duchamp playfully dealt with performativity of a gender identity on his famous transvestite photographs made by Man Ray, which show his alter ego Rrose Sélavy. Alan Turing wrote later on "On the Chemical Basis of Morphogenesis"[41], his prophetic contribution to the math-

---

[39] The law was not repealed until 1967.
[40] Turing's biographers, Hodges and Leavitt, suggested that Turin's death was the re-enactment of a scene from his favourite film *Snow White* (Walt Disney, 1937). Andrew HODGES, *Alan Turing: The Enigma of Intelligence*. London: Unwin 1985; David, LEAVITT, *The Man Who Knew Too Much: Alan Turing and the Invention of the Computer*. New York – London: W. W. Norton & Co. 2006.
[41] TURING, "On The Chemical Basis of Morphogenesis."

ematical biology. He wrote the paper at the same year when he underwent his judicial proceeding, which ended with condemnation to the hormonal treatment of his homosexuality.

Both, Duchamp and Turing, had undergone similar development in their interests from mechanic arrangements to organic matters. While Duchamp had focused on the optical effects, which can unsettle our faith into empirical experience, thus he remained on the surface of things. Turing's affair with the organic matter was much more deep-seated, for he not only contributed to the mathematical biology, but he underwent the substantial body transformation during the hormonal therapy, and he committed suicide just two years later.

Within these regrettable events, he underwent transformation from the male to female body, and from the life to the death. Turing made coming out of the toy world of representation (the metaphor fits the world of both art and mathematics) and entered into the embodied, physical experience of becoming someone else.

It can be said that Turing performed the perfect magic trick of the Turing test for it was not a trick or an illusion.[42] Unlike Duchamp, his transformation occurred, literally, within his own body. Thus, he should be recognized as not only the father of modern computing but also the first post-human, the "new mutant",[43] in the radical sense of the word.

Epilogue

Turing's mathematical hypotheses concerning the universal machine and the Turing test failed in practice. The personal tragedy of Alan Turing proved that the universal machine's axioms, its isolation and completeness, can work within the clean laboratory of theory only, but cannot be accomplished once the universal machine acquires material form, for example, the form of a personal computer, and becomes part of culture. However, we can say that Turing won the hypothetical competition between him and the other magician, Duchamp, in terms of the magic of transformation. Moreover, he became aware of the illusion of his conviction that scientific discourse evolves within the logic of scientific discourse. He feared that the sentence he had to face in his private life would affect the way his professional work is

---

[42] See the film *The Prestige* (2006).
[43] Leslie FIEDLER, "The New Mutants." In: *Collected Essays of Leslie Fiedler.* 2nd vol. New York: Stein and Day 1965, pp. 392–400. Available online at: <.http://www.texaschapbookpress.com/newmutants01.htm > [cit. 12. 8. 2013].

treated by scientific society. He expressed his apprehensions in a syllogism at the close of a letter to his friend Norman Routledge.

> Turing believes machines think
> Turing lies with men
> Therefore machines cannot think.
> Yours in distress,
> Alan[44]

Turing's contributions to computer science and his influence on disciplines like artificial intelligence and advanced robotics are enormous. However, his personal tragedy was not discussed in public for a long time. Not until 10 September 2009, when, following an internet campaign for Turing, British Prime Minister Gordon Brown made an official public apology on behalf of the British government for "the appalling way he was treated".

Meanwhile, Turing's chemically crippled body has worked like an archetype, in the deep layers of the discourse of computer culture, sublimated in Turing's writings, and interpreted as a logical slip.[45] Turing, the man, the numbers freak, the excellent (human) computer, was for a long time erased from the history of computing, and substituted by the universal machine, referred to in short, but significantly, as the Turing machine.

To add the universal machine to the list of bachelor machines is a gesture of transposition from the realm of mathematics to the realm of culture, from the realm of pure logic to the realm of self-expression. By treat the universal machine as the bachelor machine the unconscious, the sublimated "personal obsessions"[46] that cannot be excluded from the realm of science are made

---

[44] LEAVITT, *The Man Who Knew Too Much*, p. 5.

[45] Hodges interprets Turing's inclusion of gender in the imitation game of the Turing test as a "red herring". He wrote that the passage of the argument "was not expressed with perfect lucidity. The whole point of this game was that a successful imitation of a woman's responses by a man would not prove anything. Gender depended on facts which were not reducible to sequences of symbols." HODGES, *The Enigma of Intelligence*, p. 415.

[46] Curator Harald Szeemann revisited and expanded Carrouges' argument in 1975, when he organized exhibition inspired by Duchamp's The Large Glass entitled *The Bachelor Machines*. The exhibition belongs to the series of his exhibitions on personal obsessions. His attempt was to visualize the myth, thus he displayed fabricated full-scale models of different bachelor machines, including the torture and execution device, which Kafka described in *In the Penal Colony* at the exhibition. Szeemann interpreted the bachelor machine in a later interview: "It had to do with a belief in eternal energy flow as a way to avoid death, as an erotic of life: the bachelor as rebel-model, as antiprocreation." Hans OBRIST, *A Brief History of Curating*. Ostrava: Ringier Print 2008, p. 92–93.

visible. Paradoxically, from this point of view, the universal machine loses its uniqueness as the foundation of individual genius, and it becomes part of the many articulations of the bachelor machine myth. This way the universal machine becomes part of general cultural production and its significance penetrate far and deep into our culture.

////// tematická studie / thematic articles /////////////////////

PHILOSOPHICAL TOYS AS VECTORS FOR DIAGRAMMATIC CREATION: THE CASE OF *THE FRAGMENTED ORCHESTRA*

Abstract: *The central topic of this essay consists into establishing a relation between two dimensions of formation: the conceptual process of creating philosophical toys – that is of reelaborating existing philosophical concepts, mainly deriving from the thought of Gilles Deleuze and Félix Guattari, in terms of their potential as 'operative constructs' – and their parallel redeployment towards the specific problem of analyzing a recent transdisciplinary artwork (The Fragmented Orchestra by Jane Grant, John Matthias and Nick Ryan). By means of this strategical shift, theory looses its character of explanation and illustration. Philosophy as toy becomes rather the matter of evaluating the complexity of a specific artistic composition in terms of its aesthetic potential. It contributes towards developing metastable conditions of mutual resonance between heterogeneous modalities of creation.*

Keywords: *rigorous analogy, individuation, conjunctive synthesis, neuronal plasticity, art and aesthetics of sound creation*

Filosofické hračky jako vektory diagramatické tvorby: případ *Fragmentovaného orchestru*

Abstrakt: *Ústředním motivem této studie je ustavení vztahu mezi dvěma dimenzemi utváření: konceptuálního procesu vytváření filosofických hraček (tj. přepracování existujících filosofických pojmů s ohledem na jejich potenciál coby „operativních konstruktů", odvozeného zejm. z myšlení Gillesa Deleuze a Félixe Guattariho) a jejich současného využití pro analýzu nedávného transdisciplinárního uměleckého díla (Fragmentovaného orchestru Jane Grant, Johna Matthiase a Nicka Ryana). Díky tomuto strategickému posunu ztrácí teorie povahu vysvětlení a ilustrace. Filosofie se coby hračka naopak stává způsobem zhodnocení komplexity specifické umělecké kompozice z hlediska jejího estetického potenciálu. Přispívá k rozvoji metastabilních podmínek vzájemné rezonance mezi heterogenními modalitami tvorby.*

Klíčová slova: *rigorózní analogie; individuace; konjunktivní syntéza; neuronální plasticita; umění a estetika zvukové tvorby*

CLAUDIA MONGINI
Independent researcher Vienna // Austria
email / cmongini@gmx.at
url / www.claudiamongini.net

Claudia Mongini

„*How is it possible to come to massively produce a desire to create, a collective generosity, by means of the tenacity, the intelligence and the sensibility proper to arts and sciences.*"
Félix Guattari

"*The plasticity of time is inscribed in the brain.*"
Catherine Malabou

Introduction

This paper examines the role of philosophical concepts as vehicles for knowledge production in relation to an artwork which combines recent scientific (neurophysiological and physical) developments into the implementation of new sonic experiences (The *Fragmented Orchestra* by Jane Grant, John Matthias and Nick Ryan). The interest in this work arises from the fact that in it scientific, technical, sonic and visual *forms of experience* (and not only given results) *intrinsically* contribute to the emergence of a non-reductionist dimension of aesthetic expression. In this frame, the role of the philosophical concept as toy becomes that of examining the artworks along their complex compositional procedures, in order to extract and transpose the operative conditions of art towards more general questions concerning collective sensibility. That is if, as it will be shown, *The Fragmented Orchestra* creates the conditions for transposing a physical model[1] from the realm of neurophysiology towards the aesthetic one in terms of a procedure of de- and recomposition of sonic occasions, the task of philosophical tools will be that of transferring the operative field of scientifico-aesthetic construction proper to the artwork towards the aesthetico-political question of emergence of collective sensibility.

The method adopted here is what Muriel Combes following the thought of Gilbert Simondon defines as "rigorous analogy"[2]. Rigorous analogy dismisses both the use of visual and linguistic metaphors, as well as the structural transfer of logical conditions from one epistemic domain to another. It is a question of avoiding any form of reductionist similarity deriving from the transposition of elements of knowledge conceived as being „already

---

[1] Eugene IZHIKEVICH – Joe A. GALLY – Gerald M. EDELMAN. "Spike-Timing Dynamics of Neuronal Groups." *Cerebral Cortex*, vol. 14, 2004, pp. 933–944.
[2] Muriel COMBES, *Gilbert Simondon and the Philosophy of the Transindividual.* Cambridge, MA: MIT Press 2012, p. 10.

there" that is, independently from the study of their formation. Rather than transferring the whole logical structure of what is already known and taken for granted, the emphasis is set onto the problem of re-materialization of the *logical operations* pertaining to an established epistemological domain within the realm of a new productive dimension.

The idea of rigorous analogy is intimately related to the concept of individuation, which is understood as the operation leading towards the constitution of individuals, that is generic beings. What is significant to the current inquiry, is that individuation intimately relates the ontological operation of constitution of beings to the epistemological one concerning the creation of knowledge. The "rigour" of analogy derives explicitly from conceiving the relation between being and knowledge not in terms of their resultant conditions, i.e. the appearances they might take, but of the operations they are both traversing. According to this approach, analogy becomes a matter of "squaring",[3] that is of assigning another dimension of power to the *intensity* of the original discovery. Squaring emphasizes the fact, that it is not only the question of establishing a relation between different formations of knowledge and of beings, but that the relation has to be conceived in terms of a relation of relation: what gets transferred is not only a particular result deriving from specific procedures of knowledge production, but the structural logic determining the modality of individuation in a particular case. Furthermore, because of the tight relation between being and knowledge, the idea of squaring does not only refer to the relational character of a mathematical operation, but acquires the status of a "physical paradigm",[4] inasmuch as the operation allowing to extract the genetic conditions of emergence, is always bound to the *material conditions* determining the specificity of each case. Muriel Combes observes that the explicit reference to physics is "a matter of pinpointing the epistemological role"[5] played by the notion of the individual; that is, emphasis is set upon the tight relation between being in its material development, and the operative dimension of knowledge, which it comes both to acquire and to express.

Given these premises, I will proceed in the following way: first, I will *describe The Fragmented Orchestra* in terms of its aesthetic recomposition of physical and neurophysiological zones of intensity; I will subsequently introduce philosophical concepts such as disparation and individuation; next,

---

[3] *Ibid.,* p. 11.
[4] *Ibid.,* p. 12.
[5] *Ibid.,* p. 13.

I will relate the heterogeneous dimensions of the artwork and that of the concepts by means of the operative dimension of "rigorous analogy". Last, I will address the role of theoretical concepts as toys by examining the field of problematic tension unfolding between arts and science and philosophy, and addressing issues of epistemic creation and collective sensibility.

First Squaring: The "tiny brain" as a device of sonic de- and re-composition

The Fragmented Orchestra by Jane Grant, John Matthias and Nick Ryan, interrelates visual, scientific and sonic dimensions into complex patters of de- and re-composition.

These disparate aesthetic compounds are orchestrated together by means of transferring in the realm of aesthetics the operative conditions of a mathematical model currently implemented in brain research. This model[6], accounts for a quantitative description of the electrical activity of single neuronal cells in the brain area called cerebral cortex. This thin section comprising the outermost neuronal layers below the scull, function-ally accounts for the area where lower information deriving from specific internal components gets reshaped into the formation of wider and more complex patterns of association. It is the locus where sensory and motor information is combined and integrated with the cognitive processing of thinking and language. In more general terms, and this is important for the argumentative line which follows, the cerebral cortex accounts for the straightforward relation between levels of perceptual experience and pro-cesses of abstract composition.

By transposing the functional conditions of mathematics from brain sci-ence into the realm of art, *The Fragmented Orchestra* "squares" – in Muriel Combes terminology - the activity of small portions of the cerebral cortex: it artificially reconstructs their dynamics into sonic and visual aesthetic traits.

Significantly, the artificial reconstruction of a small part of cerebral cortex, is not a metaphor of the activity of the human brain. "Squaring" as will be shown, means here to reconstruct *another* cerebral cortex which *aesthetically* modulates and recombines specific levels of expressive and perceptual experience with forms of abstract reduction (the aesthetic action of the involved algorithm).

---

[6] IZHIKEVICH – GALLY – EDELMAN, "Spike-Timing Dynamics of Neuronal Groups."

The work was widely installed across UK between December 2008 and February 2009. It consisted of 24 fixed geographical locations, including FACT Gallery, Liverpool, University of Plymouth, Landscove Primary School, Devon, The National Portrait Gallery, London, Millennium Stadium, Cardiff and Kielder Observatory, Northumberland. At each of the locations, a 'soundbox' was installed, which consisted of a microphone, a small computer connected to the internet and a Feonic "drive", a device which transmits audio through resonating architectural surfaces.[7]

These sounds were transmitted across the internet and were microgranuled trough the activity of an artificially reconstructed 24 neuron "tiny cerebral cortex" situated in the FACT Gallery in Liverpool. The activity of the cortex was complexified by the introduction of two further computational elements responsible for the interconnection between the activity of single neurons and thus accounting for the creation of the patterns of association which the cerebral cortex is responsible for. Spatial delays in the information propagation between neurons were included, which cause a shift delay in the interconnection between sounds. The time-difference of the arrival of heterogeneous sounds to the "tiny cortex", was registered by another algorithmic component, the so called "Spike Timing dependent Plasticity" which accounts for a modulation of the connection strength between the single neurons, and thus for a reconfiguration of the whole sonic event without erasing the singular specificity of each sonic occasion related to one of the disparate locations. Furthermore, the activity of each artificial neuron dissolved the incoming sound into sound grains thus adding a further level of complexity to the whole design, but doing that trough subtle processes of dephasing and decomposition.

While in the gallery, "the audience, weaving their way through the space, was able to hear the live composition as a whole and listen to each of the sites individually"[8], the artificial brain also accounted for sending back from the gallery sounds to each of the sites scattered in the UK. The public in the gallery was thus not only invited to listen, but also to compose the work by moving through the space, and to take notice of the effects of this composition on an internet site which registered what was happening on each of the heterogeneous geographical places:

---

[7] Jane GRANT – John MATTHIAS, "Shifting Topographies: Sound and the Fragmented Orchestra." In: RUGG J. – CRAIG M. (eds.), *Spatialities: The Geographies of Art and Architecture*. Bristol: Intellect 2011, p. 50 (50–63).
[8] GRANT – MATTHIAS, "Shifting Topographies: Sound and the Fragmented Orchestra," p. 51.

The sounds of *The Fragmented Orchestra* will vary according to location; wind over Black Fell, inner city traffic, chanting from sports stadia and the chatter of migrating birds arriving for the winter will be combined with incidental and performed sounds from members of the public.[9]

The artificial cortex becomes a machine in terms which get close to the definition given by Deleuze and Guattari[10]: according to them machines are not to be confused with some predetermined structure, but they constitute the mechanisms for creating immanent and transformative relations within the realm of specific concrete constellations. In the case of the fragmented Orchestra, the machine consists in the connection between a layered spatio-temporal dimension which is on one side extended physically (across UK) but whose spatiality solely accounts for the transmission of a non predetermined sonic temporal sequence: "Occasionally, huge sonic 'waves' filled the gallery with sound, whilst at other times, smaller more discrete events occurred which had to be listened more intently."[11] This macroscopic cartography is further connected to the microscopic spatiotemporal patterns in the brain of the listeners/actors. There, the interplay between the spatial distribution of neurons and the evolution of their firings accounts (among other things), for the possibility of the formation of new neuronal junctions (synapses) from a different experience of sensation.

The machinic function of the artificial cortex, can be now understood more clearly within the realm of the complex relation between the macroscopic geographical dimension and the microphysics of brain activity of the listener. The "tiny cortex" relates the heterogeneic dimensions of disparate sounds and neuronal activity, but does this by means of a twofold disjunction. Grant and Matthias insist that the reconstructed brain cannot generate new sound but instead it is "the noise in the system [which] keeps the model buoyant and allows to self generate events from previous stimuli".[12] The oc-

[9] Jane GRANT – John MATTHIAS – Nick RYAN, "The Fragmented Orchestra – About the Project" [online]. 2008. Available at: <http://thefragmentedorchestra.com/about/> [cit. 31. 1. 2013].
[10] Gilles DELEUZE – Felix GUATTARI, *A Thousand Plateaus: Capitalism and Schizophrenia.* Minneapolis – London: University of Minnesota Press 1987, p. 510–511
[11] GRANT – MATTHIAS, "Shifting Topographies: Sound and the Fragmented Orchestra," p. 51.
[12] Ibid., p. 60. See also: Jane GRANT – John MATTHIAS – Tim HODGSON – Eduardo MIRANDA, "Hearing Thinking." *Lecture Notes in Computer Science*, vol. 5484, 2009, p. 237 (234–240); John MATTHIAS – Jane GRANT – Nick RYAN, "The Fragmented Orchestra." In: MIAH, A. (ed.), *Human Futures: Art in an Age of Uncertainty.* Liverpool: FACT – Liverpool University Press 2008, p. 73 (71–75).

currence of this endogenous activity is not a side effect but goes along with "the central artistic aim" of the project, which is "to affect the rupturing of the boundaries between the sensed and the action, removing the sensed and the sensory part of the "self".[13] This makes the "tiny cortex" a sonic instrument of its own, its sound being created by a mathematical modelling of the neurophysiological property of synaptic plasticity. The implementation of this property via mathematical algorithm, accounts for the fact that the microscopic sonic events produced by the firings of each neuron, are encouraged by the enhancement of a wider range of interneuronal connections.[14] That is, sonic events are on one side the expression of *singular* nervous cell activities but at the same time it is those accounting for the construction of interrelation patterns between neurons. And furthermore, the aesthetic significance of the tiny cortex arises as we have seen from a will to create sensory disconnections, and on the other side it is the machine relating geographically distant sounds and brain activities. What are the aesthetic and philosophical inferences of this artistic strategy? Can this machinic (definire) device be translated into an appropriate terminology in order to engage with the aesthetic (or aesthetico-political) question of emergence of collective sensibility?

