

Heterotopias and transformations in art and science *

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According to Michel Foucault, in the background of every culture there are certain basic codes which regulate and form the way in which we perceive, think, act and judge. They function as identification criteria, or grids by means of which we search for similarities and dissimilarities, analogies and differences between individual elements of our culture. They help us to establish the order in which all objects appear in a well-arranged and organized manner. On the one hand, in every culture there can be found something that we might call the arranging cultural codes, but on the other hand, scientific and philosophical reflections trying to provide an explanation of the nature and principles of this given order are present there as well (2002, XXII). Between these two areas Foucault found a third one, which can be called “the middle” area. In spite of the fact that the middle area is not easily analysable, it is of paramount importance for culture. It is the area in which the culture gradually diverges from the established order and loosens its bonds to it. By shifting the established point of view it neutralizes existing perceptual, linguistic and practical grids and thus subjects them to criticism. Thorough analysis of this third area leads us to the conclusion that every order is culturally and historically conditioned and thus only temporarily valid. Any change of our cultural point of view or employment of a new grid disrupts the existing arrangements and forces us to think differently.

The peculiar classification of animals which Foucault found in a passage in Borges and by which he introduces his book *The Order of Things: An Archaeology of the Human Sciences* (1966) has this disruptive power. The division that he presents evokes both smiles and admiration for the author’s creativity and imaginative ability, but at the same time it also sharpens the attention of the thoughtful reader.¹ Having become familiar with Chinese taxonomy, he had to cope with “the stark impossibility of thinking that” (Foucault 2002, XVI), and all of a sudden, he faces the limitations of our own western way of thinking, which is successfully undermined by the above-mentioned classification. The problem is not simply the oddity of unusual and bizarre juxtapositions of incongruous objects that are mentioned in the classification,

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it is rather the destabilization of the established order that normally provides the foundation for our orientation in the world and for our way of thinking, which is dependent on concrete historical, cultural and geographical spaces. In contrast to this order, the cited classification represents a certain disruption, violation and questioning of preferred ways of perception and thinking. Based on these facts, Foucault notes two specific types of disorder which destabilize standard arrangements and imply that the given cultural order does not have to be the only possible one, nor does it have to be the best. These types are *utopias* and *heterotopias*. Both these spaces (topoi) are related to all other spaces in such a way that they call into question, neutralize and disrupt fixed sets of relationships (Foucault 1997, 332). The reason why utopias can be classified as disorders is the fact that, in contrast to a real space, they represent an unreal, imaginary space. Utopias are spaces without any real locality – placeless places that are impossible to enter (332). In contrast to utopias, heterotopias are real. However, as types of space they are different from the usual types of space that we know and are thus disturbing. In *The Order of Things*, Foucault notes:

Heterotopias are disturbing, probably because they secretly undermine language, because they make it impossible to name this and that, because they shatter or tangle common names, because they destroy “syntax” in advance, and not only the syntax with which we construct sentences but also that less apparent syntax which causes words and things (next to and also opposite one another) to “hold together” (2002, XIX).

Consequently, by disintegration of standard syntactic relationships, heterotopias make narration more problematic, as is evident in the case of the Chinese taxonomy. In order to make it more comprehensive, Foucault later expanded the concept of heterotopia in his article *Of Other Spaces* (1967). He came to the conclusion that every community creates its own heterotopias such as hospitals, prisons, gardens, cinemas, theatres, libraries and ships, which are places with specific organization and special means of entry, which suggests that we should move and think differently when we are in them.²

Based on Foucault’s suggestions, we would like to point out that specific heterotopias – spaces different from those that we are accustomed to – are presently discovered by means of modern technologies. Digital technologies penetrate deep under the surface structure of conventional real places or material objects and reveal the unknown dimensions of micro and macro worlds. This is particularly apparent in the realm of digital media and modern science. Digital media constitute a new type of space – the database – a specific space which is grabbing the attention of many contemporary creative artists. The database, a set of digital data, neutralizes pre-fixed forms of order and preference. Images, sounds and words are loosened from their original indexicality and are converted into numerical code, which enables modification and combination of the obtained data. The database thus represents a new type of space which subverts the standard organization of signs. Newly created heterotopias can be identified also in modern biomedicine. The newest medical technologies such as ultrasound, computed tomography and magnetic resonance imaging discover the hitherto invisible internal environment of the human body. They enable us to image the human body at a molecular level and reveal new detailed structures

and different patterns of arrangements from those we are accustomed to. The new visualizations of hitherto unknown spaces and internal environments of the human body in many ways specify, extend or even completely refute our biological and medical forms of knowledge. The phenomenon of the current expansion of heterotopias corresponds with Foucault's opinion that every epoch creates its own spaces which strive to gain their legitimacy by opposing existing ones. In this contribution we would like to point out that both types of heterotopia are breeding grounds for the phenomenon of one media form transforming into another, while the borders of all involved media are gradually wiped out. And we cannot also omit the fact that the experimental possibilities of digital databases and attractiveness of digital imaging that lure contemporary artists have resulted in several versions of mapping, bio-art and science-art.

THE DATABASE: DATA TRANSFER AS ART

The technological qualities of digital media have already been the subject of several specialized analyses (e.g. Feldman 1997, Manovich 2001). With respect to the theme of our work, we are interested only in those aspects which are indispensable in the digital environment for the constitution of a new heterotopy, such as the database. *Numerical coding* can be considered the generally acceptable key element of digital media. By numerical coding all sorts of information can be recorded and preserved. According to the well-known theoretician of new media, Lev Manovich, this aspect of digital media has several significant implications: firstly, all elements of media are mathematically coded, and secondly, the elements might become the subject of algorithmic manipulation (2001, 27; see also Feldman 1997, 4). Manipulation by means of appropriately chosen algorithms is enabled by the fact that all pieces of information are recorded in the same code. They do not have any permanent, static value, but they can be rather seen as dynamical variables. Media forms based on numerical code such as images, texts and sounds, which lack their original meaning and content, are likely to be further modified and transformed. Another significant feature of digital media that enables modification is their *modular character*. At a higher level, the individual elements of digital media consist of discrete units (pixels, voxels, polygons etc.), which are stored separately from each other, so they can be easily exchanged, replaced or deleted without the necessity of exchanging the whole medium (2001, 30).³ According to Manovich, these two aspects are fundamental principles for many other technological features of digital media. The same numerical code and modulation enable for example the automatization of several operations during the creating, storing or sorting of data, and at the same time, they are also essential for *updates* and *transformations* of various media forms which can be potentially unlimited. In this regard, digital media are significantly different from their analogue predecessors, since users of analogue media could create only identical (though numerous) copies, not heterogeneous variants.⁴

The fact that digital media serve as a basis for the constitution of a new specific space which differs in form, function and content from other spaces makes their above-mentioned aspects relevant. A database is a set of digital data stored in an

internal or external computer storage medium. In the terminology of information sciences we speak of a *structured set of data* the main function of which is the effective search for information by means of a special language (e.g. SQL), while for data management several functional models can be used, mostly relational, hierarchical, network and object-oriented models (Downing et al. [1986] 2009, 127).⁵ In a broader cultural sense, such highly structured models are not always applicable, so a database can be then simply seen as a *collection of data* which can be used for various operations, such as selection and replacement, by which the user transforms selected data into a certain desirable form (Manovich 2001, 219). In both cases a database can be considered as an example of heterotopia. Although it is a virtual space, we should take into consideration that in this case the term “virtual” might be interpreted as possible, feasible, realizable or achievable,⁶ because a database is a type of space in which it is possible to interactively⁷ enter, to work and to communicate with, and in this regard it differs from a utopia, a placeless place, which, according to Foucault, it is impossible to get into. A database is a specific environment with unique content and with its own system arrangement, and these two characteristics are the key elements of a heterotopia. Its content consists of digital sets of data originating from various discourses, cultural and historical contexts and various semiotic systems. Due to its disparate content, its layout mode stands outside of conventional syntactic, semantic or compositional rules. These rules were applicable only within one concrete system. Since the meaning of all the pieces of information is neutralized and since they are stored flexibly in the form of numerical code in a computer storage medium, there are enough possibilities for various combinations and transformations in new unconventional sorts of arrangement depending on the user’s creativity. New structures produce new meanings. That is the reason why a database is not only a store of collected data but also a producer of new meanings (Frieling 2004, 3). As a new form of heterotopia it creates alternative modes of arrangement and thus it presents reality from different angles. It disturbs us. Or it is maybe a creative restlessness that forces us to see and think differently. Evidence of the fact that we are dealing with a new type of space is the presence of a special means of entry which is typical for heterotopias. If the means of entry was not present, there would be no reason to speak of a special type of space. The special means of entry into a database, which both isolates and makes it penetrable, is the interface. And since we enter a database through its interface and then influence it by our work, even leaving traces there that affect not only the overall shape of it but also our way of thinking and thus our culture, we can speak of heterotopia par excellence.