I address these questions by introducing another artificial entity: the Simondonian and Deleuzian concepts of disparity and individuation. The idea is to open a problematic field between the aesthetic dimension of *The Fragmented Orchestra* and the conceptual lenses of philosophy. I will then show that when entering in relation with the artwork, the concepts become 'toys', inasmuch as they acquire the function of *clinical evaluation* of a work of art. This means that philosophy does not account for a judgement "in terms of transcendent or universal criteria",[15] but examines how the conditions of "formation of new blocks of sensation",[16] concur to the creation of a new aesthetic world (or, more specifically in this case, a new aesthetic brain). What is furthermore important to stress out, is that the "toy" does not exist as a pre-given entity since the beginning. Rather, it gets constructed

---

[13] GRANT – MATTHIAS – HODGSON – MIRANDA, "Hearing Thinking," p. 234.
[14] Daniel JONES – Jane GRANT – John MATTHIAS – Tim HODGSON – Nick RYAN – Nicholas OUTRAM "The Fragmented Orchestra." *Proceedings of the International Conference on New Interfaces for Musical Expression*, vol. 9, 2009, p. 299 (297–302).
[15] Daniel W. SMITH, "'A Life of Pure Immanence': Deleuze's 'Critique Et Clinique' Project." In: DELEUZE, G., *Essays Critical And Clinical.* Minneapolis – London: University of Minnesota Press 1997, p. liii (i-lvi).
[16] *Ibid.*, p. lii.

in the very process of operative tension *with* the aesthetic realm. Construction doesn't mean to "correct" or to change the intrinsic conceptual meaning of philosophical theories, which are de facto already at hand. At the contrary, it means to precisely investigate their movements, strategies and expressions of thought, and to inflect (i.e. differentially deviate) them towards the engagement with distant matters of concern. It means to create what Alberto Toscano defines as "a local resolution of disparation, the invention of a compatibility between heterogeneous domains and demands: an 'emergence produced by asymmetrical captures correlated in time'."[17]

Out of this perspective, it can be seen that *The Fragmented Orchestra* provides the perfectly matching "artistic matter" to the conceptual move I'm interested to follow. First, because it is in itself an expression of the necessity of combining elements of knowledge deriving form heterogeneous epistemologies (that is from physical, neurophysiological, musical and visual art problems), necessity which is reflected by the different backgrounds of the involved actors (the *artist* Jane Grant, the *physicist, musician and composer* John Matthias, and the *composer* Nick Ryan).[18] Second and more significantly, because it has brilliantly resolved the tension between the heterogeneities at stake (in the creation of the "tiny brain", to resume it in synthesis).[19]

The question that now opens up, is how the "tiny cortex" qua resolved artistic disparation, can enact further fields of problematic tension, that is to produce the conditions for other problematic fields between heterogeneous entities to emerge. In order to address this issue, I introduce the philosophical concepts relevant to this realm, in terms of a brief geneaological introduction and an analysis of their unfoldings in the thought of Simondon and Deleuze. Disparity and individuation are relevant inasmuch they constitute the conceptual entities enabling to state the issue of problematic tension from a theoretical point of view.

[17] Alberto TOSCANO, *The Theatre of Production: Philosophy and Individuation Between Kant and Deleuze.* Basingstroke: Palgrave Macmillan 2006, p. 149.
[18] MATTHIAS – GRANT – RYAN, "The Fragmented Orchestra – About the Project."
[19] In this regard it is significant to note that the *Fragmented Orchestra* was awarded with the PRS Foundation New Music Award Prize, recognition being "the most financially prestigious for new music in the UK and [having] been likened to the Turner Prize for music." (MATTHIAS – GRANT – RYAN, "The Fragmented Orchestra – About the Project]). However it is symptomatic that despite this prestigious recognition there is barely any theoretical essays engaging with it. This is related to the fact that more traditional (art) theory approaches are unable to grasp the fundamental heterogeneity at the basis of the work.

Philosophical concepts: The emergence of dramatization.

The concept of disparity was coined by the French Epistemologist Gilbert Simondon in the late fifties. Simondon has used this term in order to indicate the tension between different energetic levels as the motor leading towards, what he calls, a process of individuation. The concept of individuation is introduced in order to describe the active element in the emergence and becoming of an individual entity. It opens an important philosophical shift: the individual (i.e. the being, any kind of individuated entity), is taken under consideration not from the point of view of its full constitution, but from its *genesis*. And even more important, the genesis is not inquired from a move a posteriori that is, moving from the perspective of an already constituted individual towards the inquiry of its genetic becoming. Rather, individuation describes the process of becoming individual *as such*.

To set the focus onto a process, onto something that necessarily entails a level of indeterminacy, does not mean that the content becomes vague. Quite the contrary. Simondon's inquiry regards the determination of precise conditions which are both generative of the process and allow for its sustainability. Brian Massumi[20] calls them "enabling constraints". Enabling constraints can be seen as juncture knots in order to allow for the onset of processes of *metastable resonance*. Processes of resonance, Simondon explains, significantly involve an exchange between already constituted beings, but within a systematics which is not yet fully individuated. The yet individuated part accounts for the ability and the means to produce the exchange, the not yet individuated part, constitutes the "elbow room" which gives space for the occurrence of novelty, that is, allows for the emergence of information which has not yet come to constitution. The dimension of indetermination allowing both for the openness, but also for the potential of novelty, constitutes the dimension of *metastability*. Thinking in terms of resonant metastability within the specifics of this field allows to open a space for both science and arts to be grasped in the dimension of their operative emergence.

It was Gilles Deleuze who rapidly picked up Simondon's notion of disparity and individuation. The fifth chapter of his 1968 ontological treatise "Difference and Repetition", starts with the concept of disparity borrowed from Simondon. In the reading proposed by Deleuze, disparation does not only connect to different energetic levels but also to the Leibnizian theory of

---

[20] Brian MASSUMI, *Semblance and Event: Activist Philosophy and the Occurrent Arts.* Cambridge, MA: MIT Press 2011, p. 115.

297

differential calculus. Significantly, this move allows for the inclusion of the *abstract* operative dimension of variables.

Disparation in Deleuze's understanding stands for an infinitesimal difference of intensity. It is conceived as a "difference operator" enacting both the occurrence of visible phenomena and the production of its complex surrounding relations. It is this operational shift, what allows individuation to become performative.

Deleuze understands this performative moment in terms of "dramatization". It is at the level of infinity, Deleuze explains, that the *intensity* of disparity becomes indistinguishable from its *extensity* i.e. from its more proper physical and sensuous qualities. It is in this way that heterogeneous elements are not only able to emerge, but also to acquire a *performative* character, as its very constitution accounts at the same time for the creation of new relations, of new channels of deep communication. In other terms: the metastable resonance between different entities, does not only open for new levels of communication, but lies at the very onset of their conditions of creation. Here is where the onset of the *transductive* condition starts: it accounts for the *actualization,* (the becoming real) of the relation between conditions of creation and modes of metastable communication. In other terms: the "rigorous analogy" introduced above, can now be defined more precisely in terms of intertwining differential processes which involve both microsteps of genetic construction and transmission towards another epistemic dimension.

"Dramatization", in Deleuze's conception, does not only express an ontological condition, i.e. a condition of how being and becoming is understood, but entails also a *pragmatic* aspect, as it can be seen as a „method" defining different modalities of producing a surface of sense.

Two aspects of dramatization are important for the development of the current argument.

1) It contributes to change the idea of how knowledge is understood and how it gets produced. "Knowledge" in its widest "scientific, artistic and philosophical" dimension is understood here "as a comprehensive 'sensing'"[21] and not as being limited to human cognitive processes. This wide perspective changes its definitions and its generative conditions: knowledge is primarily not defined as an act of recognition, which would involve a cognitive act of recalling something which was already preconceived, neither

---

[21] Christoph BRUNNER, "Slow Practices 11 Theses." In: SCHIESSER, G. – BRUNNER, C. (eds.) *Practices of Experimentation*. Zürich: Zürich University of the Arts 2012, p. 59 (58–69).

as the production of linguistic analogies or visual metaphors, but in terms of *problematization*. A problem is always bound to a field in which it can be stated, where the means to 'solve' it can be assessed, and where also its solutions can be found. Moreover, a problem derives from a compulsion to create. Parafrasing Isabelle Stengers, "You create (knowlegde) when you are forced or obliged to create. You do not create without a 'cause'."[22] Here "cause" is not understood in terms of a linear relation to an effect, but as an indeterminate connection to a broader dimension of sensibility, to an affective "territory". This territory is shaped by the occurrence of intensive encounters. Encounters can be of any kind: "What is encountered may be Socrates, a temple or a demon. It may be grasped in a range of affective tones: wonder, love, hatred, suffering. In whichever tone, its primary characteristic is that it can be only *sensed*."[23] Sensation is primary inasmuch as it creates the *necessity* to engage.

2) It accounts for the creation of *transversal relations* between different modes of creation scientific, artistic or philosophical. Transversal relations are expressive of the *pragmatic* unfoldings of the tension between intensities and extensities which Deleuze conceived to be the core of the movement of "dramatization". Trasversal relations involve the ability to perceive, to engage into and to create *different spatio-temporal modalities*. It is the differential relation in space- time conditions, which is constitutive of the intensity contributing to demarcate the specificity of each aesthetic or philosophical problem. Thinking in these terms, not only allows to better understand the specific conditions involved in each situation, but creates also means to find ruptures into consolidated patterns, and to allow for processes of epistemic transduction to happen.

The concatenation of a series of disparate zones of intensities and extensities lies at the basis of what Deleuze in his book on Michel Foucault,[24] understands as *the diagram qua concept*. Other than the visualization technique depicting a relational exchange between different entities, scales or points, constituting the common definition of the diagram, the conceptual term has a double role, that of a tendency and that of agency. The aspect

---

[22] *Cf.* Isabelle STENGERS, "Introductory Notes on an Ecology of Practices." *Cultural Studies Review*, vol. 11, 2005, no. 1, p. 191 (183–196).

[23] Gilles DELEUZE, *Difference and* Repetition. Columbia: Columbia University Press 1995, p. 139 [emphasis mine].

[24] Gilles DELEUZE, *Foucault.* London – New York: Continuum 2006.

of tendency refers on the connection between "yet unrealized potentials",[25] that is to the connection between the intensities at the core of the process of dramatization described before. The diagram as agency,[26] refers instead to the *actualisation* of the abstract spatiotemporal modalities in terms of relations between forces and affects, which are always intended to be concrete and singular inasmuch as they emerge within a specific dimension.

In what follows, I will discuss the modalities of diagrammatic agency in relation to the specific *case* of *The Fragmented Orchestra*. Furthermore, I will extend the notion of diagrammatic agency towards that of vectorial translation, i.e. take into account the possibility to translate the affective potential of the work of art towards new dimensions of inquiry.

Diagrammatic agency: neuronal plasticity and the physics of sounds

The aim of this section is to address the question of the endogenous plasticity of the "tiny cortex" posed at the end of section two, through the philosophical toy as diagram which has been discussed in the third part of the current article.

As already stated, the plasticity of the "tiny cortex" accounts for a complex relation between disparate sounds and brains. On one side it creates a precarious relation between sounds and brain activities at distance between each other. On the other it needs to cut out the connection with external sensory paths, in order to endorse mechanisms of self generation. In order to understand these operations, I will explore the *physical basis of sound creation* which accounts for an analogical translation (in Combes "rigorous" understanding) of the concept of plasticity from the realm of neuroscience to that of music. The plastic action of sound creation is ensured by the activity of the neurogranular sampler,[27] the algorithm at the basis of the artificial neuronal activity.

In his book Sound Ideas, Music, Machines and experience Aden Evens describes the underlying conceptual methodology, defined as granular synthesis. "Granular synthesis approaches sound as very short chunks, or grains. One creates a sound by composing these brief grains, each of which is

---

[25] Christoph BRUNNER, "Diagramm." *Einunddreissig. Das Magazin des Instituts für Theorie*, vol. 16–17, 2011, p. 64 (63–65).

[26] Eric ALLIEZ, "Diagrammatic Agency Versus Aesthetic Regime of Contemporary Art: Ernesto's Neto's Anti-Leviethan." *Deleuze Studies - The Smooth and the Striated*, vol. 6, 2012, no. 1, p. 10 (6–26).

[27] GRANT – MATTHIAS – HODGSON – MIRANDA, "Hearing Thinking," p. 235.

a *slice of sound* that endures between two and two hundred milliseconds."[28] Significantly, the scale of each grain is treated separately from that of the whole sound by the assignment of a separate set of parameters. Because of this complex division granular synthesis allows to precisely modulate tiniest sonic variations: it is not only the variation itself but also the variability of the variation, which is taken into account. And from a sonic point of view, "variable variation most effectively simulates *real-world sounds and instruments*".[29] That is, the endogenous plasticity of the artificial cortex reconstructs the material reality of the geographically sparse sounds by modulating them through another endogenous materiality, that of the neurogranular sampler, and at the same time connecting them to the plastic material connections in the brains of the listeners. Through the modulation of the variability of noise, the granular synthesis comes to transform the "stasis and consistency of an exact and determinate quantity"[30] which determines "the formal sterility of the digital" and as such to recreate "the rich depth of reality", i.e. the *haecceity of singularity*. Evens explains that actuality, differently than the digital,

> is not the sum of elemental facts [...], but includes essentially a force of productivity that sets in motion. What the digital misses, therefore, is not so much what falls between its thresholds, but the creative power of the actual, that will always defy fixed or static representation. This missing haeccity is not a further difference, not something about the object that gets missed, for any such thing about the object is amenable to digital capture. It is rather a productive difference, a not yet-determined, an ontological fuzziness inherent to the actuality itself.[31]

In the same way than the theoretical "basic unit" of disparity, can lead to a process of individuation only if set in metastable resonance with a wider collective domain, the elementary unit of artificial sound is not distinct and disconnected. The grain is not single but related to "graininess", "a matter of envelopes, layers, densities, variations and the relations among elementary grains"[32]. Furthermore, the activity at the infinitesimal level of the grain is only the minimal step, which influences upper levels of magnitude. At the

[28] Aden Evens, *Sound Ideas: Music, Machines, and Experience*. Minnesota: University of Minnesota Press 2005, p. 106.
[29] *Ibid*., p. 110 [emphasis mine].
[30] *Ibid*., p. 70.
[31] *Ibid*., p. 70–71.
[32] *Ibid*., p. 116–117.

stage of the artificial neuronal activity of the "tiny cortex", the graininess is reflected in a complex correlation between the *rhythmic* (and not random) activity of a single neuron, whose rhythmicity gets complexified ('polychro- nized') by the action of a certain surrounding group of neurons in a pattern of mutual reinforcement between the activity of the single cell and that of the group.[33]

Understanding the "tiny cortex" not only from its connective qualities, but also from the "friction" of its graininess, requires the introduction of a parallel "curettage" at the theoretical level: that is, to take into account the "break" produced by the encounter between Deleuze's philosophy with Félix Guattari's cartographic compositions. "Their collaboration," Stephen Zepke explains, "allowed Deleuze to find what he felt was missing in his own work, an engagement with real [aesthetico-]political processes".[34] To conceive theory in terms of pragmatic engagement with real frictions, re- quires a shift in perspective: the question at stake is not only how concepts get *dramatized* into different methodical configurations (i.e., into the possi- bility to conceive and to express transversal relations between heterocronic dimensions), but also how they become *actualized* into the specificity of an artistic creation (*The Fragmented Orchestra* in this case). It is at this pragmatic stage, that concepts become "toys", or "operative constructs" as Isabelle Stengers puts it. "Operative constructs" are a "matter of effec- tuation", and not of "explanation and illustration",[35] inasmuch as they deal with the specifics of the creation of an assemblage, i.e. of a partial territory which has to be yet both discovered and produced. Eric Alliez resumes this strategical move from the construction of philosophical concepts, towards the onset of a theory-practice of experimentation, into what he calls the "Guattari-Deleuze effect".[36]

---

[33] See JONES – GRANT – MATTHIAS – HODGSON – RYAN – OUTRAM, "The Fragmented Orchestra," p. 298.

[34] Stephen ZEPKE, "Eco-Aesthetics: Beyond Structure in the Work of Robert Smithson, Gilles Deleuze and Félix Guattari." In: HERZOGENRATH, B. (ed.), Deleuze/Guattari & Ecology. Basingstroke: Palgrave Macmillan 2009, p. 200 (200–216). Deleuze and Guattari met in 1968, the year in which *Difference and Repetition* was first published. Their first book written together was *Anti-Oedipus: Capitalism and Schizofrenia I,* first published in 1972.

[35] Isabelle STENGERS, "Relaying a War Machine?" In: ALLIEZ, E. – GOFFEY, A. (eds.), *The Guattari Effect*. London – New York: Continuum 2011, p. 141 (134–155).

[36] Eric ALLIEZ, "Conclusion: The Guattari-Deleuze Effect." In: ALLIEZ – GOFFEY (eds.), *The Guattari Effect*, pp. 260–274.

Becoming toy: the aesthetic individuation of *The Fragmented Orchestra*

Getting back to the realm of the "tiny cortex", the Deleuzo-Guattarian (or Guattaro-Deleuzian) "toys" in their very process of becoming individuated, allow us now to explore specific "spatio-temporal individuations *in* and *as* the world".[37] That is, they allow us to investigate how *The Fragmented Orchestra* recreates the relations between neuronal firings and registers the conditions for them to be experienced both onto an aesthetic and onto an artistic level.

Rhythm, the authors of a *Thousand Plateaus* state, is there where there is a transcoded passage "between that which is constructed and that what grows naturally, between mutations from the inorganic to the organic [...] yet without that series constituting a progression".[38] This transcoded passage between, is what the 'tiny cortex' intrinsically enacts by connecting heterogeneous disparities (the recorded sounds and the activity of the brain cells of the listeners), and endogenously constructs through the synthetic properties of noise. Given the excursus about the material basis of sonic generation, I intend now to get closer to the "paradox" of the transcoding mechanism of the "tiny cortex", i.e. to the assertion that the sonic development in the neurogranular sampler can *only* develop endogenously, i.e. by blockage of external sensory paths which on the other side constitute its necessary source.

We are here in front of a machinic device whose operational input (i.e. its feed) is characterized by a connective synthesis between distant singularities; at the same time it necessitates the disjunction from its sources, in order to produce the desired sonic events. Knowing from the *Anti-Oedipus* that the "equation" relating connection and disjunction leads to the definition of conjunction,[39] I want to pursue the current inquiry by asking under which conditions the synthesis of conjunction which Deleuze and Guattari refer to in their description of the forces constitutive of a process of subjectivation, could be transposed to the realm of an artificial device, whose "sense" is that of creating sonic events out of the tension between heterogeneus disparities pertaining to the collective realm of non-linguistic forms of expression.

---

[37] Stephen ZEPKE, "Becoming a Citizen of the World: Deleuze Between Allan Kaprow and Adrian Piper." In: CULL, L. (ed.), *Deleuze and Performance*. Edinburgh: Edinburgh University Press 2009, p. 112 (109–125), [emphasis, mine].
[38] DELEUZE – GUATTARI, *A Thousand Plateaus: Capitalism and Schizophrenia,* p. 313.
[39] Gilles DELEUZE – Felix GUATTARI, *Anti-Oedipus: Capitalism and Schizophrenia.* New York: Penguin Books 2009, p. 36–41.

In the *Antio-edipus*, the connective synthesis of production is the "pre-subjective or transsubjective" stage,[40] inasmuch as it solely produces relations between the heterogeneous singularities of Kleinian "partial objects". It does not involve any cognitive stage, but operates mechanically by the action of basic Freudian drives. The disjunctive synthesis of recording is "estranging" in the sense that it is regulated by anti-productive mechanisms, acting as blockers towards the unleash of connective relations. "The effect of anti-production on the connective syntheses then, is to desexualize desire [...], and thereby constitute a surface that *records* networks of relations among connections, instead of producing connections themselves."[41] Disjunction induces repression, but constitutes also the mechanism for potential free-dom inasmuch as it registers the conditions of productive connections and allows a multiplication and a diversification of the relations between them; it accounts for the psychic ability of registering singularities and forming chains.[42] It is in the third stage, the conjunctive synthesis, that newly re-activated productive connections of desire, are attracted to the recording surface of disjunctive points, and enact "an entire network of new synthe-ses"; the points on the disjuncted grid become loci of intensities and enact possible paths of becoming. It is only with conjunctive synthesis, that " "a" subject – or rather "some" subjectivity"[43] can be discerned. Importantly, the subject of the conjunctive synthesis has nothing to do with a fixed identity, inasmuch as this precarious and transitory stage "is a *product* of its experi-ences, rather than being their ground or their precondition"[44]. The subject emerging from experiences,

> extracts "a residual share" of their content as a sort of "recompense" for its perpetual dispossession, [thus becoming] [...] a *supplement*, a marginal epi-phenomenon, a "mere residuum." It is "a spare part adjacent to the machine," a byproduct of processes that both precede it and go beyond it. [...] And yet, there is something splendid and glorious about the subject of the conjunctive synthesis – despite its marginality and its transience. For it lives an "experience of intensive quantities in their pure state, to a point that is almost unbearable

---

[40] Steven SHAVIRO, *The Third (Conjunctive) Synthesis* [online]. 2008. Available at: <http://www.shaviro.com/Blog/?p=648> [cit. 31. 1. 2013].

[41] Eugene W. HOLLAND, *Deleuze and Guattari's Anti-Oedipus: Introduction to Schizoanalysis.* London – New York: Routledge 1999, p. 28 [emphasis, mine].

[42] Felix GUATTARI – Gilles DELEUZE, "The First Positive Task of Schizoanalysis." In: GENOSKO, G. (ed.) *The Guattari Reader.* New York – Oxford: Wiley-Blackwell 1996, p. 92.

[43] HOLLAND, *Deleuze and Guattari's Anti-Oedipus: Introduction to Schizoanalysis,* p. 36.

[44] SHAVIRO, "The Third (Conjunctive) Synthesis."