In relation to other spaces, heterotopias perform certain functions which oscillate between two opposite poles. According to Foucault, they either create spaces of illusion or compensation (1997, 335); in other words, they reflect dominant preferences and their ways of arrangement. And a database performs this function. It represents that mode of the world’s structure that is different from narration, which for a long time dominated in various discourses, since it provided the legitimacy of the discourses and determined their competencies. The dominant feature of a database is its anti-narrative logic, by which it follows the tradition of distrust of great narratives

and meta-stories initiated by postmodernism (Lyotard 1993, 143). While narration follows the logic of cause and effect and thus preserves a certain linear development, a database is a collection of data which do not necessarily constitute an orderly unit. Manovich comments on the nature of this difference:

As a cultural form, the database represents the world as a list of items, and it refuses to order this list. In contrast, a narrative creates a cause-and-effect trajectory of seemingly unordered items (events). Therefore, database and narrative are natural enemies. Competing for the same territory of human culture (2001, 225).

The logic of plurality, of database, stands in opposition to the consistent mode of logically organized sequences of events, which is manifested for example in contemporary artistic forms of databases such as multimedia encyclopaedias, collections of photographs on CD-ROM, virtual museums, galleries and, last but not least, web pages. A typical feature of all these examples is that any user can enter them and not only browse the individual items according to a default setting but also edit and replace the items or add new ones – a web page is a good example – so the result is rather a heterogeneous collection than a compact narrative. After all, it is difficult to maintain a straight developmental succession if the basic, fundamental material perpetually changes. However, this does not mean that the database can substitute narration in all regards. As a type of heterotopia, it presents different, alternative possibilities from those of narration and advocates a viewpoint of plurality. Although, in this regard Manovich points out at least one important fact: a change of priorities. While in the old media the syntagmatic level (narration) was explicitly present and the paradigmatic level (choice of possibilities) remained implicit, digital media invert this relationship. The database, as a collection of possibilities, has become explicit while the narration remains implicit (230–231). The change of priorities indicates the state of our contemporary cultural preferences and also undoubtedly emphasizes a particular ability of heterotopia: the ability to call into question any actual preference and thus to demonstrate that any preference has only temporary, historically and culturally conditioned validity.⁸

Besides the fact that in a digital environment there is the possibility to identify the constitution of a new heterotopia, such as a database – a collection of digital data, we cannot omit one significantly remarkable means of element arrangement: transformation. The fact that all data in a digital medium use the same numerical code makes the transformation to any other media format easy. Manovich uses the term transcoding, which is a transcription of content into another format, and regards this feature as the most significant implication of digital media (45). These technological features are remarkable mainly for one reason: they provide space for artistic and aesthetic imagination. They are presently used, for example, by the art of mapping, which is an art that is thriving nowadays and which includes text, music, sculpture and architecture (Simanowski 2006, 70–71). Although the term mapping comes from cartography, where it denotes the drawing of graphic symbolic representations onto a map, it has recently acquired new meanings particularly in connection with computer graphics and digital artwork.⁹ The flexible database format allows artists to configure the data in many different ways, to transfer them or to insert them into

new contexts. Primarily, the flow of data, which can be transformed into an unconventional harmonic shape, has become their source of inspiration. The art of mapping has shaped itself as an alternative means of data layout which has absolutely no ambition to correspond with standard systematic ways of data organization. Mapping combines not only data coming from various forms of art but also from various discourses.