– a celibate misery and glory experienced to the fullest, like a cry suspended between life and death, an intense feeling of transition, states of pure, naked intensity stripped of all shape and form." In other words, it lives a purely *aesthetic* condition.[45]

It is by a procedure of conceptual extraction of the *operations* at the basis of the Antioedipal production of subjectivity*,* and their recomposition into the realm of an artificial process of creation of sounds, that we can now start to appreciate the "tiny cortex" from its aesthetic dimension: its 'machinic function' sets the conditions for pure encounters between heterogeneous sonic dimensions and their (artificial) neurophysiological substrates of capture and elaboration. The basic material procedure of decomposing heterogeneous sounds into their graininess, reduces on one side the sound to its minimal conditions and in so doing, allows to lie bare (and thus to perceive) its qualitative properties such as density and variation. This means that what gets transmitted, is not only the re-composition of disparate heterogeneous sounds but also a "residual share", of the original experience determining the conditions of sonic production.

What the wired and wireless internet connections are conveying from the fragmented geography of sparse sites to the ear/brains of receivers, is not solely a composite sonic sequence out of sparse singular happenings, but also the *intensity* of the differential relations between the sounds. The "paradox" of the artificial conjunction lies in the *subtraction* intrinsic in the materiality and process of graininess. Subtraction which produces *both* the detachment from the sonic origins *and* accounts for the creation of new tones. It is in the realm of this double articulation that the heterogeneous sonic elements get interlaced into the dynamics of a "stronger synthesis". Deleuze and Guattari explain:

> It is clear that what is necessary to make sound travel, and to travel around sound, is very pure and simple sound, an emission or wave without harmonics [...]. The more rarefied the atmosphere, the more disparate elements you will find. Your synthesis of disparate elements will all be the *stronger* if you proceed with a sober gesture, an act of consistency, capture or extraction that works in a material that is no longer meager but prodigiously simplified, creatively limited, selected. For there is no imagination outside of technique.[46]

---

[45] *Ibid*.
[46] DELEUZE – GUATTARI, *A Thousand Plateaus,* p. 344–345.

Claudia Mongini

The *technical* construction of the "tiny cortex", is what shapes the overall aesthetic (and artistic) dimension *of The Fragmented Orchestra.* The algorithmic modelization of its basic elements, the grains, allows for the creation of "time patterns and rhythms", which on one side reproduce the 'internal' neurological rhythms, as they derive from the implementation of a mathematical model simulating neurophysiological activity in the brain[47]. The 'effect' of this reconstruction which follows certain neurophysiological paths of the brain (that of the cerebral cortex) in a deep and precise way but nonetheless does it *artificially,* is that of an estrangement: the "'internal' neurological rhythms", which the granular synthesis reshapes, "appear unfamiliar to us"[48]. This is because the granular element acts as a threshold and thus introduces a new "sensual boundary: below a duration of around twenty milliseconds, all sounds are perceived as 'clicks' and it is impossible for us to distinguish the frequencies of the sound sources".[49]

The granulation thus produces a new sonic event which in its very act of becoming, "circumvents any 'motor' action, which we would expect to oc-cur in a real brain/body in which a sense precedes processing which causes action".[50] It does it by extracting, through a process of subtraction, both from the brain/body physiology and from the sounds in nature the "rare-fied atmosphere" which Deleuze and Guattari conceive as being necessary in order to reorganize the sonico-physiological material into a novel 'plane' of consistency. The very moment in which the motor action is prevented on a physiological level (in the body/brain of the listeners), is also that in which it gets artificially extended in the processing of the 'tiny cortex' *itself.* It is the schizo-event of 'cutting' certain physiological spatiotemporal-conditions and 'pasting' them as a process of construction of a distant and 'neutral' nervous system, which allows for the re-configuration of the sensual input on a wider level. Out of this perspective, the "tiny cortex" constitutes a basis for a "strong synthesis" of the disparate, basis which is both material (it con-sists into the activity of a portion of artificially reconstructed cortex) and immaterial (the artificial neurons are not bound to any "real" physiological process) and whose degree of consistency is determined by extraction and creative selection of and from its sources.

[47] IZHIKEVICH – GALLY – EDELMAN, "Spike-Timing Dynamics of Neuronal Groups."
[48] GRANT – MATTHIAS, "Shifting Topographies: Sound and the Fragmented Orchestra," p. 57.
[49] *Ibid.*
[50] *Ibid*., p. 58.

How do all these technical considerations, concerning the materiality and the artificiality (i.e. the formation) of *The Fragmented Orchestra,* concur towards a (possible) grasping of its aesthetic and artistic value? The process of composition between heterogeneities which gets synthesized into the sonic event and subsequently rearranged into the formation of neurophysiological states, fits into the realm of the Whitehedian "aesthetics of the Beautiful"[51], i.e. an aesthetics in which the "production of the new" does not arise from a gesture of overcoming (the real), but instead emerges out of a transformation of existing heterogeneous forms of expression towards the constitution of novel singularities.[52] Stephen Shaviro emphasizes the importance of this understanding of aesthetics in terms of a (political) "act of resistance"[53]. If practices of "sampling, recombination and reappropriation"[54] do constitute a common generality in contemporary capitalist culture, the aesthetic concern becomes that of redirecting the "logic" of these practices towards the "novelty" of beauty. *Because* novelty and beauty are currently abused and misused in such a heavy and omnipresent manner, it becomes all the more important to evaluate them according to their enabling potential towards generating what Whitehead understands as a "creative event".[55]

Whitehead defines beauty as "the mutual adaptation of the several factors in an occasion of experience";[56] adaptation is never happening casually, but "implies an end", an aim which emerges in the process of adaptation itself. The aim does not predetermine experience but rather constitutes its consequence. This perspective, Shaviro states, "is what opens the doors to novelty. Every achievement of unity is something that has never existed before: something different, something radically new".[57] Novelty arises when multiple entities reach the level of unity, a unity which is never permanent, but only in "continual transition". The fact that novelty cannot be deter-

---

[51] Steven SHAVIRO, *Without Criteria: Kant, Whitehead, Deleuze, and Aesthetics.* Cambridge, MA: MIT Press 2009, p. 151. In this regard it is relevant to note that Shaviro's argumentative line towards this idea of aesthetics, unfolds through the development of the three Antioedipal syntheses explained before. This, he states, is the crucial moment in which Deleuze and Guattari encounter Marx and, indirectly, Whitehead (p. 125–127).

[52] Alfred N. WHITEHEAD, *Process and Reality (Gifford Lectures Delivered in the University of Edinburgh During the Session 1927-28).* Detroit: Free Press 1979, p. 21.

[53] This definition originates from Gilles DELEUZE, *Two Regimes of Madness: Texts and Interviews 1975–1995.* Cambridge, MA: Semiotext(e) 2007, p. 317.

[54] SHAVIRO, *Without Criteria,* p. 171.

[55] Ibid., p. 154–157.

[56] Alfred N. WHITEHEAD, *Adventures of Ideas.* Detroit: Free Press,1967, p. 252.

[57] SHAVIRO, *Without Criteria,* p. 73.

mined in terms of a particularity which establishes it, doesn't mean that it is boundless; Whitehead's whole ontology 'grounds' in creativity. "Creativity is an ultimate principle and a universal ground, only because – and precisely because – it is featureless and neutral, entirely without a character of its own".[58] Because of its generic neutrality this ultimate principle cannot be determined by any "metaphysical authorization", or by an "ethical imperative"; instead it requires aesthetic constraints. By drawing a relation between the philosophies of Kant and Whitehead, Shaviro proposes to elaborate a "constructivist account of the conditions of receptivity, or sensibility"[59]; that is, he identifies aesthetic constraints as the necessary conditions which account for the production of novelty.

From this brief outline, we understand that the beauty of *The Fragmented Orchestra* can be grasped in the aesthetic process of constructing the generic "tiny cortex". That is, in the operation of redirecting sounds, perceptions, neuronal activity pertaining to specific subjects or objects towards a level of impersonal and therefore indifferent 'grounding'. This is a gesture that affirms the "ubiquity of creativity",[60] i.e. that creation can come from any kind of human and non-human sources (or resources). It is this ubiquity that accounts for the emergence of beauty in a potential state, I.e it demarcates a general compatibility for integration, without yet producing the act of integration itself.[61]

With the ideas of novelty and beauty, Whitehead provides the enabling conceptual means by which the question of the consistency necessary for synthesizing the disparate can be framed onto an aesthetic level. Because these notions derive from the affirmation of creativity in its widest understanding, they "respond to the singularity of every occasion of experience".[62] From this point of view, the procedure of sonic extraction by granular synthesis is a novel reconfiguration of diverse peripheral sounds in distant relation with accidental listeners.

What remains to be discussed now, is how to frame *The Fragmented Orchestra* from its artistic side. That is, how the Whiteheadian concepts of novelty and beauty can be understood in their actualization within the specificity of the "process of production" enacted by the artwork. I will proceed with the question of how the sonic production under consideration can

[58] *Ibid*., p. 150.
[59] *Ibid*., p. 51.
[60] *Ibid*., p. 158.
[61] *Ibid*., p. 73.
[62] *Ibid*., p. 150.

be thought in terms of transforming the "residual share" emerging out of the third conjunctive synthesis into the pragmatics of a collective enunciation in the realm of art. Enunciation is here understood in terms of the definition that Félix Guattari gave in his last book *Chaosmosis*; as the emergence of a collective "logic of non-discursive intensities"[63], i.e. the valorization of all "pre-personal, polyphonic, collective and machinic"[64] modes of production, which are currently kept suppressed by the semiotic one. It is by the inclusion of this complex and rich tissue of singularities within the realm of theory, that the "novelty" characterizing the sonic event of *The Fragmented Orchestra,* can be grasped conceptually.

Second Squaring: art as a process of collective synaptogenesis

In the previous paragraph I have introduced the Whitehedian notion of beauty in terms of a conceptual definition. The question to be addressed now, is how beauty gets constructed within the realm of the constraints relative to the artwork under consideration. Otherwise stated, how the heterogeneous "occasions of experience", are adapted into the formation of the artistic "object".

The first problematic issue in this regard, is that although *The Fragmented Orchestra*, "covered a vast area of physical space", the 'object' did not exist as such. Grant and Matthias clarify:

> Whilst there were 24 connected sites and a central exhibition area, the real 'space' of the work was in the connectivity of the sites, the in between, in the temporal firing events of the work. All that was evident regarding the materials of the work were speakers, 'soundboxes', wires, microphones, and a central "listening space".[65]

Given these conditions, the question arises, why the distinction between art and aesthetics should still be maintained. In "art and experience", John Dewey[66] has defined as *artistic* the moment of the making of art, and as *aesthetic* its perceptual potential, i.e. the experience that one can make out of it. Given the complex system of feedbacks between sonic inputs and the reac-

---

[63] Felix GUATTARI, *Chaosmosis: An Ethico-Aesthetic Paradigm.* Bloomington: Indiana University Press 1995, p. 22.
[64] *Ibid.*, p. 21.
[65] GRANT – MATTHIAS, "Shifting Topographies," p. 55–56.
[66] John DEWEY, *Art as Experience.* New York: Perigee Trade 2005, p. 162.

tions of the listeners, it is clear that *The Fragmented Orchestra* has blurred these categories from their very roots. The reason why I nonetheless propose to make use of these concepts, is because I want to question them in terms of their relation in-between. That is, I want to understand them as operative constraints along the definition given by Stengers, and ask about how they can be reshaped by the conditions set by the artwork. First of all, the current artistic frame accounts for the necessity of redefining the "artistic object" in terms of a fragmentary complexity without specific locality.

In order to address the issue of grasping the non local dynamics from an artistic point of view, I follow Stephen Zepke's thesis, according to which Félix Guattari "remakes" the Duchampian readymade by fragmenting art into "polyphonic" and "multiplicatory" *processes* of individuation. Guattari, Zepke argues, has transposed the Duchampian 'nominalist' paradigm – according to which everyone is able to *consciously decide* about what is to be considered art – in the realm of an aesthetic paradigm "that does not efface art but marks its renewed relevance within contemporary life".[67] The Duchampian aesthetic decision, generic inasmuch as it could come from any *rational* being, is transposed into the indifference of a proto-aesthetic[68] – realm; the semiotic act of speaking out a decision gets translated into an "event of enunciation" which includes a wider range of human and non-human modalities of expression.[69] Zepke exemplifies the shift from the readymade as

---

[67] ZEPKE, "Becoming a Citizen of the World," p. 112.

[68] The term protoaesthetic is an expression by Guattari, by which he intends to emphasise that his focus does not lie on "institutionalized art, to its works manifested in the social field, but to a dimension of creation in a nascent state, perpetually in advance of itself". GUATTARI, *Chaosmosis*, p. 102.

[69] Zepke's argument is that Guattari's reading turns the Duchampian "conceptual readymade" into an "affectual readymade". The parallel examination of Duchamp's *oeuvre* with the work of the Russian literary critic Mikhail Bakhtin, allowed Guattari to revalue aesthetically not the object itself but the involved creative act. With this move, Guattari kept from Duchamp the desideratum of an 'aesthetics of indifference', unbounded from a specific actor, skill or taste. On the other, he strongly rejected the mental operation of consciousness at the basis of the readymade as "object" (the "nominalism" by which art gets valued). See ZEPKE, "Becoming a Citizen of the World." Out of this argumentative line Zepke has begun to retrace the conditions for an alternative geology of contemporary art, along the work of John Cage, Allan Kaprow, Robert Smithson, and Adrian Piper, as well as articulating its political potential (see Stephen ZEPKE, "From Aestehtic Autonomy to Autonomist Aesthetics: Art and Life in Guattari." In: *The Guattari Effect*, pp. 205–219. My former analysis of the graphical notations of the composer Anestis Logothetis is situated in this line of research. See Claudia MONGINI, "Sign and Information: On Anestis Logothetis' Graphical Notations." In: ZEPKE S. – O'SULLIVAN S. (eds.), *Deleuze and Contemporary Art.* Edinburgh: Edinburgh University Press 2010, p. 227–245.

object to the 'event' of "making ready", in the discussion of the score which Allan Kaprow associated to his performances "Happenings". Especially in the work after 1961, Kaprow spoke in terms of score – i.e. explicitly importing the concept of musical notation in the sphere of performative art – as a possibility for projecting the sheer magnitude and unforseeable details in the real world" onto a neutral plane. The project was to create a "plan(e) of composition", whose organizational principle gets directly constructed in "the Happening in an ongoing, aleatory and autopoietic feedback loop [...] in which the question of individual subjective expression is subsumed by that of the construction of an individuation of the world."[70]

The neutral "plane" re-constructing the happening in terms of individuation, is the element allowing to draw a line of continuity between Kaprow's score and the "tiny cortex" of *The Fragmented Orchestra*. In the last case, the operative conditions of the "score" are defined by the way the artificial neurons of the "tiny cortex" treat the incoming sound. This mechanism, called neurogranular sampler,[71] is the specific algorithmic implementation of the idea of granular synthesis described before; it triggers (i.e. extracts) grains of sound from the original pattern. "The resulting sound therefore consists of short bursts of the original sample triggered by the cortical neurons. It is a sonification of the cortical firing patterns."[72] This means that the heard result is the activity of the neurons, filled up with the content of the original sound. The artificial neurons of the "tiny cortex" thus transform the specificity of a particular sound into an "indifferent" shape, which nonetheless reproduces the tension of the original tonalities. The neuronal action contracts the original sound and in so doing extracts its "residual share", i.e. its expressive modalities.[73] It unleashes the sonic forces to a bare state of sensation and recomposes them into a new chain of machinic processes. A conjunctive chain: its connectivity creatively plays out its non-connectivity by accentuating the sheer presence of "the unexpungeable difference between the sheer individuality of [sonic and perceptive] events".[74]

Sound as a mean of expression as such, becomes of prior significance in the constitution of this realm of generic indifference, inasmuch as "it has the

---

[70] *Ibid.*, p. 113.
[71] Eduardo MIRANDA – John MATTHIAS, "Music Neurotechnology for Sound Synthesis: Sound Synthesis with Spiking Neuronal Networks." *Leonardo*, vol. 42, 2009, no. 5, pp. 439–442.
[72] GRANT – MATTHIAS – HODGSON – MIRANDA, "Hearing Thinking," p. 235.
[73] EVENS, *Sound Ideas: Music, Machines, and Experience*, p. 18–19.
[74] MASSUMI, *Semblance and Event*, p. 21.

ability to create a space without a tangible physical presence".[75] Sound opens the pathway towards the creation of what Guattari calls "partial modules of temporalization", a break with the "hypothetical projection" of "a time of generalized equivalence".[76] That is, sound or better said the procedure of becoming sonic ("sonification") *modulates* different spatio-temporal conditions by recomposing them into a novel dimension. It differentiates space-time situations and creates what Deleuze calls "spatio-temporal dynamisms: that is [...] agitations of space, holes of time, pure syntheses of space, direction and rhythms." "These dynamisms", Deleuze continues, "always presuppose a field in which they are produced, outside of which they would not be produced"[77]. Thus the question arises, how to define the field of action proper to the artwork.

> At the geo-macroscopical level of temporality, because of the lack of consistent service of internet broadband lines, an artificial latency was built in into the sonic transmission, in order to avoid cuts in the stream. This had the effect that "a sound event is not echoed back for several seconds of time. Though not intentional, this serves to accentuate the vast distances travelled by audio signals out of the geographical network." This latency constituted the refrain of the broad geographical space.[78]

This broad latency resonated with the time holes given by the microscopic delays in nerve cell transmission at the level of the brain of the listeners. Axonal conduction delays refer to the time required for a nervous signal to travel from its initiation site at the centre of the cell, towards its periphery terminals, where transmission to other neurons gets enacted through synapses. These delays get to assume a wider significance when the activity of more cells is taken under consideration, as they concur to shape the strengths of the connections between groups of neurons. "Tipically, a connection will be increased if a pre-synaptic neuron causes a postsynaptic neuron to fire. The connection is depressed if the firing of the postsynaptic neuron occurs before the pre-synaptic neuron has fired, a phenomenon known as 'Spike-Timing Dependent Plasticity'."[79]

---

[75] GRANT – MATTHIAS, "Shifting Topographies," p. 56.
[76] GUATTARI, *Chaosmosis*, p. 16.
[77] Gilles DELEUZE, *Desert Islands And Other Texts, 1953–1974*. Lapoujade, D. (ed.). Cambridge, MA: Semiotext(e) 2004, p. 94–95.
[78] JONES – GRANT – MATTHIAS – HODGSON – RYAN – OUTRAM, "The Fragmented Orchestra," p. 300–301.
[79] GRANT – MATTHIAS, "Shifting Topographies: Sound and the Fragmented Orchestra," p. 55.

By means of its operation of heterogeneous reassembling, the "tiny cortex" counteractualizes[80] both the virtual cavities of the web and the neurophysiological gaps in the brain into another fragmental dimension: the synthetic action of sound-grains. It makes the rhythmic nature of sound explicit, inasmuch as it lies bare its "intense moments of widely varying lengths"[81]. It does this by extracting the time movements from specific material conditions – the functional shift of the differential equations originally envisaged to model human neuronal activity and the internet delay – and recomposing them at the level of another physical motor: the graininess of the artificial grains. Duchamp's "artistic object" is thus pushed at its very limit of dissolution; at the point in which the semiotic circuitry between the object and its nominal collective judgement crumbles and gets recomposed into "an abstract machinic transversality".[82] The "tiny cortex" reshapes different temporalities into a generic mutative form which partains to the rich enunciative registers of a generic polivocal collectivity. By establishing complex (non)local relations between singular neuro-sonic disparities, the *Fragmented Orchestra* rewires the plastic modulations at the level of single brains into a wider circuitry entailing the potential for a collective neuronal regeneration. New sonic formations induce different sensual experiences which might become the onset for an enhanced synapto-genetic formation in single brains. These novel particular configurations feed back into the collective ability to react plastically to the plasticity of our brains.[83]

It is at this level of practical mutual action, that an ethical component can be perceived in its emergence. An ethics which is not the 'philosophical imperative' the way Shaviro has criticised it, but an "enabling constraint" for a wider dimension of ethico-aesthetic *experimentation*. A concomitant creation of the conditions for an emergent collective sensibility, in which the philosophical toy intervenes in terms of a partial actant.

---

[80] This concept is explained by Deleuze in *Negotiations* (Gilles DELEUZE, *Negotiations 1972–1990*. New York: Columbia University Press, 1997, p. 202); it denotes the action upon any kind of activity channelled into predefined paths and roles, and its operative transformation into a new dimension of composition.

[81] EVENS, *Sound Ideas,* p. 116.

[82] GUATTARI, *Chaosmosis*, p. 107.

[83] Catherine MALABOU, *What Should We Do with Our Brain?* New York: Fordham University Press 2008, p. 30.

314

///// recenze ////////////////

Neznesiteľná ľahkosť zdôvodnenia prima facie

Marek PICHA, *Kdyby chyby. Epistemologie myšlenkových experimentů.* Olomouc: Nakladatelství Olomouc 2011. 195 s.

Michal Ivan

Predstavte si, že by ste mali písať recenziu na knihu Mareka Pichu. Keby ste začali tak, ako ja teraz, ponúkali by ste čitateľovi myšlienkový experiment (podľa definície, ktorú ponúka Marek Picha)? Odpoveď na túto otázku nie je úplne jednoznačná, ale k tomu sa dostaneme neskôr. Najskôr si povedzme niečo o tom, čo nám autor vo svojej monografii pripravil. Kniha *Kdyby chyby* je monografia zaoberajúca sa myšlienkovými experimentami. Jej podnadpis znie *Epistemologie myšlenkových experimentů* a podstatná časť knihy je venovaná práve ich epistemológií. Neprehliadnuteľnou časťou je aj niečo, čo by sme s istými obmedzeniami mohli nazvať „ontológiou" myšlienkových experimentov. Je to hlavne prvá časť, predstavujúca snahu o definíciu a ďalej časti pohybujúce sa na hrane ontológie a epistemológie (napr. koncepcia ako Machov psychologizmus). Ako odpoveď na epistemický status ponúka

autor pojem prima-facie zdôvodnenia, akúsi skromnú koncepciu bez veľkých ambícií, no aj bez prepadávania skepticizmu. V neposlednom prípade podáva dôkladnú analýzu toho, ako postupovať pri kazuistike, akých chýb by sme sa mali vyvarovať pri posudzovaní myšlienkových experimentov.

Téma myšlienkových experimentov, hoci to tak z pohľadu miestnych diskusií nemusí vyzerať, predstavuje jednu z tých najpopulárnejších a najvýznamnejších v súčasnej filozofii. Práca Mareka Pichu k nej pristupuje ambiciózne, pričom autor preukazuje znalosť týchto diskusií, čím prináša neznalému čitateľovi okrem samostatnej práce aj prehľad tých najzaujímavejších príspevkov. Reaguje tak na autorov ako sú napr. Gendlerová, Williamson alebo autori z kruhu experimentálnej filozofie. Jedinou záhadou z tohto pohľadu zostáva malý priestor venovaný pojmu intuície, ktorý v týchto diskusiách práve naopak hrá obvykle významnú úlohu a býva často spájaný s „rozhodovaním sa" o výsledkoch myšlienkového experimentu, obzvlášť diskutovaná je napr. otázka expertných intuícií odborníkov (čiže filozofov). Na druhú stranu, vzhľadom na autorov deklarovaný dešpekt k diskusiám verbálneho charakteru (pozri napr. s. 40), je pochopiteľné, že pri otázke intuície mu stačí poukázanie na rovnakú podmienku

zdôvodnenia intuície (rovnakú s myšlienkovými experimentmi). I tak by som považoval minimálne za vhodné uviesť viac súvislostí medzi intuíciou a myšlienkovými experimentami.

V prvej kapitole si Picha kladie otázku, čo to myšlienkový experiment je. Ide o otázku, ktorá má rovnako tendenciu presúvať sa do verbálneho sporu, čo si však autor uvedomuje. Čitateľovi ponúkne svoju definíciu („Myšlienkový experiment je soubor pokynů určujících, jakou konkrétní situaci si představit s cílem něco zjistit.") a uvedie jej výhody v kontraste k ďalším definíciám. Rozkúskované na časti tu vidíme tri podmienky – 1) súbor pokynov; 2) predstavovanie si; 3) kognitívny cieľ. Jedným z (treba dodať, že explicitne prijatých) dôsledkov je, že aj odhadovanie je považované za myšlienkový experiment. Myšlienkovým experimentom tak je odhadovanie, či sa batožina zmestí do kufra auta, pokiaľ ho vykonáme predstavovaním si, ako by sme kufre naskladali (s. 32).

S tým isto možno polemizovať, no autor má na také vymedzenie právo. Väčší problém vidím v bode 3. Čo je to totiž kognitívny cieľ, čo znamená „něco zjistit"? Autor síce upozorňuje, že nemá v úmysle zahrnúť fantazírovanie medzi myšlienkové experimenty, no je to také jednoduché? Povedzme, že pred verejným vystúpením postupujete

podľa určitých pokynov a predstavujete si ako rozprávate pred publikom, vďaka čomu nadobudnete presvedčenie, že to zvládnete a tréma je zbytočná. Picha tvrdí, že tu prebehol reálny psychologický experiment, ktorý vykonal subjekt sám na sebe. Je však hranica medzi odhadovaním vlastnej emocionálnej reakcie a odhadovaním naskladania batožiny akokoľvek jasná? A nie je napríklad predstavovanie si záchranného člnu s piatimi ľuďmi a jedným psom (príklad, ktorý Picha medzi myšlienkové experimenty zaraďuje) podobným psychologickým experimentom?

V druhej kapitole sa Picha začína venovať epistemickej otázke. Keďže sa neuspokojuje s tým, že by myšlienkové experimenty mali iba didaktický význam, púšťa sa do debaty o ich epistemickom význame. Ponúka 3 otázky: 1) Je myšlienkový experiment zdrojom nového presvedčenia?; 2) Je myšlienkový experiment zdrojom epistemicky zdôvodneného presvedčenia?; 3) Je myšlienkový experiment zbytočný? Z nich sa ako najplodnejšia javí druhá otázka. Autor predkladá štyri rôzne teórie o zdrojoch zdôvodneného presvedčenia myšlienkových experimentov (konkrétne Brownov apriorizmus, Machov psychologizmus, Kuhnov konceptualizmus a asocianizmus), ktoré by mali dokladať ich epistemický prínos. Po dôkladnom kritickom zhodno-

tení sa napokon prikláňa k tomu, že je možné zodpovedať otázku epistemického významu aj bez toho, aby sme museli prijať niektorú z týchto koncepcií.

V ďalšom texte sa objavujú, aspoň sa mi tak zdá, tri výrazné postoje voči myšlienkovým experimentom. Jedným je odmietnutie prílišného optimizmu voči ich epistemickému statusu. Optimistické koncepcie predpokladajú, že myšlienkové experimentovanie je tvorené určitým psychologickým procesom a zároveň, že tento proces je dôveryhodný. Avšak to sú príliš silné predpoklady, ktoré podľa autora neprejdu testom skepticizmu (s. 77). Druhým postojom je obhajoba pojmu prima-facie zdôvodnenia, ktorý je založený na akceptácií. Tretím postojom je opakované odmietanie skepticizmu, ktorý by spochybňoval význam myšlienkových experimentov ako taký.

Čo je to zdôvodnenie prima facie? Túto kľúčovú otázku Picha rozoberá v tretej kapitole. „Přesvědčení, že *p,* je pf-zdůvodněné, pokud existují epistemicky relevantní důvody pro *p* a zároveň dané přesvědčení není vyvrácené" (s. 71). Ako je asi zjavné, kritickým sa stáva pojem epistemicky relevantných dôvodov. Ktoré dôvody teda sú tie, ktoré sú epistemicky relevantné? Picha ich definuje nasledovne: „*D* je epistemicky relevantní důvod pro *p* jedině tehdy, pokud D vede k akcepto-

vání *p*" (s. 77). Pokiaľ nemáme silnejší dôvod, na základe ktorého by sme presvedčenie p odmietli a zároveň ho na základe myšlienkového experimentovania akceptujeme, je toto presvedčenie pf-zdôvodnené. Je to práve táto definícia, ktorá je základom Pichovej obhajoby epistemického statusu myšlienkových experimentov.

Výhodou tohto prístupu je, že poskytuje jednoznačnú odpoveď na epistemickú prínosnosť myšlienkových experimentov – prínosné sú práve preto, lebo vedú k akceptácií. Môžeme ich využiť v argumentácií a v prípade, že náš spoludiskutér akceptuje rovnaký záver (výsledok) myšlienkového experimentu ako my, máme takpovediac navrch – preniesli sme na neho dôkazové bremeno (s. 80). Zároveň nie je rozhodujúcou sila akceptácie - dôležité je, že určité tvrdenie považujeme za pravdivé a sila akceptácie nemá vplyv na silu argumentu, ktorý myšlienkovým experimentom podkladáme. Ako príklad uvádza Picha nasledujúci pomyselný rozhovor, ktorý uvediem vcelku, aby som ním poukázal na jeden zvláštny dôsledok.

„Adam: Percepce je vlastností částí.

Boris: Vážně? To se mi nějak nezdá.

Adam: Prošel jsem si Leibnizův Mlýn a vyšlo mi, že percepce musí být vlastností částí.

Boris: Co je to Leibnizův Mlýn?

317

Adam: Představ si percipující stroj, vlez dovnitř a prozkoumej. Nenajdeš v něm nic kromě mechanicky spojených částí, nebo ano?

Boris: Asi ne. Ale jak to s tím souvisí?

Adam: Kdyby byla percepce vlastností kompozice, jak tvrdíš, musel bys ve stroji najít i něco dalšího.

Boris: Ano, to bych asi nejspíš musel."

Čo je ne tomto príklade zvláštne? Ukazuje sa na ňom podľa mňa problém dostatočnosti pojmu zdôvodnenia prima facie. Totiž, dokáže takýto prístup odlíšiť dôveryhodné zdroje od tých nedôveryhodných? Čo keby sme príklad pozmenili a Boris by akceptoval nový postoj na základe Adamovho rozprávania o tom, čo videl vo vešteckej guli? Epistemický význam vešteckej gule potom môžeme zachytiť nasledovne: Pokiaľ nie je veštenie z gule vyvrátené, potom je *prima facie* zdôvodnené. Picha si, zdá sa, silnejší pojem zdôvodnenia ani za cieľ nekladie, keďže, ako vraví, „*prima facie* argument není postaven na důvěryhodnosti procesů. Netvrdí, že imaginace má tendenci k pravdě, a my bychom jí proto měli důvěřovat. Tvrdí pouze tolik, že když už považujeme nějaké přesvědčení za pravdivé, nemůžeme se tvářit, jako bychom ho za pravdivé nepovažovali." (s. 85). Pokiaľ však dôveryhodnosť nie je otázkou, akú váhu

má takýto pojem epistemického významu? V istom deskriptívnom ponímaní úlohy epistemológie, ktorej ambíciou je opísať všetky zdroje akceptácie, ktoré v spoločnosti nájdeme, je takáto definícia zdôvodnenia asi prijateľná. Otázkou zostáva užitočnosť takéhoto pojmu – že ľudia nadobúdajú presvedčenia z rôznych dôvodov je triviálnym faktom.

Picha však pokračuje ďalej. Jeho tretí výrazný postoj je odmietanie skepticizmu. Postoj, že sa myšlienkove experimenty používajú, ergo k niečomu sú, nie je dostatočná. Skeptik nenamieta, že myšlienkove experimenty nevedú k akceptácii, namieta, že pri určovaní pravdy tvrdení je rovnako účinná veštecká lampa. Pichova odpoveď je, že otázka miery dôveryhodnosti je otázkou empirickou. Vedú myšlienkové experimenty k lepším alebo horším výsledkom? To musíme zistiť pozorovaním. A podľa Pichu skeptik jednoducho nepreukázal, že myšlienkové experimenty vo väčšine prípadov vedú k skôr nepravde ako pravde (s. 86).

Zdá sa mi, že tu Picha postupuje príliš zbrklo a vytvára si zo skeptika tak trochu fackovacieho panáka. Jednoducho všeobecne bez podloženia povie, že skeptikovi sa nepodarilo preukázať nedôveryhodnosť. Podobným postupom dospejeme k tomu, že sa preukázať skeptikovu neoprávnenosť nepodarilo Pichovi – jednoducho neposkytol empi-

rický dôkaz toho, že skeptikovi sa to nedarí. Podobne naprázdno vyznieva diskusia s experimentálnou filozofiou (s. 134–137). Tá sa predsa snaží realizovať konkrétne experimenty, ktoré prinášajú konkrétne výsledky a tie by bolo namieste konkrétne posúdiť. Dodajme, že autor určitú konfrontáciu s konkrétnymi neduhmi podstupuje v poslednej kapitole - poskytuje prehľad chýb, ktorých sa pri hodnotení myšlienkových experimentov dopúšťame. Ako budem o chvíľu tvrdiť, robí to kvalifikovane a kvalitne. No takmer pri každej chybe dodáva, že to je iba chyba, na ktorú si musíme dávať pozor a všetko bude v poriadku.

Ďalší postup Pichovej argumentácie je ešte záludnejší (s. 85). Predstavme si, že by sa nám podarilo dokázať, že myšlienkove experimenty (alebo kľudne aj veštenie z gule) vedú v nadpolovičnej väčšine k omylu. Podľa Pichu tým paradoxne považujeme myšlienkové experimenty za dôveryhodný zdroj! Stačí predsa negovať ich výsledok a vo väčšine prípadov získame pravdivý výsledok. Nie je mi jasné, či je potom vôbec možné dokázať nedôveryhodnosť akéhokoľvek zdroja.

Vo štvrtej kapitole sa Picha zaoberá eliminativizmom, teda teóriou, podľa ktorej sú myšlienkové experimenty epistemologickými parazitmi, sú to iba rétoricky upravené argumenty, ktoré nemajú silu samú o sebe. Je ich totiž možné rekonštru-

ovať do podoby argumentu a svoj záver dokážu zdôvodniť iba do tej miery, do akej je toho schopný tento všeobecný argument. Na základe analýzy Pisanského experimentu, ktorého štruktúrovanosť a explicitnosť postupu je mimochodom výnimočná a napr. v porovnaní s experimentmi ako sú Záchranný čln alebo aj Dvojča Zeme, sa až zdá, že sú v niečom podstatnom odlišné, rekonštruuje Picha diskusiu medzi obhajcami a kritikmi tohto postoja. Riešenie sporu v diskusii samotnej nenachádza a ako cestu von poskytuje rozlíšenie medzi e-xperimentom a i-xperimentom. To zakladá na rozlíšení medzi exemplom a ilustráciou (vypožičanom od autorov Perelman a Olbrechts--Tyteca). Myšlienkový experiment použitý ako príklad, ako dôvod všeobecného tvrdenia, je e-xperiment, myšlienkový experiment použitý na ilustráciu všeobecného princípu je i-xperiment. Ten prvý je epistemicky prínosný, zatiaľ čo ten druhý nie je. Či ide o jeden alebo druhý však závisí na konkrétnom použití myšlienkového experimentu – dá sa použiť oboma spôsobmi.

V poslednej piatej kapitole autor ponúka prehľad toho, čoho by sme sa mali pri posudzovaní myšlienkových experimentov vyvarovať. Postupuje tu so znalosťou veci a podáva dôkladný prehľad. Chybami myšlienkových experimentov sú Neprojateľný výsledok, Nedôveryhodný

319

výsledok, Nedosiahnuteľný výsledok a chybami argumentov obsahujúcich myšlienkový experiment sú Nerelevatívnosť, Nesprávna generalizácia, Netrpezlivosť. Možné chyby sú uvedené na príklade, je uvedená ich podstata, kritická otázka, ktorá nám pomôže konkrétnu chybu odhaliť a možnosti ako postupovať. Kapitola sa tak stáva užitočnou príručkou pre každého, kto by chcel myšlienkové experimenty využívať alebo kritizovať.

Na záver Picha prehľadne zopakuje najdôležitejšie otázky a odpovede vo forme akéhosi FAQ (najčastejšie kladených otázok). Príjemným a užitočným zároveň je dodatok, ktorý uvádza prehľad všetkých myšlienkových experimentov, ktoré sa nachádzajú v knihe. Pridáva k ním príbeh vedkyne Mary a tak snáď jediným slávnym experimentom, ktorý v knihe, je dumanie nad tým, aké to je byť netopierom. Experimenty sú vždy popísané citáciou príslušného autora, je uvedený ich destilát a pri viacerých aj princíp a diagram. Stávajú sa tak, nakoľko skromným, doplnkom, ktorý poskytuje prehľad, aký u nás chýba (ak by autor náhodou uvažoval o encyklopédii myšlienkových experimentov, prípadne ďalších filozofických argumentov, bolo by vhodné ho v tom iba podporiť).

Aby som zhrnul predchádzajúce, zdá sa mi, že pre Pichu sú myšlienkové experimenty akýmsi dialektickým nástrojom pre tých, ktorí ich akceptujú. Pokiaľ ich totiž niekto odmietne, nedostaneme sa k potrebnému bodu v diskusii – k akceptácii. A keďže Picha neobhajuje dôveryhodnosť predstavivosti, nejestvuje vyššia inštancia, na ktorej by sme sa mohli s tým, kto myšlienkove experimenty odmietne akceptovať (alebo len bude vždy tvrdiť, že nevie, ako ich posúdiť), nie je možné ich takémuto človeku nijako „nanútiť". Je to postoj zaujímavý, no skrýva podľa mňa v sebe viacero záludných bodov. Vyššie uvedené polemické poznámky nemajú byť ničím viac, než polemickými poznámkami. A je vlastne dobre, že mohli vzniknúť – kvalitná práca sa pozná aj podľa toho, že je s čím nesúhlasiť. Marek Picha napísal v tomto zmysle kvalitnú knihu. Pokiaľ bolo jej predstavenie na viacerých miestach jej kritikov, je to tým, že kniha vyzýva ku diskusii. Ešte raz je nutné vyzdvihnúť i rozsah tém, ktoré sa Picha pokúša rozobrať a množstvo polemík s renomovanými autormi, do ktorých sa (úspešne) púšťa. A tak jediná skutočná výčitka, ktorú voči knihe mám, je technického charakteru. Knihe chýba menný i vecný index. Verím, že by bol užitočný a pomohol by pri práci mnohým, nielen autorovi tejto recenzie.

///// recenze ////////////////

Médium v jednotném čísle

W. J. T. MITCHELL – Mark B. N. HANSEN (eds.), *Critical Terms for Media Studies.* Chicago – London: University of Chicago Press 2010, 353 s.

Andrea Průchová

Antologie[1] *Kritické pojmy mediálních studií* usiluje o artikulaci současné povahy tohoto oboru. Ta podle jejích editorů směřuje ke stále otevřenějšímu charakteru, který čerpá z propojení společenskovědních oborů s poznatky přírodních věd (zjm. biomedicíny a kybernetiky) při sledování trendů technologického vývoje. Kniha je výsledkem editorské práce kulturního a literárního teoretika Marka B. N. Hansena a historika a teoretika umění W. J. T. Mitchella, kteří interdisciplinární povahu textu vytyčují jeho rozdělením do tří zastřešujících částí – „Estetika“, „Technologie“ a „Společnost“. Tyto oddíly se zabývají estetickými, technickými a politickými formami, v nichž lze média sledovat. Hlavním motivem textů je reflexe tradičních

---

[1] Recenze vznikla v rámci projektu GAUK 1122313 a Specifického vysokoškolského výzkumu SVV 2013 267 501.

témat a metodologických postupů spjatých se studiem médií vedená dekonstrukční logikou narušování moderních dichotomických kategorií. Návaznost jednotlivých textů, pocházejících z různých oblastí společenských věd, zajišťuje specifické pojetí termínu *médium* definované předmluvou.

Při formulaci vize mediálních studií 21. století se obracejí Hansen a Mitchell zpět k myšlení klasika oboru Marshala McLuhana a k jeho porozumění vztahu lidského těla a média. McLuhan nechápe tělo jako privilegované médium řídící vnímání našeho okolí ani jako plošný přenašeč informací šířených médii. Tělu rozumí jako nesoběstačné platformě nabízející a organizující všechny možné akty mediace. Z této představy o lidském těle odvozují editoři vlastní definici pojmu *médium*. Rozumí mu jako synergickému prostředku lidské společnosti, jenž proměňuje člověka stejně, jako člověk proměňuje médium. V podobě archeologického prostředku médium odhaluje minulá uspořádání společnosti a formou vynálezu objevuje nová fakta. V inspiraci prediktivními schopnostmi oboru meteorologie používají editoři termín *mediarologie*, jímž označují kýženou úroveň stavu mediálních studií, které budou schopny předpovídat vývoj forem a vztahů ve společnosti. Zdůrazněním vzájemné součinnosti člověka a média se pub-

321

likace vymezuje proti předchozímu populárnímu pojetí média jako neutrálního kanálu přenosu informací, který nastolila komunikační a lingvistická teorie sedmdesátých let. Na základní otázku „Jak souvisí koncept média s médii?" kniha odpovídá ustanovením média za nezbytnou podmínkou ontologické, fyzické i sociální existence člověka a studium médií pasuje na rovinu poznávání základního fungování jednotlivce i celku společnosti.