Mapping, an art based on data transfer, represents a specific form of contemporary art, but it is also, according to Roberto Simanowski, an example of the remediation of photography (74). He notes that, like photography, mapping unifies the documentary character with subjectivity, or, in other words, the documentary record of reality with a subjective choice of visualization. On the one hand, the artist uses data from the database in the same form in which they are recorded, on the other hand, he chooses the way in which they will be transformed and presented. Thus it is possible to find traces of an old medium in a new one and uncover an artistic photographic strategy in the art of mapping. However, unlike photography, mapping can be characterized as being highly dynamic, since what is emphasized is not the result itself but the act of transformation, which is performed before the very eyes of a receptive viewer. While photography represents the events of the past, the art of mapping is performed at the actual time (74). At the same time, this unambiguous emphasis on the data transformation process foregrounds the question of the material processed in mapping – digital data. If the material itself is thus foregrounded and centralized instead of being suppressed, then it is evident that the art of mapping uses the logic of hypermediacy as described by Jay David Bolter and Richard Grusin. In contrast with the logic of immediacy which aims at the transparency and invisibility of a medium in favour of the work of art, the logic of hypermediacy focuses on the visualization of the medium in the creative process. Both logics can be considered strategies of remediation reflecting the relationships of old and new media (Bolter – Grusin 1999, 55). And since the art of mapping stresses the process of data transfer from one form of medium into another, by which it applies the logic of hypermediacy, it can worthily be considered to be an example of remediation.

The database demonstrates its difference from other types of space most notably by the specific manner of its element arrangement. Transformation of digital data, which is potentially unlimited, dissolves any hitherto valid element arrangements, opens new insights and produces new meanings, which is good evidence that the database, by its character, can be considered a heterotopia. And therefore it is not surprising that it attracts the attention of many mapping artists. However, it should be noted that these artists cannot do without the appropriate technological knowledge or without the cooperation of specialists. Thus art and technology not only inspire one another but also overlap and modify each other.

HETEROTOPIAS AND TRANSFORMATIONS IN BIOMEDICINE

Certainly, the database is not the only example of newly emerging heterotopias. Owing to the broad application of modern technologies we discover other spaces of micro and macro worlds which very often refute or complement our knowledge.

They function as heterotopias, or other spaces – spaces different from those that we have been familiar with so far.¹⁰ As an example of this expanding phenomenon, we have chosen one of the best-known branches of modern science – biomedicine. In the following part of our contribution we would like to briefly discuss the fact that also in this field it is possible to identify the presence of heterotopias, and it is also possible to observe the transformations which inform us about the character of the newly emerged space.

Several new technologies have recently established themselves in biomedicine, which by means of light, ultrasound or magnetic resonance imaging penetrate through the surface of the human body into the biological structures of our organisms in order to obtain their visual image. The tendency to reveal to the human eye inaccessible and unknown spaces and to record their structure as a visual representation is not new in the history of medicine (Sturken – Cartwright 2009, 352–353). But only the rapid development of these technologies enabled significant progress. For example, X-rays in computed tomography pass through the examined organ at different angles and thus we are able to obtain important raw data which are then computer-processed and transformed into their visual representation. The obtained image of the internal organs of the human body consists of several thin layers which were scanned at different angles. Magnetic resonance imaging is based on the physical principle of a strong magnetic field and radio waves and on the monitoring of changes in behaviour of hydrogen atoms in the magnetic field environment. The obtained data are transformed into detailed images of internal tissues by using complicated algorithms. As in computed tomography, the digital images are basically two-dimensional cuts which are possible to convert into volumetric 3D images. Ultrasonography is used for the examination of soft tissues and is based on application of ultrasound which echoes off the tissue. Echoes are then recorded and converted into a graphic record (Möller – Reif [1998] 2015).

The above-mentioned examples are just a few of the many methods and technologies used in biomedicine not only for diagnostics but also for expanding our knowledge of the human organism. Regarding the theme of our contribution, we suppose that as illustrations they are sufficient and adequate. These methods demonstrate that the molecular system of the human body which we explore by using modern technologies can be considered a unique form of heterotopia. The space that we study has a highly complex structure, which is a result of varied interactions at various levels of the human organism as a single unit (Mayr 2002, 23–29). Individual parts of this system are mostly multifunctional, thus it is too difficult to describe their function in full detail. Therefore, regarding their diverse aspects, they have become subjects of study of various branches of science. Since this highly complex, unique space perpetually modifies our existing knowledge, it can be considered to be a very important example of heterotopia. Its importance derives from the fact that we learn new facts about ourselves and about the human organism. A special means of entry into this space can be passed through by using medical technologies.

It should be noted that the visual representation of invisible molecular parts of the human body also plays an important role in the process of data transformation.

For example, in magnetic resonance imaging different physical properties are monitored, e.g. radio-frequency impulses, magnetic fields, the density of hydrogen atoms, and from these properties, by using mathematical algorithms, is later generated the resulting image of the tissue. Such an image is a result of multiple transformations of measured physical data into their final visual representation. In ultrasonography, acoustic data are transformed into a graphic record. Ladislav Kesner notes that the digital images of biological structures obtained in the process of data transformation are not always isomorphic with their object, and that they mostly have the character of a difficult *construction* (2007, 169–171). The resulting image may even be modified in several ways. While art unanimously welcomes the possibilities of new constructions and designs for its experimental projects,¹¹ science, which aims at objectivity and accuracy, must be very careful in interpreting synthetically created digital images. Though we can philosophically speculate about the objectivity of such a constructed image, its benefits in medical practice and in expanding knowledge of the human organism cannot be denied (170).

Biological structures of the human organism have gradually become an attractive theme for contemporary bio-art and science-art. In their work, artists use cells, tissues, molecules and genes which they include into their visual images, and they do not even shy away from post-human visions in which they combine human and non-human structures. It is worth mentioning the artistic works of Suzanne Anker, Mark Dion and Eduardo Kac. Another interesting project, which originated in Slovakia, is the educational application *Human Anatomy VR* by the authors Tomáš Brngál and Miloš Svrček which functions as a comprehensive human anatomy atlas and provides useful information for medical students in 3D form. Projects like this prove the fact that heterotopias, such as the molecular system of the human body, are an inexhaustible source of inspiration not only for scientists, but also for artists.¹²

CONCLUSION

Michel Foucault characterized heterotopias as specific spaces which call into question, disrupt and overturn our existing systems, the hitherto valid order of things, our ways of thinking and also our ways of attaining knowledge. They are significantly important particularly from the point of view of culture, since they affect cultural dynamic shifts and transformations. The main aim of our contribution was to present the idea that such specific spaces are presently discovered and explored particularly by means of modern technologies. Regarding digital media, the database – a collection of digital data – has a heterotopic character; it subverts the standard arrangement of signs and enables the creation of innumerable variations and unconventional combinations. Modern technologies also unveil the other marvellous spaces of our world. One of them is for example the molecular system of the human organism, which can be characterized by high complexity, multifunctionality and highly variable interactions, and owing to these characteristics our forms of knowledge are perpetually enhanced, extended and sometimes even refuted. It is interesting that both the above-mentioned examples of heterotopia use data transformation as a signif-

icant form of their element arrangement, by which the borders between semiotic systems and between scientific and artistic discourses are gradually being wiped out. After all, Lev Manovich concurs with this, and considers transcoding to be the most important implication of digital media. Undoubtedly, one of the reasons is the fact that the domains of technology and culture increasingly affect each other.