Jádro recenze tvoří zhodnocení sekce „Estetika". Ta se jeví být klíčovou hned v několika ohledech. Za prvé, v rámci oborových textů dosud nebyla estetická perspektiva, kladoucí důraz na proces percepce a individuálního mentálního prožitku média, důsledněji rozvíjena. Úvahy z oblasti filosofie umění, dějin umění a estetiky prozatím zastávaly funkci vhodně zvolených příkladů uměleckých děl (nejčastěji novomediálního charakteru), které ilustrovaly cizí teoretické stanovisko. Přínos estetického oddílu proto spočívá v rozvoji méně frekventovaných témat tělesnosti či vnímání prostoru a času, která jsou vzhledem k pojetí média jako základního elementu ekosystému společnosti nezanedbatelná. Za druhé, se skladba a obsah témat vybrané části („Umění", „Tělo", „Obraz", „Materialita", „Paměť", „Smysly" a „Čas a prostor") dovolávají mcluhanovské perspektivy nejsilněji.

Za třetí, tento oddíl nejvíce koreluje s editorskou představou stále se rozšiřujícího mezioborového pojetí mediálních studií.

Úvodní esej "Umění" kulturní a vizuální teoretičky Johanny Drucker působí nejméně přesvědčivým dojmem. Autorka řeší široké téma podáním výčtu mezníků vývoje mediálních forem. Historický exkurz nenaplňuje editorskou ambici přínosu nových podnětů. Drucker, věnující se studiu vizuálních prostředků sdělování informací, dlouhodobě čerpá z analýzy transformace uměleckých forem ve vztahu k rozvoji nových komunikačních prostředků. Zde však její text zůstává pouhým popisem formálního vývoje umění. Proměny médií uměleckého vyjádření sleduje od starověkého pojetí *techné* ke vzniku středověkých řemeslných cechů a novověkého uměleckého trhu až k romantické představě umělce / génia. Nástup masového tisku a reprodukci uměleckých děl, které vedou ke znejistění podstaty originálu uměleckého díla, označuje Drucker (podobně jako většina zainteresovaných autorů) za klíčový zlom ve vývoji uměleckých forem. Výrazný rozvoj uměleckých hnutí druhé poloviny 20. století, užívajících postupů postmoderního eklekticismu, konceptuálního elitismu či minimalistické redukce forem, chápe právě jako reakci na znejistění tradičního pojetí umění. V kontextu všech pří-

spěvků se text jeví odtržen, bez širší obsahové i tematické návaznosti.

Další texty lze číst více provázaně. Pro přehlednost je můžeme rozdělit do dvou trojic, přestože tak v publikaci nejsou řazeny. První trojici reprezentují témata „Tělo", „Materialita" a „Smysly". Jejich společným jmenovatelem je problematika tělesnosti, jež zdůrazňuje tělesné kvality užívání médií. Text lingvistky a dokumentaristky Bernadette Wegenstein představuje tělo jako aktivní médium rozvoje lidské kultury. Stručným historickým přehledem autorka nabourává protichůdné kategorie duch – tělo, tělo jako objekt – tělo jako subjekt. Zdůrazňuje jejich používání v současné společnosti. Upozorňuje na ně zejména v oblasti reklamy a kosmetické propagandy, v nichž se tělo stává hlavním kapitálem. Nástup virtuálního prostředí, tvrdí Wegenstein, proměňuje rovnici, jež dosud spojovala tělo s materiálními kategoriemi a duši s imanentní podstatou. Příchodem nových médií virtuálního charakteru dochází k paradoxní exteriorizaci těla do nehmotné podoby. Dle autorky proto patří novým médiím důležitá role celospolečenského nástroje, který definitivně vyvrací stále přežívající duální karteziánské představy.

Stejným argumentačním postupem střetu hmotné substance a spirituálních kvalit postupuje také lingvista Bill Brown v eseji „Materialita".

Autor se zabývá tématem strachu společnosti z dematerializace reality. Ten se v ní objevuje pravidelně, a často také slouží jako argumentační prostředek proti šíření nových technologií. Důvodem je domnělý nárůst abstrakce vztahů mezi osobami a konkrétními věcmi, který je novými technologiemi způsoben. Jak například během rozšířování směnného média peněz či vynálezu fotografie, strach ze ztráty reality byl ve společnosti vždy přítomen. Změnila se nějak situace dnes, kdy zažíváme nevídanou invazi technologií do každodenního života? K odpovědi autor, stejně jako Wegenstein, používá samotných nových médií postavených do role obětního beránka. Ukazuje, že jsou to právě nová média, která naplňují funkci rematerializace. Podobně jako lidské tělo formuje a propojuje abstraktní vjemy přicházející z okolí, slouží nyní rozhraní obrazovky k tvorbě konkrétního a uchopitelného světa informací. V přeneseném slova smyslu nás obrazovka počítače chrání před rozpadem okolního světa.

Závěr trojice kapitol tvoří esej „Smysly" teoretičky umění Caroline Jones. Autorka textem usiluje o obhajobu smyslového vnímání, jež hraje v západním myšlení vzhledem k intelektuálním rozměrům ducha roli outsidera. Jones detailně popisuje jednotlivé umělecké proudy posledních pěti dekád, jejichž vznik motivovala snaha změnit negativní

etické a politické hodnocení smyslových kvalit. Autorka představuje řadu směrů pasujících se do role reformátorů smyslového vnímání. Ty formou tělesných performancí a ritualizovaných praktik poukazovaly na bytostné sepětí smyslové zkušenosti s intelektuálním výkonem. Mezi příklady nechybí evropský Vídeňský akcionismus či díla amerických zástupkyň feministického umění 60. a 70. let.

Druhou trojici textů tvoří autorské eseje editorů Mitchella a Hansena „Obraz", „Paměť" a „Čas a prostor". Editoři zde pracují s triádou pojmů *obraz*, *gramatizace* a *paměť*, pomocí nichž chtějí vymezit estetický přístup ke studiu médií. Mitchell, autor kontinuálně se věnující filosofii obrazu a tvůrce termínu *obrat k obrazu*,[2] definuje obraz jako nutnou podmínku existence jakéhokoliv média. Přestože byl historicky obraz polem mnoha sporů mezi těmi, kteří jej jako médium reprezentace uznávali či odmítali (vzpomeňme středověký spor ikonoklastů a ikonodulů), obraz je dle Mitchella *vždy* médiem reprezentace, a to ve dvojím ohledu. Obraz je přirozenou součástí dalších zobrazovacích médií, jakými jsou hudba, poezie či vizuální repre-

zentace (např. socha, malba, fotografie). Jednotlivá média však také vnímáme jako obrazy. Mitchell obhajuje fakt, že obraz byl v naší kultuře historicky stále přítomen a ani nástup nových technologií nemůže jeho pozici či existenci ohrozit. Autor odmítá zejména možnost transformace obrazu způsobenou nástupem digitalizace. V návaznosti na práci estetika a analytického filosofa Nelsona Goodmana[3] ukazuje, že digitální obraz není nebezpečně dematerializovaným binárním kódem bez přímého vztahu k realitě, ale je tvořen omezeným množstvím prvků stejně jako abeceda, hudební stupnice či mozaikový obraz. Obraz slouží jako jedno ze základních médií percepce a orientace ve světě, ačkoliv nabývá různých povah.

Společným textem editorů je esej věnovaná termínům času a prostoru. Západoevropskému myšlení vždy dominoval čas nad prostorem. Nástup moderních technologií tisku, fotografie a filmu autoři považují za moment, který situaci změnil. Vyjevil obě kategorie jako vzájemně propojitelné. Expanze médií tisku, fotografie a posléze i filmu probudila v teorii hlubší zájem o jemnější diferenciaci času v různých kvalitách trvání, pohybu, montáže (např. Bergson, Deleuze) či autenticity prožívaného času (např.

---

[2] W. J. T. MITCHELL, *Picture Theory: Essays on Verbal and Visual Representations.* Chicago: University of Chicago Press 1994, s. 11–34.

[3] Nelson GOODMAN, *Jazyky umění: nástin teorie symbolů*. Praha: Academia 2007.

Husserl, Heidegger). Nevyhnutelně jsou tyto kategorie vztaženy také k podmínkám života člověka, který je do nich vetknut a pouze jejich prostřednictvím je schopen vnímat a rozlišovat další média.

Poslední esej „Paměť" francouzského teoretika technologií Bernarda Stieglera představuje nejzajímavější text oddílu. Stiegler staví své pojetí média na referenci k paleontologické teorii antropologa André Leroi-Gourhana. Ta se zabývá původem technické paměti člověka. Leroi-Gourhan tvrdí, že rozvoj lidské biologické paměti probíhá na základě používání uměle vytvořených nástrojů. Z tohoto pohledu vývoj člověka neprobíhá geneticky, nýbrž extrageneticky na základě setkání s mimobiologickými fakty. Otázka technické paměti se vzhledem k expanzi nových technologií jeví aktuální. Mohou paměť ohrozit? Hansenovo úvodní slovo k eseji definuje povahu strachu z nových médií jako vedenou logikou *pharmakonu*. Nové formy technologické paměti (např. iPad, cloud computing) oceňujeme jako způsob uchovávání informací, který nás však zároveň zdánlivě zbavuje potřeby užívat plnou kapacitu paměti. Stiegler v textu tematizuje situaci přechodu od individuálních mnemotechnik k používání hromadných síťových mnemotechnologií. K odvrácení strachu z paměťových technik používá pojem *gramatizace*. Termín

gramatizace označuje přirozený proces zapomínání aktu užívání určitého média ve chvíli, kdy pronikne do každodenního života společnosti (např. opomínáme tužku při psaní). Nové technologie explicitně nabízejí možnost exteriorizace paměti. Dříve probíhal přechod paměti do vnějšího prostředí nereflektovaným zacházením s nástroji individuálních mnemotechnik (např. zápisník, psací stroj, diktafon). Nyní se stává na první pohled viditelným. Veřejná prezentace možností síťové kapacity paměti zároveň proměňuje politickou a sociální situaci. Zřetelně exteriorizovaná paměť nových médií se stává prostorem kreativním činnosti jedince. Člověk nepředstavuje pasivního konzumenta nástrojů technické paměti, ale tuto paměť může aktivně obohacovat a sdílet. Tím se však také z oblasti technické paměti, jak varuje Stiegler, stává otevřená politická hra kontroly systémů paměti.

V celku se antologie pokouší o rozvoj mediálních studií jako interdisciplinární společenské vědy, jež společnosti umožňuje poznat její ontologické a sociální elementy i predikovat vlastní budoucnost. Volí metodologický postup dekonstrukce modernistické terminologie, s níž ve vztahu ke kritice médií operujeme. Mediální studia jsou prezentována jako typ protovědy, schopné porozumět šíři současné společnosti v momentě sjednocení společenskovědních oborů. K tako-

325

vému výsledku je však nutné připojit ty disciplíny, jež dosud zůstávaly stranou, tak jako v případě filosofie umění a estetiky. Obtížnost úkolu vyvstává již v propojení oddílu „Estetika" s dalšími částmi publikace. Mnohé historické odbočky činí z esejů místy opakování základních znalostí z dějin umění. Zdůrazňování spojitosti reflexe médií v estetických kategoriích s nástupem nových technologií nabývá nezřídka čistě kauzálního charakteru, a blíží se tak spíše východiskům kritického determinismu, vůči němuž se editoři vymezují. Výrazně je opomenuto propojení estetické části se společenskou a politickou perspektivou, které dlouhodobě hrají na poli estetického uvažování klíčovou roli. Politické proměny související se změnou myšlenkových formací společnosti vždy vycházely i zpětně ovlivňovaly fenomén umělecké tvorby. Vyznění antologie se namísto trojjediného čtení („Estetika", „Technologie", „Společnost") stává třídílnou publikací, která sama na sobě demonstruje, nakolik jsou snahy o interdisciplinární rekonstrukci oboru náročným úkolem. Také forma publikace, která je přehledovým slovníkem, by neměla zůstat opomenuta. Heslovité zpracování esejí samo se vzpírá snaze přinést odhalení nových mezioborových souvislostí. Pro takové objevy je třeba delší textové plochy i jasnějšího ideového východiska publikace. Dozvídáme se pouze málo o algo-

ritmu výběru zpracovaných termínů, a chybí také zdůvodnění, proč právě slovníkový přehled má sloužit jako vhodná forma definice nového pojetí pojmu médium. Na stranu druhou, a to zejména, je nezbytné ocenit celkový přínos knihy ve dvou ohledech. Za prvé, ve snaze rozšířit mediálně studijní slovník o kriticky zhodnocené termíny z oblasti estetiky a umění, jež ovlivňují reflexi vztahu člověka a společnosti. A za druhé pak, vytyčením vize sjednocené „třetí" cesty mediálních studií jako alternativního modelu k dogmaticky rozdělenému poli několika různých historických tradic.

///// zpráva z konference ////

Věda jako veřejný obraz

The Public Image. International Visual Sociology Association Annual Conference 2013. Centre for Urban and Community Research, Goldsmiths, University of London (Velká Británie), 8.–10. července 2013.

Michal Šimůnek

International[1] Visual Sociology Association (IVSA) je jednou z něko-

lika organizací, které vznikly v průběhu 70. až 90. let 20. století jako institucionální reakce na vizuální obrat v sociálních vědách.[2] Ačkoli byla založena ve Spojených státech převážně americkými sociology, od samého počátku byla koncipována jako mezinárodní a mezioborová organizace, což je patrné např. na stránkách časopisu Visual Studies[3] a zejména pak v průběhu pravidelných výročních konferencí, které IVSA pořádá již od roku 1983 a jichž se vedle sociologů a antropologů pravidelně účastní vědci napříč různými obory sociálních věd společně s dokumentaristy, umělci a aktivisty.

Letošní konference se konala ve Velké Británii pod pořadatelskou záštitou Centre for Urban

and Community Research (CUCR) na Goldsmiths College, University of London a jak již napovídá název The Public Image, ústředním tématem bylo objevování souvislostí mezi vizuální a veřejnou sociologií a hledání možností, jak by mohly vizuální sociální vědy přispět k rozvoji Burawoyovy koncepce veřejné sociologie.[4] Problematika vztahu vizuálního a veřejného a zejména pak otázka, jak učinit sociální vědy nejen „vizuálnějšími," nýbrž i „viditelnějšími" a srozumitelnějšími pro širokou veřejnost, je nesporně jedním z klíčových témat, které se současné (vizuální) sociální vědy snaží řešit. Zřejmě právě díky aktuálnosti zvoleného tématu přilákala letošní konference velké množství řečníků a přinesla řadu zajímavých doprovodných akcí: v rámci plenárních zasedání a čtyřiceti panelů vystoupilo více než dvěstě padesát řečníků; organizátoři konference připravili řadu workshopů, filmových projekcí a terénních „procházek" do ulic Londýna; účastníci konference měli možnost navštívit několik instalací studentských prací a výstavu Visualising Affect,[5] která byla zaměřena na problematiku možností a limitů využití uměleckých postupů jakožto

---

a dialogickém obratu v sociálních vědách" (reg. č. 13-33640P).

[2] První vizuálně orientovanou vědeckou institucí byla International Visual Literacy Association, která se začala formovat již v roce 1968. IVSA byla založena v roce 1981 a např. již v roce 1984 ji následovala Society for Visual Anthropology, v roce 1985 Societé Française d'Anthropologie Visuelle a v 90. letech pak byla v rámci British Sociological Association ustavena British Visual Sociology Group a International Sociology Association vytvořila tématickou skupinu Visual Sociology Thematic Group.

[3] IVSA vydávala do roku 1991 newsletter Visual Sociology Review, od roku 1991 časopis Visual Sociology, který byl v roce 2002 adoptován nakladatelstvím Taylor & Francis, kde časopis dodnes vychází pod titulem Visual Studies.

[4] *Cf.* zejména Michael BURAWOY, „For Public Sociology." American Sociological Review, roč. 70, 2005, s. 4–28.

[5] Podrobněji výstavu představuje webová stránka dostupná z: <http://visualisingaffect. weebly.com/index.html> [cit. 15. 7. 2013].

výzkumných strategií v sociálních vědách. Hlavní téma konference bylo v rámci výše uvedených aktivit rozvedeno do řady souvislostí jako např. vztah vědy a aktivismu, problematika participatorních a inovativních metod, vztah soukromého a veřejného, dohledu a osvobození, vědy a ne-vědy (umění, dokumentarismu, žurnalistiky), důsledky digitalizace a multimedializace sociálních věd, etické aspekty vizuálních výzkumných metod apod. V souvislosti s rozsahem letošní konference tak Alison Rooke z pořádajícího CUCR v uvítacím proslovu výstižně a zcela oprávněně poznamenal, že letošní konference se proměnila spíše do podoby festivalu s mnoha paralelně probíhajícími akcemi. Z těchto důvodů nemohu níže předložit komplexní obraz letošní konference IVSA, nýbrž pouze několik stručných a mými preferencemi a postřehy ovlivněných „momentek."[6]

Momentka první – veřejná věda jako samozřejmost: Název konference a veškeré oficiální materiály počínaje výzvami k zasílání návrhů příspěvků až po program konference směřovaly pozornost účastníků k promýšlení postavení vizuálních sociálních věd ve vztahu k Burawoyově koncepci veřejné sociologie. Zmínku o Burawoyovi a jeho koncepci jsem však v průběhu konference zaznamenal pouze jednou, a to v rámci uvítací řeči, ve které Monica Sassateliová a Alison Rook z pořadající CUCR připomněli hlavní zaměření konference. V následujících třech dnech v rámci panelů, kterých jsem se účastnil, v diskusích u kávy a čokoládových sušenek a nebo z úst Douglase Harpera, Lese Backa a Caroline Knowlesové, kteří se zhostili zahajovacích a závěrečných plenárních přednášek, nebyla problematika veřejné sociologie ani jednou zmíněna.

Toto mlčení však neznamená, že by ideál veřejné sociologie nehrál v průběhu konference důležitou roli. Skutečnost, že účastníci konference neměli zpravidla potřebu explicitně se odvolávat na Burawoye, je do značné míry dána tím, že směřování k ideálu veřejné vědy je v komunitě vizuálně orientovaných sociálních vědců považováno spíše za samozřejmý předpoklad než za výzvu, o které by se mohlo pochybovat a diskutovat.[7] Koncept

---

[6] Kompletní program konference je dostupný na oficiálním webu IVSA, srv. The Public Image. IVSA 2013 Annual Conference – Conference Program [online]. Dostupné z: <http://visualsociology.org/images/stories/conference/2013/IVSA_2013_program_7.2.13.pdf> [cit. 15. 7. 2013].

[7] Vizuální sociální vědy měly vždy velmi blízko k angažované vědě (např. tradice sociální fotografie je považována za klíčový zdroj inspirace pro vizuální sociologii – srv. např. Howard S. BECKER, „Photography and Sociology." In: Doing Things Together: Selected Papers. Evanston: Northwestern

veřejné vědy se tak objevoval v řadě příspěvků a diskusí zejména v podobě zpravidla nadšeného vítání participatorních metod, inovativních výzkumných přístupů a v diskusích o možnostech a očekáváních spojovaných s novými digitálními technologiemi. Ačkoli sdílím toto nadšení, považuji omezenou míru diskuse o rizicích a problémech participatorních metod,[8] nových tech-

nologií[9] a poněkud jednostranné a nekritické přijetí ideálu veřejné vědy[10] za snad jediný nedostatek letošní konference IVSA. Tím samozřejmě nechci tvrdit, že by si účastníci konference neuvědomovali rizika a kontroverze spojené s vizuálními metodami a veřejnou sociologií, jen se o nich v atmosféře sdíleného nadšení rozhodli nemluvit.

Momentka druhá – staré naděje a nejistoty: Významný představitel současné vizuální sociologie Luc Pauwels nedávno poznamenal, že „na vizuální sociální vědy již nemůžeme pohlížet jako na exotickou specializaci a práci s vizuálními daty bychom měli přestat považovat za jakousi alternativní podobu (sociální) vědy."[11] Ačkoli je jeho

---

University Press 1986; Douglas HARPER, Visual sociology. London – New York: Routledge 2012, s. 18–38) a k ideálu veřejné vědy. Snaha používat obrazy jakožto nástroje sběru dat a reprezentace vědeckého poznání byla totiž vždy do určité míry motivována snahou opustit vědu založenou na textech, číslech, psaní a nepřístupném odborném žargonu. V této souvislosti byly obrazy (zejména fotografie a film) považovány za nástroj otevření se sociálních věd jiným „neakademickým" žánrům a publikům (srv. např. Howard S. BECKER, Telling about Society. Chicago – London: University of Chicago Press 2007; Clifford GEERTZ, Works and Lives. The Anthropologist as Author. Stanford: Stanford University Press 1988) a potenciálně i dialogu a produkci sdíleného vědění (srv. např. Marc Henri PIAULT, „Audiovizuální vyrovnání aneb za mimotextovou antropologii." In: ČENĚK, D. – PORYBNÁ, T. (eds.), Vizuální antropologie – kultura žitá a viděná. Červený Kostelec: Pavel Mervart 2010, s. 25–68).
8 Srv. např. Davis BUCKINGHAM, „,Creative' Visual Methods in Media Research: Possibilities, Problems and Proposals." Media, Culture & Society, roč. 31, 2009, č. 4, s. 633–652. Ačkoli v průběhu konference byly participatorní metody převážně adorovány, např. Luc Pauwels v příspěvku A constructive critique of visual ‚participatory' methods as data-production

and empowerment strategies poukázal na řadu etických a epistemologických úskalí, která jsou s participatorními metodami svázaná.
9 Rizikové důsledky digitalizace byly výrazněji zvažovány snad jen v panelu Exploding Bentham's Scopic Regime: Does the Metaphor of the Panopticon Still Hold? jemuž předsedal Paolo Cordullo z Goldsmiths.
10 Burawoyova koncepce nebyla v sociálních vědách jednoznačně a nekriticky přijata. Řada autorů např. poukazovala na riziko ohrožení integrity sociálních věd, problém banalizace a deprofesionalizace vědy apod. Přehledově o kritice Burawoyovy koncepce srv. např. Lawrence T. NICHOLS (ed.), Public Sociology: The Contemporary Debate. New Brunswick – London: Transaction Publishers 2007.
11 Luc PAUWELS, „Visual Sociology Reframed: An analytical Synthesis and

poznámka s ohledem na množství institucí, periodik, monografií a antalogií věnovaných vizuálním metodám a studiu vizuální kultury zajisté výstižná, mezi vizuálně orientovanými sociálními vědci můžeme stále identifikovat silnou potřebu obhajovat oprávněnost existence samotné vizuální sociologie, přínos vizuálních metod a vizuálních způsobů reprezentace pro rozvoj sociologického poznání.[12] Zajímavé přitom je, že způsob této obhajoby se v mnoha ohledech nezměnil od doby zrodu vizuální sociologie na konci 70. let minulého století, což lze ilustrovat např. editorským úvodem Jona Wagnera k antologii Images of Information, jenž je de facto seznamem problémů a otázek, kterým musí vizuální sociologie

čelit, má-li se stát uznávanou součástí vědy. Jeho několikastránkovou argumentaci můžeme shrnout do jedné klíčové otázky: Za jakých okolností mohou být fotografie (či jiná vizuální média) zdrojem sociologického poznání?[13]

S drobnými formulačními rozdíly zazněla tato otázka z úst hlavních řečníků konference opakovaně zejména v rámci plenárních přednášek.[14] Douglas Harper v konferenci otevírající přednášce Terrible Beauty: the Public Eye of De-Industrialization představil svůj rozpracovaný soubor dokumentárně laděných fotografií z oblasti Monongehelia River Valley poblíž

Discussion of Visual Methods in Social and Cultural Research." Sociological Methods & Research, roč. 38, 2010, č. 4, s. 575.

[12] Příznačný je v tomto smyslu komentář Howarda S. Beckera: „Antropologové a sociologové používají fotografie od samého počátku jejich disciplín, avšak doposud se nebyli schopni dohodnout, jak a proč by vlastně měli fotografie používat. Zdá se, že my sociální vědci nějak cítíme, že je dobré fotografie používat, že to beztak každý dělá a my bychom neměli zůstat stranou. Avšak zároveň nejsme schopni vysvětlit sobě nebo komukoli jinému, proč by tomu tak vlastně mělo být." (Howard S. BECKER, „Photograhy as Evidence, Photographs as Exposition." In: KNOWLES, C. – SWEETMAN, P. (eds.), Picturing the Social Landscape: Visual Methods and the Sociological Imagination. London – New York: Routledge 2004, s. 193).

[13] Srv. Jon WAGNER, „Introduction: Information in and about Photographs." In: WAGNER, J. (ed.), Images of Information. Still Photography in the Social Sciences. Beverly Hills – London: Sage 1979, s. 11–22.

[14] V obdobném duchu se pak nesla diskuse k řadě příspěvků, kdy se často probíralo, do jaké míry je ten či onen výzkum sociologický a jaké sociologické poznání prezentované fotografie přinášejí. Tato diskuse byla výrazná např. nad příspěvkem The use of time-lapse photography in visual research: a rhythm-analysis of Billingsgate fish market, ve kterém Dawn Lyonová představila výzkum, jehož cílem bylo postižení senzorických aspektů a různých podob interakcí odehrávajících se na londýnském rybím trhu Billingsgate Fish Market. Výsledný krátký film složený ze série pravidelně pořízených fotografií podkreslených záznamem zvuku rovněž pořízeném v pravidelných intervalech je dostupný na <http://www.nowaytomakealiving.net/post/2332/> [cit. 15. 7. 2013].

Pittsburghu, prostřednictvím kterých se snaží dokumentovat lokální důsledky ekonomického kolapsu amerického ocelářství, přičemž na tomto příkladě přesvědčivě demonstroval, jak mohou fotografie vypovídat o sociálním a environmentálním úpadku dané lokality. Les Back v předposlední plenární přednášce nazvané Why do Sociologists take Photographs obhajoval sociologickou fotografii odkazem na Bourdieův způsob práce s fotografií a na příkladech jeho „alžírských" snímků ilustroval, jak fotografie vypovídají nejen o tom, co zobrazují, ale i o povaze Bourdieuovy sociologické imaginace. Caroline Knowlesová zakončila konferenci přednáškou nazvanou Uses of Photography in the Practice of Sociological Research, ve které se pokusila formulovat několik základních důvodů, proč fotografie podporují sociologickou imaginaci.[15]

Výše zmínění autoři tak do značné míry ignorovali letošní téma konference a místo toho měli potřebu obhajovat vizuální sociologii jakožto disciplínu, která má právo být součástí sociálních věd. Jejich obhajoba přitom měla povahu diskuse, která je příznačná pro období 70. a 80. let minulého století (zaměření pozornosti na fotografii zejména dokumentárního charakteru) a kterou dnes lze s ohledem na velké množství podobných úvah považovat za příslovečné nalévání starého vína do nových lahví.[16] Výše uvedená Wagnerova otázka je sice stále důležitá a aktuální, před jejím zodpovězením je však nutno hledat odpovědi na to, co jsme ochotni považovat za sociologické poznání, kde je hranice mezi vědou a ne-vědou a zda-li je tato hranice vůbec ještě podstatná. A právě v tomto duchu se v rámci téměř všech panelů odehrávala diskuse o důsledcích digitalizace, o nových technologiích a o participatorních a inovativních metodách.

Momentka třetí – experimenty, inovativní přístupy a nové „digi-

---

[15] Millsův koncept sociologické imaginace (srv. Charles Wright MILLS, Sociologická imaginace. Praha: SLON 2002) je mezi vizuálními sociology velmi oblíben a je často zmiňován jako argument pro obhajobu vizuální sociologie. Jinde Knowlesová píše: „Tím, že vizuální metody zachycují partikularity sociálních procesů, ilustrují obecné prostřednictvím jedinečného a objasňují vztah mezi těmito dvěma rovinami, jsou obzvláště vhodné pro rozvíjení myšlení, které Mills označil [...] jako ‚sociologickou imaginaci'." (Caroline KNOWLES – Paul SWEETMAN, „Introduction." In: KNOWLES, C. –

SWEETMAN, P. (eds.), Picturing the Social Landscape: Visual Methods and the Sociological Imagination. London – New York: Routledge 2004, s. 7.).
[16] Srv. např. Jon WAGNER, „Constructing Credible Images. Documentary Studies, Social Research, and Visual Studies." American Behavioral Scientist, roč. 47, 2004, č. 12, s. 1477–1506.

tální" lahve: Historií i současností vizuálních sociálních věd zajímavým způsobem proniká časté odvolávání se na experimentální povahu toho, co vizuální sociologové dělají. V této souvislosti Howard S. Becker již v roce 1979 v předmluvě k výše odkazovanému Wagnerovu sborníku poznamenal, "že do oblasti vizuálních sociálních věd vstupují lidé s odlišným zázemím, vzděláním a zkušenostmi a nutně tak provádějí velice rozmanité experimenty (téměř vše co v této chvíli uděláte je experiment) a rozsah nových nápadů, postupů a výsledků je v celkovém úhrnu velice vysoký."[17] Experiment zde má přitom význam zejména metodologického experimentu, kdy různé pokusy s využitím vizuálních metod a jejich případné nedostatky jsou legitimizovány právě poukazem na to, že se jedná o "pouhý" experiment. Toto platí výrazně právě i o diskusi o využívání nových digitálních technologií a o inovativních metodách.

Z hlediska tématu konference je přitom významné, že motivace pro experimentování s novými technologiemi a metodami je dána zejména snahou učinit sociální vědy a sociologické poznání přístupnější. A právě v tomto smyslu můžeme za řadou

příspěvků a následných diskusí rozpoznat Burawoyův koncept veřejné sociologie, a to jak v tradičním, tak v organickém smyslu,[18] přičemž příchod nových digitálních technologií posouvá současnou diskusi o veřejných vizuálních sociálních vědách za hranice diskuse 70. a 80. let: nové "digitální lahve" jsou totiž v mnoha ohledech plné "nového vína".

Z plenárních přednášek výše uvedenému nejvýrazněji odpovídalo vystoupení Bernda Kräftnera (Incubating a Syndrome – Crossmedial Sociology), který představil výzkumný projekt založený v ethnografickém výzkumu hranic vnímání jedinců s tzv. syndromem areaktivní bdělosti způsobeným zpravidla dlouhodobým komatem. Cílem projektu bylo dokázat, že i pacienti se závažnými poruchami vědomí jsou schopni reagovat na podněty z vnějšího okolí, pročež tým vědců vedený Kräftnerem pod hlavičkou neziskové organizace Research Center for Shared Incompetencies (shared.inc) vyvinul řadu experimentálních technik pro rozpoznání úsměvu na tvářích vybraných pacientů. Tento výzkumný projekt

---

[17] Howard S. BECKER, "Preface." In: WAGNER, J. (ed.), Images of Information. Still Photography in the Social Sciences. Beverly Hills – London: Sage 1979, s. 7.

[18] Jednoduše řečeno, tradiční přístup usiluje o zpřístupnění vědeckého poznání v rovině reprezentace vědeckého poznání, organický přístup pak prostřednictvím participatorních, dialogických a angažovaných přístupů zpravidla v rámci komunitně zaměřených výzkumů (srv. BURAWOY, "For Public Sociology," s. 7–9).

(stejně jako další projekty share.
inc) je bytostně mezioborový, vy-
chází z experimentálního míchání
různých metod a přístupů a jeho
nedílnou součástí je angažovaná
intervence do zkoumané reality,
tedy například proměna přístupu
k pacientům v komatózním stavu.
Výstupy z jejich projektů pak mají
multimodální povahu, zpravidla
kombinují text, fotografie, video,
kresbu, malbu, materiální objekty
a řadu interaktivních prvků.[19]

Obdobně laděných příspěvků
bylo možno zaznamenat v průběhu
paralelně probíhajících sekcí řadu:
např. diskuse v panelu Visual Me-
thods Revisited (předseda Luc Pau-
wels) byla zaměřena na promýšlení
teoretických a metodologických
výzev spojených s digitalizací a pro-
dukcí komplexních multimodálních
reprezentací v sociálních vědách.
Řada příspěvků pojednávala o ino-
vativních přístupech, jako např.
spoluautorský příspěvek Wendy
Martinové, Katy Pilcherové a Lese
Backa The Use of Visual Diaries to
Elicit Insights into Everyday Life,
ve kterém byl představen výzkum-

ných projekt zaměřený na postižení
povahy každodennosti lidí v důcho-
dovém věku, jenž byl metodologicky
založený na rozhovorech podpo-
rovaných fotografickými deníky.
Různí řečníci dále zvažovali např.
možnosti využití 3D vizualizací
(Lauren Leigh Hinthorne, Resear-
ching the Un-seeable Through 3D
Visual Representation: An example
from Papua New Guinea), mobil-
ních záznamových technologií typu
SenseCam, Subcam nebo Google
Glass (Jen Tarr, Power and ethics in
research with new mobile digital re-
cording technologies) nebo metody
tzv. digitálního vyprávění (digital
storytelling), které se věnoval ze-
jména panel Visual Methodologies
and Technologies.[20]

Teoreticky jsou inovativní pří-
stupy ukotveny v řadě přístupů,
přičemž výrazně byl zmiňován
např. vztah vizuálních sociálních
věd a STS (Science and Technology
Studies) a jedním z nejčastěji odka-
zovaných autorů byl Bruno Latour.[21]
Latourovou sociologií vědy byl in-
spirován např. panel Inventive Fu-

---

[19] Podrobnější informace o shared.inc lze
nalézt na webu této organizace (dostupné
z: <http://www.sharedinc.net> [cit. 15. 7.
2013]). Aktivity této skupiny jsou známé
i české veřejnosti, neboť v červnu a červenci
tohoto roku se v brněnské Galerii Art konala
výstava Collective Sensor, na které byly
představeny výstupy právě z projektu, který
Kräftner prezentoval na konferenci IVSA.

[20] V tomto panelu jsem vystoupil s příspěv-
kem The Craft of Digital Storytelling in
Social Sciences: Possibilites, Problems and
Proposals.

[21] Srv. Bruno LATOUR, „Poznání a vizu-
alizace aneb Jak myslet očima a rukama."
Teorie vědy, roč. 30, 2008, č. 3, s. 33–90;
Bruno LATOUR, Making Things Public.
Atmospheres of Democracy. Karlsruhe –
Cambridge – London: TKM –The MIT Press
2005.

333

tures for Visual Sociology: Visual Sociology meets Science and Technology Studies vedený Ninou Wakefordovou a Michaelem Guggenheimem z Goldsmiths nebo například panel On Mapping (předsedající Felipe Palma a David Moatse rovněž z Goldsmiths), ve kterém byly zvažovány zejména digitální možnosti produkce map jakožto specifického typu analytických vědeckých zápisů.

V souvislosti s inovativními metodami a novými technologiemi byla věnována velká pozornost participatorním metodám, které lze vnímat jako nejvýraznější naplnění organické podoby veřejné vědy. Vedle tradičních fotografií/filmem/videem podporovaných rozhovorů (photo-elicitation method) byla řada příspěvků věnována participatornímu a dialogickému potenciálu digitálních technologií. Např. Paolo Favero představil v příspěvku Learning to look beyond the frame: Reflection on the integration of GPS-tracking in visual ethnographic practice své výzkumné experimenty založené na propojování vizuálních metod s GPS technologií a stejně jako mnoho dalších řečníků naznačoval, že vizuální sociální vědy musí vykročit mimo tradiční vztah vědce a zkoumaného a mimo rám obrazu, tedy rozšiřovat vizuální rovinu reprezentace o další senzorické a interaktivní záznamy skutečnosti.

Momentka čtvrtá – Goldsmiths a budoucnost vizuálních sociálních věd: Letošní konference IVSA naznačila a potvrdila několik tendencí, které lze identifikovat ve vizuálních sociálních vědách přibližně od konce 90. let: směřování od vizuálních k multimodálním a multisenzorickým reprezentacím a posun od dokumentární a observační tradice vizuálních metod k participatorním metodám, sdílené produkci sociologického vědění a veřejné sociologii. Tyto dvě tendence tvoří (a zřejmě i v blízké budoucnosti budou tvořit) ústřední téma vizuálních sociálních věd. A právě v této souvislosti se letošní výroční konference IVSA příznačně konala právě v Goldsmiths, kterou lze považovat za jedno z center, kde jsou výše uvedené tendence výrazně podporovány. K rozvoji vizuální sociologie tak již řadu let přispívá konferenci pořádající CUCR.[22] Zdejší katedra sociologie a v jejím rámci založená výzkumná iniciativa Methods Lab[23] věnuje hlavní vědecké úsilí průzkumu možností a limitů vizuálních, senzorických a inovativních metod sociálněvědného výzkumu.[24] Na Goldsmiths již několik let

[22] Bližší informace viz web CUCR dostupný z: <http://www.gold.ac.uk/cucr/> [cit. 15. 7. 2013].
[23] Informace o této iniciativě jsou dostupné na <http://www.gold.ac.uk/methods-lab/> [cit. 15. 7. 2013].
[24] Mezi poslední výrazné publikační počiny tohoto pracoviště lze zařadit například knihu Les BACK – Nirmal PUWAR (eds.), Live Methods. London, Wiley-Blackwell 2013.

334

běží studijní program MA in Photography and Urban Cultures,[25] který bude počínaje nadcházejícím akademickým rokem 2013/2014 rozšířen o magisterský a doktorský studijní obor Vizuální sociologie (MPhil/PhD in Visual Sociology).[26] Ostatně toto výrazné směřování Goldsmiths k vizuálnímu a inovativnímu se odrazilo i v průběhu samotné konference, kdy tamější vědci předsedali patnácti tématickým panelům a přednesli více než třicet příspěvků v rámci paralelních sekcí.

Jestliže vizuální sociální vědy neměly a doposud nemají žádné centrum (spíše se jedná o řadu institucí, výzkumných týmů a jednotlivých badatelů roztroušených po celém světě), letošní výroční konference IVSA možná naznačila, že Goldsmiths má potenciál stát se klíčovou institucí vizuálně orientovaného výzkumu v sociálních vědách. Možná i v této souvislosti se bude na letošní konferenci vzpomínat jako na významný moment v historii vizuálních sociálních věd.

---

[25] Srv. web programu dostupný z: <http://www.gold.ac.uk/pg/ma-photography-urban-cultures/> [cit. 15. 7. 2013].
[26] Pro informace o tomto programu srv. <http://www.gold.ac.uk/pg/ma-visual-sociology/> [cit. 15. 7. 2013]. Obecně o vizuální sociologii na Goldsmiths srv. blog <http://visualsociologygold.wordpress.com/> [cit. 15. 7. 2013].

Struktura filosofie v pojetí Zdeňka Vašíčka

Zdeněk VAŠÍČEK, *Jak se dělají filosofie*. Praha: Triáda 2012, 240 s.

Petr Krása

Zdeněk Vašíček (1933–2011) ve své poslední (posmrtně vydané) knize *Jak se dělají filosofie* analyzuje obecný způsob konstrukce filosofií. Nezkoumá, co filosofie jsou, ale to, jak se tvoří, ačkoli tento jeho rozbor dává celkem dobrou představu, co si nakonec pod pojmem „filosofie" představit. Mnohé se o filosofiích čtenář dozvídá již z přehledu kapitol knihy, např. že sledují jazyk, jsou jazykem formulovány, musí respektovat celek, jsou charakteristickým způsobem konstruovány, pracují s pojmy, jsou předávány určitými médii a samy médium tvoří.

V úvodu práce autor čtenáři nabízí, že jeho knihu nemusí číst lineárně od začátku do konce, ale pořadí kapitol může náhodně volit. Prozrazuje, že v tom je zakódována zpráva, a sice, že se nevyhnul opakování (třebaže vždy v jiných souvislostech) (a to i celých pasáží z minulých děl),[1] že v knize zůstávají

---

[1] Srv. např. Zdeněk VAŠÍČEK, *Podmínky volby*. Praha: Triáda 2003, s. 119–139.

banality, bez nichž podle něho není konec konců možné nic pochopit. Podotýká, že jeho práce je rozvinutím stanoviska Fritze Mauthnera, že: „celá naše filosofie sestává více z jazyka než z rozumu [...]. Chybí nám doposud gramatika rozumu" (s. 7–8).

Filosofie pak autor představuje především jako jisté celky, které jsou vytvářeny jako celkové výpovědi o celku nějakých jsoucen. Mluvit o jedné filosofii je problematické, protože filosofie se člení na různé disciplíny (metafysika, etika, estetika a logika) a směry. „Všechny mají odlišné metody a předměty, každá si mele své – jakákoli superfilosofie je v nedohlednu" (s. 12). Přesto minimálně jejich struktura je podobná.