TRANSLATED FROM SLOVAK BY PETER DUSÍK

NOTES

- ¹ In one of his texts, Borges divides animals into the following categories: “a) belonging to the Emperor, b) embalmed, c) tame, d) suckling pigs, e) sirens, f) fabulous, g) stray dogs, h) included in the present classification, i) frenzied, j) innumerable, k) drawn with a very fine camelhair brush, l) etcetera, m) having just broken the water pitcher, n) that from a long way off look like flies” (Borges [Foucault 2002, XVI]).
- ² In medicine, heterotopia is the presence of a particular tissue type at a non-physiological site. Another frequently used term dystopia denotes an undesirable place, an antonym of utopia. Accessed June 5, 2017. <https://en.wikipedia.org/wiki/Dystopia>.
- ³ There is an interesting parallel between linguistics and digital media. Digital media contain levels of discrete representation and so does language: language divides reality, the continuous spectrum, into a series of discontinuous terms and discrete units, on several levels (sentences, words, morphemes), which enables communication (Manovich 2001, 28–29).
- ⁴ Jakub Macek deals with various aspects of characteristic features of digital media (2013). The influence of these features on electronic literature is further analysed in the works of Zuzana Husárová (2012, 79–90).
- ⁵ In the *Dictionary of Computer and Internet Terms*, database is defined as “a collection of data stored on a computer storage medium, such as a disc that can be used for more than one purpose” (Downing et al. [1986] 2009, 127).
- ⁶ According to the *Slovak Dictionary of Synonyms*, synonyms of the adjective virtual are: 1. *possible* – feasible, realizable, performable, achievable, conceivable..., 2. *unreal* – inauthentic, nonviable, abstract, fictitious, simulated, illusory, unnatural... Accessed June 5, 2017. <http://slovníky.juls.savba.sk/?w=virtu%C3%A1lny&s=exact&c=V378&d=sss&ie=utf-8&oe=utf-8>. See also: <http://www.the-saurus.com/browse/virtual>.
- ⁷ With regard to the term interactivity, Bogumiła Suwara stresses that “in the new media, the term does not apply to physical interaction (clicking, opening/closing a port, body moves), but it concerns psychological interaction. The following psychological processes might be involved: supplementing missing information, hypotheses formulation, updating of already known information/data and identifications necessary for understanding a text or a picture” (2012a, 193).
- ⁸ Róbert Gáfrík controverts Manovich’s point concerning the possibilities of the applicability of new media to literary science. According to Gáfrík, Manovich’s book *The Language of New Media* only partially expands the horizons of literary scientists (2008, 128). On the other hand, from the point of view of culture and philosophy, this book provides valuable insights into our culture in an age of increasing influence of digital media. Manovich even considers the database to be *the cultural form* of our century (2001, 225).
- ⁹ Katarína Ihringová dedicates her work to the study of the close connection between cartography and art as well as to the appropriation of cartographic semiotics in art in the wider context and also in the concrete examples of Slovak visual art (2012, 148–170). See also Sieber 2013, 93–106.
- ¹⁰ Pavol Rankov reflects on the new spaces that are emerging together with digital technologies. He deals with the creation of such spaces in the digital environment where terms such as architecture, map or chatroom are being increasingly used. He is aware of the ability of new technologies to uncover spaces hitherto inaccessible to us (2006, 23).

- ¹¹ Regarding the visual synthesis which is created not by means of optical instrument but by means of medical technologies, such as magnetic resonance imaging, Bogumiła Suwara points out the dangers concerning attempts at their interpretation (2012b, 217).
- ¹² Neuroaesthetics is a new scientific sub-discipline that combines scientific and artistic approaches to neurological mapping of the perception of a work of art. Its visions, objectives and interaction with the history of art is analysed by Katarína Ihringová (2016, 132–139).

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Heterotopias and transformations in art and science

Heterotopias. Digital media. Database. Transformation. Mapping. Molecular system of the human organism.

Michel Foucault characterized heterotopias as specific spaces which disrupt and overturn our existing systems, the hitherto valid order of things and also our ways of thinking. They are significantly important particularly from the point of view of culture, since they affect cultural dynamic transformations. The author in her contribution points out that we presently discover such specific spaces mainly by means of modern technologies. Regarding digital media, the database – a collection of digital data – has a heterotopic character; it neutralizes the present forms of orders and preferences. Images, sounds and words are loosened from their indexicality and are converted into numerical code, which enables the modification and combination of the obtained data. The database thus represents a new type of space which subverts the standard organization of signs. Modern technologies also unveil other unconventional spaces of our micro and macro worlds. The newest medical technologies such as ultrasound, computed tomography and magnetic resonance imaging penetrate through the surface of the human body into the depths of biological structures in order to obtain their image, and they indeed make the molecular system of the human organism visible. This molecular system can be characterized by high complexity, multifunctionality and highly variable interactions, and the medical technologies in a certain way contribute to the fact that our forms of knowledge are constantly enhanced, extended and sometimes even refuted. This current expansion of heterotopia corresponds with Foucault's opinion that every epoch creates its own spaces which strive to gain their legitimacy. It is interesting that in both cases of the above-mentioned examples of heterotopia the data transformation can be seen as a significant form of their element arrangement, and thus the borders not only between semiotic systems but also between scientific and artistic discourses are gradually wiped out.

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