Jak tedy filosofii definovat, když desítky jejích vymezení si někdy odporují? Autor připomíná různá pojetí filosofie, např. u Nietzscheho, existencialistů nebo specifické chápání pojmu v běžném jazyce. Další analýzu staví na pojetí filosofie jako myšlení o myšlení: „To, co je všem filosofiím až dosud společné, je vystiženo podle mého soudu [...] tvrzením, že filosofie je myšlení o myšlení" (s. 15). Proto svou knihu považuje za pokus o meta-filosofii.

Chceme-li se zabývat tím, jak jsou filosofie utvářeny, vytváříme další myšlenkový celek, jenž představuje celek vyššího řádu, který patří do celku filosofie. „Filosofie

má tedy tu zvláštnost, že reflexe o ní je součástí jí samé" (s. 16). Vašíček v knize zkoumá, jak se filosofie vyjadřují, nikoli co vyjadřují. Proto se zaměřuje především na jazyk, kterým se vyjadřují, a na celek jako formu jejich výpovědí. Z toho samozřejmě plynou jejich charakteristiky.

Autor dále rozebírá obecnou slovní zásobu jazyka a jeho fungování. Zjišťuje, že základní slovní zásoba pracuje především s objektovými pojmy, které vstupují do vzájemných vztahů. V základě jazyka nachází jeho schopnost tvořit celky. Děje se tak především díky opozitům. Každodenní jazyk nelze oddělit od každodenního světa, celek světa je propojen se svým jazykem. Upozorňuje proto, že to, co víme o světě, je potřeba hledat ve struktuře jazyka, jímž se o něm vyjadřujeme. „Díky této vzájemné podmíněnosti (z níž lze usuzovat na obdobnou strukturu) můžeme prostřednictvím jazyka, podobně jako v zrcadle, byť i křivém, na každodennost alespoň nahlédnout. [...] Jazyk byl vynalezen ke komunikaci v celku a sám celek tvoří. Směřování k celku je v jazyku zakódováno" (s. 50).

Těmto tématům se autor věnoval již v dřívějších publikacích,[2] kde podobně rozebírá vztah celku

---

[2] Zdeněk VAŠÍČEK, *Obrazy [minulosti]: O bytí, poznání a podání minulého času.* Praha: Prostor 1996; VAŠÍČEK, *Podmínky.*

a jazyka, vztah mezi jazykem a mýtem apod., přičemž zjišťuje, že jazyk, mýtus a pojetí historie v podobě historické syntézy mají velmi podobnou strukturu, která odpovídá struktuře obrazu. Obraz Vašíček v základním pojetí vymezuje jako „reprezentaci většího množství objektů a jejich vztahů, kde – na rozdíl od příběhu – pořadí jejich recepce není jednoznačně předepsáno."[3] To dává tušit, že i filosofie je pro Vašíčka vlastně obrazem. Nasvědčuje tomu již zmíněné doporučení, jak číst jeho poslední knihu.

Celek jazyka podle Vašíčka představuje předobraz světa. Celek světa pak nachází své vyjádření v jednotlivých filosofiích, v nichž, protože jsou formulovány jazykem, můžeme sledovat základní podobnosti. Jako základní stavební kámen v nich autor nalézá binární opozice, které vytvářejí jejich prostor. Poukazuje třeba na to, že základní gramatická kategorie, jakou je číslo, „představuje významnou oposici, kterou např. Platon povýší na principiální protiklad Jedno kontra Dvojí a Mnohé" (s. 61). Soustavy opozic a negací dovolují filosofii vytvářet nové pojmy, otevírají možnost klasifikace a hierarchie, vyvozování důsledků z předpokladů atd.

Výstavba popisu světa začíná ve filosofiích často právě na základě soustav binárních opozic. Popis světa musí splňovat především požadavky celku, potom se můžeme zaobírat otázkou, co je možné o tomto celku říci. Objevuje se tím mimo jiné problém vztahu celku a jeho částí, vztahů mezi jednotlivými částmi celku, kde každá část může představovat další celek atd., objevuje se dynamika těchto vztahů, případně statičnost celku. Různé vědy mohou za celek považovat předměty svého zkoumání. Filosofie je zde v jisté nevýhodě, má-li se vyjadřovat o celku všeho. Autor naráží na problém definic celku, kterých může být více. Připomíná, že způsob, jakým k celku při jeho zkoumání přistoupíme, ovlivňuje to, co o tomto celku zjistíme. „Celek lze rovněž vymezit jako všechny vzájemné vztahy jednotlivostí (lze se vůbec vyhnout kruhové definici?). Záleží pak na výběru těchto vztahů a v tom případě nám hrozí jistá libovůle výběru z jejich počtu nebo závislost na jejich postavení v oposicích, universech, na jejich kategorisaci. Jestliže zvolíme vztahy subsumpce, nemůžeme než dostat hierarchii, což byla cesta starších metafysických systémů. Zvolíme-li časový sled, dostaneme diachronické uspořádání a zdůraznění

---

[3] VAŠÍČEK, *Obrazy*, s. 51. Jinde vymezuje obraz jako „soubor objektů a jejich vztahů, v němž z hlediska našeho zájmu nechybí nic podstatného, který je rozčlenitelný na diferencované části, jež musí navzájem, i jen zprostředkovaně, souviset, přičemž pořadí recepce těchto částí není jednoznačně dáno." – VAŠÍČEK, *Podmínky*, s. 123.

kontinuity, v případě synchronic-kých vazeb dospíváme ke kausalitě" (s. 91).

V praxi proto mohou existovat vzájemně se vylučující teorie či přístupy. Tak máme např. indi-vidualismus vs. holismus nebo idealismus vs. materialismus. Dal-ším problémem je, že pokud celek popíšeme, pak tento popis může být jeho částí, tedy ho měnit. Nelze dost dobře konstruovat do sebe uzavřený celek, systém nezávislý na okolí, bez instituce prvotního hybatele apod. Celek, pokud má své okolí, může s ním být v interakci. Je potom součástí vyšších celků. „Vlastností každé řádné filosofie je proto snaha vyjadřovat se o všem, a musí si tedy konstruovat jakýsi všeobjímající celek, v jehož rámci (se) může vypovídat. Na druhé straně můžeme poněkud zlomyslně říci, že nalezneme-li jazyk, ve kte-rém se můžeme vyjadřovat o všem, můžeme se nadít nějakého toho celku" (s. 99–100).

Jak známo, hledali takový jazyk např. Descartes, Leibniz a Komen-ský, kteří byli v podstatě přesvěd-čení, že pokud nalezneme dokonalý jazyk, poznáme dokonale řád světa. Otázkou ovšem je, zda tento řád do světa nevkládáme. Má-li ale filosofie popisovat všeobsahující celek, je zřejmé, že popisuje něco, o čem má na začátku jen mlhavé představy. Musí počítat s tím, že může existovat mnoho různých

popisů tohoto celku.[4] Ilustrací mohou být desítky pojetí pojmu Bytí. Četným pokusem, jak tento celek vymezit, byla ve filosofii snaha stanovit absolutní hranice tohoto celku.[5] Celek všeho lze myslet, nikoli poznat. „Vyšetřujeme pak totalitu myšlenou, nikoli svět jako totalitu. Takováto totalita je vlastně podmínkou naší zkušenosti – a jak ji potom zkoumat? Přitom musíme ale tuto myšlenkovou práci zahrnout do totality skutečnosti – zavádějící a nepříjemné" (s. 124).

Dalším znakem filosofií, který Vašíček zkoumá, je jejich uvažo-vání v pojmech. Problémem je zde samotný pojem pojmu. Pojmy se snaží zachytit základní vlastnosti jimi popisovaných jevů, celků. Ve vztahu k celku to znamená, že

---

[4] Zde opět Vašíček nalézá ve filosofii podob-nost o obrazem. „Obraz je totiž obrazem proto, že připouští vždy možnost více inter-pretací, není a nemůže být jednoznačný" (s. 104).

[5] „Tak máme Platonovo Dobro, Aristotelova Hybatele, Původce, Stvořitele, tomistického Boha, Descartovu absolutní a Spinozovu nekonečnou substanci (*Deus sive natura*), Schellingův absolutní Rozum (jako sply-nutí Přírody a Ducha, Objektu a Subjektu), Hegelův absolutní Duch, Okenovo Absolutno. Rovněž Jedno (*hen*) – (slučující jedno/jiné a látku/formu) – je charakteri-zováno jako jediné, věčné, nekonečné, ne-měnné a nedělitelné. Obdobnou roli mohou hrát i totalita, vše, vesmír, svět, universum, příroda. Tyto postuláty mají funkci výcho-zího bodu, absolutní jistoty, konce regrese *ad infinitum*, bohužel za cenu prázdnoty či nepostižitelnosti" (s. 122).

pojem je určován celkem a naopak. Ustavováním vztahů mezi jednotlivými pojmy se potom můžeme vyjadřovat o platnosti či neplatnosti výpovědí. Setkáme se samozřejmě s různými významy jednotlivých pojmů v různých filosofiích. „Jestliže někdo jiný tvrdí o témže něco jiného, pak si patrně stanovuje jiný rámec [...]. Abychom se dohodli, museli bychom předpokládat další rámec rámců, jakési meta-metateorie" (s. 135).

Původ pojmů nachází Vašíček především v metaforičnosti přirozeného jazyka. Zpřesňování pojmů může vést k abstrakcím a ideálním typům, kterým v realitě nic neodpovídá. Co potom ale poznáváme a co filosofie popisují? „Je-li takový pojem skutečně základní, nemůže mít už pojmovou referenci, může být jen odkazem na vzájemně sdílené představy založené na společné zkušenosti – a ty jsou obvykle popsatelné jednoduchým jazykem každodennosti" (s. 145). Jsme-li navíc my sami součástí celku, pak se tvrzení o něm vztahují také na nás. Vašíček správně připomíná, že s popisy světa a návody k jeho používání se setkáváme již v rámci naší socializace. „Chováme se podle své deskripce, nebo popisujeme své chování?" (s. 163).

Z faktu, že filosofie něco vyjadřují, vyplývá nutnost zkoumání zásad logiky a argumentace. Filosofie se nedějí ve vzduchoprázdnu,

ale jsou přenášeny určitými médii, která se historicky mění. Mění se formy těchto médií (ústní podání, odborný článek), mění se postavení vypovídajících, mění se také materiál médií (svitek, elektronická informace). Samy filosofie jsou samozřejmě zároveň také médii. To vše se vzájemně ovlivňuje (v neposledku bychom mohli do těchto úvah připojit také společenské změny), působí na realitu, tyto důsledky se zpětně odrážejí v našem obraze světa.

Ve Vašíčkově pojednání, které představuje meta-filosofii jako obraz,[6] celek a soustavu binárních opozic, se tak setkáváme se zacykleností, ze které na ty, kdo by chtěli filosofii dělat, může dopadat marnost takového počínání. Z jeho výkladu plyne, že se pohybujeme ve strukturách (jazyka, pojmů, teorií), které se vzájemně předpokládají a dokazují.[7] Kniha tak vyúsťuje v otázku vlastně klasickou: Poznáváme svět takovým způsobem, jakým existuje, nebo pro nás existuje takovým způsobem, jakým jej poznáváme? Každé poznání z velké části vychází z reflexe poznání předchozího. Má tato spirála někde konec? Filosofie tak kladou při odpovědích na základní otázky mnoho dalších otázek. Ostatně sám

---

[6] Což vysvětluje a zároveň předpokládá mnohost jeho interpretací, čili jednotlivých filosofií.
[7] Zde je zřejmě třeba hledat základy oné gramatiky rozumu.

Vašíček na mnoha místech knihy upozorňuje na problémy, které se filosofii dosud nepodařilo vysvětlit, ačkoli se o to musí pokoušet. Každý takový pokus představuje objevení dalších problémů a nutnost dalších zkoumání. „Takže: jediný způsob, jak zjistit, co filosofie je, je ji dělat" (s. 213), uzavírá knihu citací Russela.

Je vysoce pravděpodobné, že na velkou řadu základních otázek se nám nikdy nepodaří najít odpovědi. Přesto však Vašíčkova analýza konstrukce filosofií přináší jistou útěchu: „Sama filosofie se ocitá v roli média, totiž média výchovy k *virtus* (k ní patřila i schopnost formulovat a obhájit své postoje a tvrzení), tedy k ideálu občana" (s. 195), pokud je v ní ovšem toto stále přítomno (a nestává se prázdnou učeností). Domnívám se, že ano, že filosofie kultivuje naše pobývání ve světě, jakkoli je v dnešní postmoderní podobě vystavena mnoha vlastním problémům. Je tedy na místě k Vašíčkově otázce „jak" připojit otázky, kterým se v textu, jak sám upozorňuje, nevěnuje. Otázky „proč" a „nač".

///// recenze ///////////////

Přínos renesančních učenců historiografii matematiky

Robert GOULDING. *Defending Hypatia: Ramus, Savile and the Renaissance Rediscovery of Mathematical History*, New York: Springer, 2010, 201 s.

Dagmar Zajíčková

Gouldingova kniha *Defending Hypatia: Ramus, Savile and the Renaissance Rediscovery of Mathematical History* (2010) je snahou ukázat, že různá pojetí dějin vědy, především matematiky, existovala už v období renesance, a nejedná se tedy o oblast, jež zaznamenala rozmach až během osvícenství, které je běžně ztotožňováno se vznikem a rozvojem této vědecké disciplíny. Mnozí historikové považují za první skutečný výklad dějin matematiky dvousvazkové dílo *Histoire des mathématiques* (1758), jehož autorem je francouzský vědec a matematik Jean-Étienne Montucla (1725–1799). Montucla dějiny matematiky chápal jako rozvoj lidského ducha a byl přesvědčen, že v matematice docházelo postupem času ke změnám a pokrokům, které byly totožné s pokroky lidského ducha.

Hlavním záměrem Gouldingovy knihy je snaha dokázat, že

práce z dějin matematiky existovaly už před Montuclovými *Histoire des mathématiques*, a že i ony si zasluhují naši pozornost. Goulding se domnívá, že výklady dějin matematiky lze nalézt i v renesanci, a že renesanční matematici věnovali pozornost rozvoji této vědy, jejímu pokroku i úpadku. Podle Gouldinga to byli právě renesanční humanisté, kteří významně přispěli k historiografii matematiky, a z nichž jsou nejvíce známí Federico Commandino (1509–1575) a Bernardino Baldi (1553–1617). Kniha má být, podle autorových slov, „studiem renesanční historiografie matematiky a také přínosem pro institucionální dějiny matematiky" (s. xii). Goulding se zaměřuje především na dva autory, kterým podle něho není v současné historiografii vědy věnována dostatečná pozornost. Prvním z nich je francouzský matematik Petrus Ramus (Pierre de la Ramée, 1515–1572), jehož přínos jako historika vědy je podle Gouldinga opomíjen, přestože z jeho prací čerpali Baldi i Commandino. Druhým významným vědcem a historikem vědy, jemuž Goulding věnuje část knihy, je anglický matematik Henry Savile (1549–1622), který na Ramovy práce reagoval. Kniha je rozdělena na dvě velké části, z nichž každá obsahuje několik podkapitol.

První část tvoří čtyři kapitoly, z nichž ta úvodní je věnována původu a rozvoji historických pojednání o vzniku a vývoji matematiky a přenášení této vědy z kultury na kulturu. Za důležitý zdroj pro renesanční dějiny matematiky považuje Goulding výklad dějin matematiky, který předložil řecký historik Diodorus Siculus (1. stol. př.n.l.) ve svém díle *Bibliotheca historica.* Podle Gouldinga byl Diodorus, podobně jako mnoho ostatních řeckých historiků, fascinován starověkým Egyptem a domníval se, že matematiku vynalezli egyptští kněží, kteří svůj volný čas věnovali matematice a jejímu zdokonalování. Židé a Babylóňané byli podle Diodora vysláni z Egypta jako kolonisté, a Chaldejci, národ s dokonalými astronomickými znalostmi, byli egyptští kněží přestěhovaní do jiné země. Řekové pak vědu zdědili od Chaldejců. Za další důležitý zdroj, z něhož čerpali renesanční historikové matematiky, považuje Goulding Flaviův (37/38 – asi 100) příběh o původu židovského národa a také matematiky, jíž Židé podle Flavia vynalezli. Autor se v této části knihy věnuje ještě dalším důležitým osobnostem, jakými byli mimo jiné například řecký novoplatónský filosof Proklos (412–485), který ve svém *Komentáři k první knize Eukleidových Základů* nastínil dějiny matematiky, jež vyvrcholily napsáním Eukleidových *Základů*, nebo Johannes Regiomontanus (1436–1476), jenž se také věnoval dějinám matematiky od období sta-

341

rověku až do své doby. Podle Goulldinga renesanční autory spojoval především hon za nalezením praprůvodní ztracené moudrosti bibliclkých patriarchů v období před potopou (*prisca sapientia*), o níž hovořili ve svých dílech Flavius, Diodorus a ostatní řečtí historikové. Goulding upozorňuje na to, že v dochovaných dílech tohoto typu nalézáme pouze chaotický a nejasný výklad. Autor v knize předkládá možnosti, jak se renesanční vědci s těmito obtíllžemi vypořádali. Buď se zaměřili na užitečnost věd nebo si osvojili platónský pojem „přirozenost matemlmatiky", případně kombinovali oba způsoby, jako například Girolamo (Geronimo) Cardano (1501–1576) (s. 18). Zde autor také uvádí, že právě Ramus a Savile, jimiž se kniha předlldevším zabývá, předkládají dvě odllišné verze dějin matematiky, které inklinují k jednomu nebo druhému způsobu výkladu.

Druhou kapitolu autor věnuje vývoji prvotních Ramových názorů na matematiku a její dějiny, které předložil v práci *Dialecticae institutiones* z roku 1553, a pak také Ramovu pojetí dějin matematiky a jeho dílům *Arithmetica* z roku 1555 a *Prooemium mathematicum*, které bylo vydané v roce 1567. Goulllding se domnívá, že právě *Prooemium mathematicum* mělo největší vliv na dějiny matematiky, a to až do doby, kdy byly publikovány Monltuclovy *Histoire des mathématiques*.

Goulding v této kapitole nejprve stručně popisuje Ramovu *Dialecticae institutiones*, a poté se dostává k výkladu Ramových dějin matemaltiky, v němž pokračuje i v další kapiltole. Podle autora Ramus věřil Flaviloovu příběhu o původu věd, podle něhož se o největší rozvoj matemaltiky zasloužili bibličtí patriarchové v období před potopou. Teprve po potopě, když se znovu obnovilo lidstvo, se věda šířila k Egypťanům, Řekům, Italům, Arabům, a dalším, a nakonec k Francouzům. Goulllding u Rama objevuje snahu najít kompromis mezi Flaviovým vyprállvěním o původu věd a nezpochybllnitelnými úspěchy řeckých matemaltiků (s. 29). Autor na tomto místě vyvrací možnou domněnku, že by Ramus mohl Flaviův příběh odmítllnout, že by mohl nesouhlasit s předllstavou, že Adam a s ním i první lidé měli nejdokonalejší znalosti v oblasti matematiky. Místo toho si Goulding všímá Ramova hodnocení úspěchů řeckých matematiků, a Euklleidových *Základů,* které považolloval za dílo, v němž byla obsažena všechna matematická fakta, která dali dohromady jeho předchůdci.

Ve třetí kapitole autor pokrallčuje ve výkladu Ramových dějin matematiky, se kterým začal už v předcházející části. Svoji interllpretaci zde opírá o díla *Prooemium mathematicum* z roku 1567 a jeho rozšířenou verzi *Scholae mathemallmaticae*, která vyšla v roce 1569.

Goulding se opět navrací k Flavi- ově představě o původu vědy, kte- rou byl podle jeho názoru Ramus inspirován. Od zkoumání původu matematiky a jejích dějin přechází autor k Ramově kritice řecké vědy. Domnívá se, že v průběhu psaní svých prací byl Ramus stále méně a méně okouzlen řeckou matema- tikou a řeckými matematiky. Au- tor se v této kapitole z velké části věnuje Ramovu nejasnému názoru na Platóna. Podle Gouldinga Ra- mus přešel od chvály v první části svého *Prooemia* až ke kritice a obvi- nění Platóna z úpadku matematiky, ve druhé části knihy. Jako jednu z hlavních příčin této kritiky pova- žuje Goulding to, že Ramus vkládal do Platóna naději, že znovu obnoví a ustaví původní, ztracenou mate- matiku z období před potopou, a on místo toho tuto příležitost promar- nil (s. 46). Goulding se domnívá, že dokonalá matematika z období před potopou byla podle Rama jed- noduchá a dostupná všem, a Platón, místo toho, aby tuto jednoduchost obnovil, zahalil matematiku do fi- losofických nejasností. Toto je podle autora hlavní bod Ramovy kritiky řecké matematiky a Platóna přede- vším, neboť v jeho pojetí se mate- matika stala složitou a dostupnou pouze vyvoleným.

Centrální postavou čtvrté ka- pitoly je anglický matematik Henry Savile. Autor v této části knihy ho- voří především o Savilově životě,

vědecké práci a jeho přednáškách z matematiky a astronomie, a také o Savilově reakci na Ramovo dílo. Na tomto místě je důležité zdů- raznit, že veškerá Savilova práce se dochovala pouze v rukopisech, které Goulding studoval a mohl tak prostřednictvím této knihy sezná- mit čtenáře s dosud neprobádaným dílem tohoto renesančního mate- matika. Goulding se domnívá, že Savile čerpal z Ramova *Prooemia*, ale nesdílel Ramův názor na účel a hodnotu matematických věd. Au- tor také tvrdí, že Savile přejímal Ra- movy myšlenky a názory a poté je otáčel proti němu, nicméně nachází společné rysy v pojetích obou vědců. Například oba matematici se snažili bránit matematiku před obviněním z obtížnosti a nejasnosti, i když ka- ždý jiným způsobem. Za hlavní roz- díl v přístupu obou vědců považuje autor snahu každého z nich zaměřit se na odlišnou část matematiky. Za- tímco Ramus se podle Gouldinga vě- noval především praktické stránce matematiky a užitečnosti této vědy, Savile svůj zájem soustředil na te- oretické aspekty. Oproti kapitolám věnujícím se Petru Ramovi a jeho myšlenkám se tato daleko více za- měřuje na Savilův život a na institu- cionální prostředí, v němž působil, což mnohdy zastiňuje informace, které by podle názvu jednotlivých kapitol měly být klíčové. Práce s pů- vodními Savilovými rukopisy po- skytovala Gouldingovi daleko širší

343

potenciál pro zpracování této části knihy, který ale zůstal nevyužit.

Pátá a šestá kapitola se věnují Eukleidovi a jeho *Základům*. V páté kapitole Goulding analyzuje dobové prameny a poukazuje na to, že v minulosti docházelo k dohadům a nejasnostem okolo Eukleida. Domnívá se, že mnozí vědci a matematikové zaměňovali Eukleida (325 př.n.l.–260 př.n.l.), autora *Základů*, za Eukleida z Megary (450 př.n.l.–370 př.n.l.), Sókratova žáka a stoupence jeho filosofie. Goulding zde ukazuje, že renesanční historikové matematiky, včetně Petra Rama i Henryho Savila, si uvědomovali problémy související se snahou určit autora *Základů*. A nejen tito dva matematici si všimli chybného ztotožnění Eukleida, autora Základů, a Eukleida z Megary, sókratovského filosofa. Goulding považuje právě Petra Rama za prvního, kdo odhalil správnou totožnost autora *Základů*.

Šestá kapitola se týká samotných Eukleidových *Základů* a nejasností spojených s jejich autorstvím. Renesanční vědci se podle Gouldinga domnívali, že *Základy* mají dva autory, jedním z nich je Eukleidés, řecký matematik a geometr, a druhým je řecko-egyptský matematik Theón (335–405). V této části knihy autor ukazuje odlišné pozice, které zastávali Ramus a Savile, přičemž oba ve svých výzkumech čerpali Z Proklových *Komentářů*

k první knize Eukleidových *Základů*. Goulding tvrdí, že pro Rama Theón nebyl pouze tím, kdo *Základy* sestavil dohromady a vydal, ale jeho role byla daleko významnější. Ramus podle Gouldinga předpokládal, že Eukleidés byl autorem teorémů a Theón důkazů. Savile s Ramovým tvrzením nesouhlasil, nepovažoval Theóna za autora *Základů*, a svá zkoumání uzavřel tím, že i když Theón nebyl autorem *Základů*, byl vynikajícím vědcem a matematikem. Autor knihu uzavírá zajímavou Savilovou úvahou a také asociací *Základů* s příběhem Theónovy dcery, matematičky Hypatie.

Kniha Roberta Gouldinga *Defending Hypatia: Ramus, Savile and the Renaissance Rediscovery of Mathematical History* je originálním zpracováním téměř neprobádaného tématu. Goulding zprostředkoval čtenářům koncepce dějin matematiky nejen dvou autorů uvedených v názvu knihy, naopak, snažil se o zařazení Rama i Savila do dobového i institucionálního kontextu. Bez povšimnutí tak nezůstali ani ostatní více či méně známí renesanční vědci a matematikové a jejich práce a také zdroje, z nichž čerpali. Kniha je velkým přínosem pro historiografii vědy a je prvním a dosud jediným podrobnějším zpracováním nejen renesančních dějin matematiky jako celku, ale především práce dvou matematiků, jimž se dosud nikdo podrobněji nevěnoval.

///// recenze ///////////////

Kniha o obrazech, které opustily svůj rám

Kateřina SVATOŇOVÁ, *Odpoutané obrazy: archeologie českého virtuálního prostoru*. Praha: Academia 2013, 344 s.

Josef Vojvodík

> ... je to tedy pouze „obraz", je to, ať se sebevíc jeví, „nic".[1]

Když Andy Warhol vysvětluje motivaci své instalace *Silver Clouds* z roku 1966, říká, že chtěl zanechat malování a místo toho dělat filmy, a uvažoval, „že musí být nějaká cesta, jak s tím skončit, a myslel jsem si, že jediná cesta je udělat obraz, který lítá [...]. A ten nápad je, naplnit je héliem a pustit je z okna a ony potom uletí. A tím je o objekt [...], který tady stojí, míň. A to je potom [...], no jo, způsob, jak nechat malování a [...]". O obrazech a obrazových fenoménech, jež překračují a opouštějí tradiční kategorii a funkci obrazu jako plošného a artificiálního předmětu, určeného ke ztvárnění a vizuální

recepci reálných nebo fiktivních obsahů, pojednává nyní kniha Kateřiny Svatoňové, vydaná nakladatelstvím Academia. Je pozoruhodným a problémově bohatým příspěvkem nejen k teorii a „archeologii" médií a k diskusím o realitě obrazu, ale také k poznání specifik českého iluzivního a virtuálního prostoru, dosud stále nedostatečně prozkoumaného. V době omniprezence obrazu kniha Kateřiny Svatoňové ukazuje, že není vždy snadné a jednoznačné určit, co ještě obraz je či není, neboť existují objekty, které jako obrazy primárně nevnímáme a přesto jimi jsou a naopak existují objekty a věci, které na první pohled jako „obrazy" vypadají, aniž by jimi ve skutečnosti byly. Jestliže autorka „odpoutané obrazy" charakterizuje jako takové, jež opouštějí svůj rám, dotýká se jednoho ze základních určení obrazu, kdy rám (ať skutečný nebo fiktivní) funguje jako dispozitiv, umožňující obraz vnímat právě jako obraz, tedy jako *ohraničenou* plochu, odkázanou na určitého materiálního nositele. Také projekce, pro něž tento dispozitiv zdánlivě neplatí (např. IMAX apod.), mají své hranice, na které divákův pohled naráží.

Pojem „odpoutané obrazy" se vztahuje na obrazy, osvobozené od dosavadních struktur své produkce i recepce, od svého „nositele" (plocha, okno, rám atd.), odpoutávající se od zákonitostí centrální perspektivy a geometrického vidění,

---

[1] Edmund HUSSERL, Phäntasie, Bildbewusstsein, Erinnerung. Zur Phänomenologie der anschaulichen Vergegenwartigungen. Texte aus dem Nachlass (1898–1925). Husserliana XXIII. Den Haag: Martinus Nijhoff 1980, s 46.

od vžitých a petrifikovaných norem, a konstituující virtuální prostor. Kateřina Svatoňová je specifikuje jako decentralizované, dislokované, fragmentární, pluralizované, diskontinuální a jejich vytváření velmi úzce souvisí s proměnami pojmu reality a s tím, co by bylo možné nazvat „experimenty se skutečností". Rozlišuje *vnější* odpoutané obrazy, které se buď fragmentarizují nebo vytvářejí „všeobklopující celek", produkované většinou technicky, a *vnitřní* mentální obrazy.

Zkoumání fenoménu „odpoutaných obrazů" a virtuálního prostoru, v němž se realizují, je v knize Kateřiny Svatoňové strukturováno čtyřmi hlavními kategoriemi: *myslí, percepcí, odpoutaným obrazem, prostorem.* Metodicko-teoreticky je kniha postavena na kombinaci několika přístupů a hledisek, umožňujících mezioborovou analýzu „odpoutaných" a „odpoutávajících se" obrazů, konkrétně intermediálně-technický přístup, psychologicko-neurologický, kulturně-filozofický a kulturně-historický přístup. Přínos zvolené kombinace rozdílných metodicko-teoretických přístupů spočívá v tom, že umožňuje adekvátní přístup k fenoménu polydimenzionality obrazu, pikturální dimenze pohledu, obrazového prostoru / prostoru obrazu, a zároveň k *myšlení* o obrazech a *v* obrazech jako specifické mentální operaci „ve sféře fikce" (Husserl).

Autorka však nevychází pouze z prací teoretiků médií, obrazu a vizuality jako William J. T. Mitchell, Rudolf Arnheim, Jonathan Crary, Oliver Grau, Siegfried Zielinsky, Friedrich Kittler, Georges Didi-Huberman, Mieke Balová, Anne Friedbergová ad., ale invenčním způsobem využívá a pro své zkoumání zhodnocuje uvažování fenomenologů jako Alfred Schütz i badatelů z oblasti fenomenologicko-antropologické psycho(pato)logie vnímání jako Erwin Straus, Eugène Minkowski, Ludwig Binswanger nebo Svetozar Nevole, jenž ve čtyřicátých letech 20. století rozvíjel svébytnou fenomenologii iluzivního vnímání, předznamenávající v nejednom aspektu současné uvažování o pronikání do virtuální skutečnosti, hyper-reality atd. Za podnětnou považuji v její knize také aktualizaci teorie aperspektivity historika kultury Jeana Gebsera z jeho proslulé, třebaže dnes již historické práce *Ursprung und Gegenwart* (1949/1953), která je v českém prostředí téměř neznámá.

Jako jeden z cílů své knihy zdůrazňuje Kateřina Svatoňová „proniknout do divákovy mysli, která je odpoutaným obrazům vystavena". Ve svých přednáškách o fantazii a obrazovém vědomí (Husserliana XXIII) uvažuje Husserl o paradoxní podvojnosti obrazu, která spočívá v podvojné viditelnosti obrazu: obraz je sice viditelný jako „fyzický

objekt" a „obrazový objekt", existující v času a prostoru, zároveň je mu však vlastní specifická irealita, neboť „obrazový objekt je fiktum, [je] objektem vnímání, ale zdánlivým objektem" (Scheinobjekt). To znamená, že obraz se „vyjevuje", ale má charakter neskutečnosti a je ve sporu s aktuální přítomností.

Samotný metaforický pojem *odpoutání* evokuje fenomenologickou *epoché* ve smyslu zpochybnění a „neutralizaci" samozřejmého postoje ke skutečnosti tzv. přirozeného světa. Proto věnuje Kateřina Svatoňová v poslední 5. kapitole pozornost „vnitřním odpoutaným obrazům" a „subjektivním jevům optickým" Svetozara Nevoleho a jeho uvažování o možnostech vytváření a vnímání obrazů, odpoutávajících se od svého kontextu. Tyto obrazy mají charakter imaginativní variace, jež je specifickou formu anomalizace. Tento „nepřirozený postoj", jako specifický výkon fenomenologické reflexe,[2] tvoří zároveň podstatu anomalizace a narušování kontextu v Nevoleho experimentech.

Kateřina Svatoňová upozorňuje na podstatnou skutečnost, že dnešní média a jejich zacházení s obrazy se opět pokoušejí obraz, který opustil rám, znovu zarámovat a „spoutat", virtuální prostředí svazovat mřížkou perspektografu a konvencemi

původně renesančního centrálně perspektivického myšlení. Dnešní technologie a média připouštějí skutečnost (i virtuální) jen pokud je pro běžného vnímatele představitelná, mediálně přenosná a v této redukované podobě také digitálně manipulovatelná.

Poněkud vypointovaně by se dalo říci, že *vnější* odpoutané obrazy, produkované komunikačními médii mohou technicky inscenovat hyperrealitu, ale právě *jen* inscenovat (až k čistě zábavnímu efektu) v závislosti na smyslovém vnímání, pohybu těla atd. *Vnější* „odpoutané" obrazy mohou být nositelem „estetického zdání"; v jejich případě jde, jak Kateřina Svatoňová píše, také o hledání ve specifickém smyslu „ideálního" nebo přinejmenším alternativního prostoru a obrazu světa. Polyvizuální a polymediální instalace československých pavilonů na EXPO'58 a '67 pod heslem „Bilance světa pro svět lidštější" ('58), program *Zrození světa* ('67; Josef Svoboda, Alfréd Radok) ad. mají zároveň společensko-politickou nebo přímo ideologickou implikaci. Samotné realizace těchto vnějších „odpoutaných" obrazů, jimiž se autorka zabývá v kapitole „Technický fragmentárně-imersní prostor: sítě, jež si spolu hrají", jsou ovšem ambivalentní: na jedné straně měl být nejmodernějšími technologiemi simulován co nejkomplexnější obraz ve všech ob-

---

[2] Edmund HUSSERL, Logická zkoumání II/1. Praha: OIKOYMENH 2010, s. 25.

lastech tzv. rozvinuté socialistické společnosti a světa socialistické skutečnosti, jehož rozvoj přestal být utopií, na druhé straně znamená samotné zmnožení a fragmentarizace obrazů, myšlenka polyvizuality atd. kritiku totálního a totalizujícího obrazu totalitního systému. Heterogenita je postavena do opozice k homogenitě (obrazu) světa. Třebaže tento typ (postmoderních) obrazů operuje s fragmentem, je pro něj příznačné, jak Kateřina Svatoňová ukazuje, směřování k celistvosti, k typu multimediálního „Gesamtkunstwerku".

Pohled člověka není *jen* intuitivní, je zároveň reflexivní, „klamaný" ovšem příslibem, který vzbuzuje jeho žádostivost. Dalo by se říci, že to je v jistém smyslu také efekt „odpoutaných obrazů"; žádostivost je vedena touhou vidět--poznat, co je „za nimi", chce je „odhrnout" jako imaginární závěsy. Co se však za nimi skrývá, je past klamné reprezentace, neboť jejich podstatou je subverzní, desorganizující, anamorfotický princip.

Fenomenologie vnitřních „odpoutaných obrazů", kterou Kateřina Svatoňová rekonstruuje ve zmíněné poslední kapitole své knihy, je především fenomenologií určitého *stavu*, v němž se fenomenolog zdrží všech úsudků o reálných skutečnostech a pohybuje se v oblasti čirých možností. V tomto stavu se reálný svět stává fenoménem světa. Tato

myšlenková operace předpokládá ovšem „zničení světa" (*Weltvernichtung*) a dosažení stavu transcendentální subjektivity, pro kterou neexistuje už žádné „tam venku". Erwin Straus, k jehož fenomenologicko-antropologické psychologii a psychopatologii vnímání se Kateřina Svatoňová vztahuje, zdůrazňuje již ve své významné práci *Vom Sinn der Sinne* z roku 1935: „realita světa zůstává jako objasněná a prokázaná problematickou. Vnější svět je zprostředkovaný, sekundární, vnitřní svět evidentní, bezprostřední, primární".[3] Imaginativní variace mají – zde konkrétně u Nevoleho – charakter fascinujícího, třebaže riskantního experimentování. Nevole usiloval o proniknutí do takových stavů – a o jejich poznání -, v nichž smyslově vnímatelný svět pozbyl charakter skutečnosti. Mezi experimentálně vyvolanými a patologickými zkušenostmi existuje určitá podobnost, jak ukázal již Kurt Goldstein,[4] pokud svět ve specifickém smyslu izolujeme, tedy „uzavřeme" jako výzkumnou laboratoř.

V souvislosti s vnitřními „odpoutanými obrazy" Nevoleho experimentů uvažuje Kateřina Svatoňová o Teigeho teorii vnitřního modelu,

[3] Erwin STRAUS, Vom Sinn der Sinne. Berlin: Springer 1956, s. 374.
[4] Kurt GOLDSTEIN, Der Aufbau des Organismus. Den Haag: Martinus Nijhoff 1934.

kterou Teige promýšlel v časové koincidenci s Nevoleho uvažováním a jeho experimenty. Teorie vnitřní formy, vnitřní zkušenosti, vnitřního modelu, vnitřního obrazu zaujímá důležitou pozici v estetice a filosofii dvacátých až čtyřicátých let 20. století. Na tomto místě bych připomenul jen pozoruhodnou antropologii vnitřní zkušenosti Schelerova a Husserlova žáka Paula Ludwiga Landsberga, který zdůrazňuje nezbytnost „niterné praxe" lidského bytí, která je však především námahou a pokorou, bez níž není pravé sebepoznání možné: „Niternost vnitřní zkušenosti tkví tedy především v tom, že život, který je konkrétním subjektem vší zkušenosti, nevychází ze sebe ven k nějakému ‚předmětu', nýbrž setrvává v sobě a chápe sebe skrze sebe sama. [...] proces vnitřní zkušenosti je sám toliko částí celkové seberealizace, během níž se personální subjekt stává ryzejším, zaměnitelnějším a samostatnějším, *niternějším* dokonce sám vůči sobě. Nezůstává jen sám u sebe, nýbrž se ubírá ‚tajuplnou cestou' sebeuskutečňování a humanizace".[5]

Kniha Kateřiny Svatoňové je pozoruhodnou událostí: nejen proto, že přináší velké množství poznatků, jež autorka vřazuje do nových souvislostí, že seznamuje s řadou

koncepcí z teorie médií, z filosofie umění, vizuálních studií a psychologie vnímání, z nichž mnohé jsou v českém prostředí téměř neznámé. Její kniha není jen *arche(o) logií* ve smyslu odkrývání nánosů a vrstev s cílem proniknutí k *archē* jako základu, podstatě, počátku českého virtuálního prostoru, jak čteme v jejím názvu. Její uvažování o „odpoutaných obrazech" se dotýká aktuálních problémů a otázek teorie vizuality, obrazu, mediality. Že obrazy mohou, jsou schopny *něco* ukazovat, je nezpochybnitelné. Otevřeným problémem zůstává, co naznačuje citát Maurice Merleau-Pontyho, jímž autorka otevírá první kapitolu své knihy: „Není nic těžšího než vědět, co vlastně vidíme". Také obrazy disponují (podobně jako řeč) logickou formou; již proto má pojem „arche*ologie*" v názvu knihy své opodstatnění, třebaže s ním autorka pracuje v přeneseném významu. Ludwig Wittgenstein k problému logické formy obrazu v *Traktátu* (2.172) poznamenává, že svoji formu zobrazení nemůže obraz zobrazit: „prokazuje ji" („es weist sie auf"). A stejně tak se obraz vzpírá diskursivní analýze. Viditelné zůstává záhadou a uvažovat o obrazech, znamená uvažovat souběžně o neviditelném, nezobrazitelném a neztvárnitelném. Obraz, jak píše Dieter Mersch, vydává svoji vlastní medialitu unikání (*Entzug*). Je to medialita, jež zůstává ve sféře

[5] Paul Ludwig LANDSBERG, Einführung in die philosophische Anthropologie. Frankfurt am Main: Klostermann 1934, s. 9.

neviditelného.[6] Není náhodné, že fenomén „hyperstereoskopie" je posledním slovem knihy Kateřiny Svatoňové: knihy, jejímž hlavním a klíčovým tématem jsou *hyper*fenomény, otevírající (potenciálně) imerzní prostor (jako *hyper*steroskop, který chtěl sestrojit Nevole) jako souhru reality a ireality, jíž je ovšem vlastní realita svého druhu, prostor, v němž se vnímatel setkává s mimořádným, *hyperbolickým*, jež vybočuje z řádu a uspořádanosti, aniž by se od ní ovšem zcela vzdálilo, a vyvolává tak údiv, ale i úděs.

---

[6] Dieter MERSCH, „Medialität und Undarstellbarkeit. Einleitung in eine ‚negative' Medientheorie." In: Sybille Krämer (ed.), Medialität und Performanz. München: Fink Verlag 2004, s. 75–96. Pojem „Entzug" může znamenat také „mizení", „odebrání", „odepření", „ztrátu".