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**DISKUSSIONSBEITRÄGE ZUR KARTOSEMIOTIK
UND
ZUR THEORIE DER KARTOGRAPHIE**

(Theoretische Probleme der Kartographie und ihrer Nachbardisziplinen)

18



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**Selected articles on atlas- and
cartosemiotics**

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Preface

Number 18 of the series "Diskussionsbeiträge zur Kartosemiotik und zur Theorie der Kartographie" contains six selected articles of A.Wolodtschenko and one article with Florian Hruby. These articles, which focus on atlas- and cartosemiotics were published in the period from 2001 to 2015. They demonstrate a methodological transition from cartosemiotics to atlassemiotics.

A.Wolodtschenko and H.Schlichtmann

December, 2015

Vorwort

Das Heft 18/2015 der "Diskussionsbeiträge zur Kartosemiotik und zur Theorie der Kartographie" enthält sechs ausgewählte Artikel von A.Wolodtschenko und ein Artikel zusammen mit Florian Hruby. Diese Artikel, die einen atlas- und cartosemiotischen Fokus haben, wurden in der Zeit von 2001 bis 2015 veröffentlicht. Sie demonstrieren den methodologischen Übergang von der Kartosemiotik zur Atlassemiotik.

A.Wolodtschenko und H.Schlichtmann

Dezember 2015

Предисловие

Сборник № 18 "Дискуссионные статьи по картосемиотике и теории картографии" включает в себя шесть статей А.Володченко и одну совместную статью с Флорианом Хрубь. Статьи характеризуются атласно- и картосемиотическими наработками, которые были сделаны в период с 2001 по 2015 гг. и документируют методический переход от картной семиотики к атласной семиотике.

А.Володченко и Х.Шлихтманн

Декабрь 2015г.

Selected Cartosemiotic Activities in the 1990s (2001)

1. Preamble

Since more than three decades cartosemiotics has been developed in the framework of theoretical cartography and has already its own small history. Its formation has begun in the late sixties of the 20th century. Up to the early nineties a certain theoretical knowledge has been accumulated in the European cartosemiotics – but this process took place in a polarized ideological space. Cartosemiotic research has experienced a fresh impetus and activities in the nineties, which were characterized as years of its revitalization. To say that these years were only crowned with success and achievements in cartosemiotics would mean giving a one-sided portrayal of the development and accumulation of cartosemiotic knowledge. New cartosemiotics also proposed new points of growth in cartography, e.g. concerning research of the traditional and virtual, structural models of maps and map-like images. This paper deals only with some activities of the nineties concerning cartosemiotic and map language research.

2. Selected cartosemiotic and map language monographs 1988-2000

Cartosemiotics with its manifestations in the nineties of the 20th century is an interesting issue not only for the European, but also for the international theoretical cartography. During the last 10 or 12 years several cartosemiotic works were accumulated in the theoretical cartography, especially in form of monographs. Below a list of selected cartosemiotic and map language monographs issued from 1988 until 2000. In this list of eleven monographs, four have been issued in Russian, three in English, and one in German, French, Polish and Slovak each. All these works are based on the national and international cartographic traditions.

- Liouty, A.A.: Map language: essence, system, functions. Moskva 1988.
- Pravda, J.: Zaklady koncepcie mapoveho jazyka. Bratislava 1990.
- Wolodtschenko, A.: Map language problems and cartosemiotics. Dresden 1993.
- Kekelia, D.I: Cartosemiotics. Tbilisi 1995.
- MacEachren, A.: How Maps Work. New York and London 1995.
- Neytchev, P.: Jezyk czy kod kartograficzny? University of Warsaw 1997.
- Wolodtschenko, A.: Cartosemiotics and prehistoric maps. Barnaul - Dresden 1997.
- Hussey, C.: La Carte, un Modèle, un Langage. Genève 1998.
- H.Schlichtmann (Ed.): Map Semiotics Around the World. / Regina/, ICA 1999
- Wolodtschenko, A.: Kartosemiotische und konzeptionelle Aspekte der 90er Jahre. In: Diskussionsbeiträge zur Kartosemiotik und zur Theorie der Kartographie. (Hsg. H.Schlichtmann, A.Wolodtschenko), Band 2. Dresden 1999.
- Casti. E.: Reality as representation. The semiotics of cartography and the generation of meaning. Bergamo 2000 (Italian orig. 1998).

By the way in this list of monographs one can not find the textbook cartosemiotics for students. I have planed a similar book for Dresden cartography students for 2002-2003. Unfortunately, a monograph about the history of cartosemiotics, e.g. the European one

doesn't exist at all. That is why the paper by Wolodtschenko /2001/¹ may be considered as a first step on the way to prepare a small monograph concerning cartosemiotics of the European countries.

3. International correspondence seminars and discussion-paper series

3.1 Collection "Kartosemiotik/Kartosemiotika" 1991-1995

At the beginning of the nineties, the rejuvenation of cartosemiotics took place. The international correspondence seminar organized by J.Pravda and myself, has given research of map language new impetus. From 1991 to 1995, six issues of the series "Kartosemiotik/Kartosemiotika" have been published. Each of them was a collection of articles about the semiotics of cartographic representations and related problems, written in German and Russian. The collection has become a good example of the consolidating of different cartographic schools and traditions. Being a "cartosemiotic tribune" it is open to discussions, opinions and constructive criticism. It was the internal communication of cartographers from different countries, which has become one of the new forms of expressing theoretical cartographic thinking. Following specific goals have been accomplished as well:

- further activation of cartosemiotic research at the national and international levels
- popularization of the general and applied map language investigations
- strengthening of the position of theoretical cartography and cartography as a science
- creation of a peculiar kind of bridge between cartographers of the West and the East in the German-Russian language area.

In 1995, the collection and correspondence seminars were suspended, owing to other commitments of the editors.

3.2 Collection "Diskussionsbeiträge zur Kartosemiotik und zur Theorie der Kartographie" 1998- 2000

The tradition of "Kartosemiotik" / "Kartosemiotika" was continued by a new series entitled "Diskussionsbeiträge zur Kartosemiotik und zur Theorie der Kartographie" (Discussion papers on cartosemiotics and on the theory of cartography), edited by H. Schlichtmann and A. Wolodtschenko. It contains contributions in German, Russian, and English. Three issues have been published in 1998, 1999 and 2000.

The first issue "Discussion ... 1/1998" includes a five articles, three in German, one in English, and one in Russian. It were diverse articles with theoretical relevant aspects of cartography, geomorphology and tactil communication.

The issue 2/1999 is a collection of diverse articles in the period from 1990 till 1999. The author - Alexander Wolodtschenko one of the initiators of, and participants in, the cartosemiotic activities of the 1990's - presents, in a chronological order, his selected publications (fifteen in German, and two in English) in the monograph "Cartosemiotic and conceptional aspects of the 90s".

The issue "Discussion... 3/2000" includes five artcils. Like the first issue, this one contains diverse theoretic articles (two in German and in English each, and one in Russian) of the cartography and other geosciences.

¹ Wolodtschenko, A.: Kartosemiotische Systeme und Konzeptionen in Osteuropa. In: Kartographisches Symposium Theorie 2000, Kartographische Bausteine 19. Institut für Kartographie TU Dresden 2001, S.89-94.

The complete list of all articles these issues and their authors will be published in article "Ten years international correspondence seminars in cartosemiotics" by H. Schlichtmann and A. Wolodtschenko in the Proceedings of the 20th ICC (Beijing 2001).

4. Working Group and Subcommittee of the ICA Commission

4.1 Working Group on Map Semiotics in the ICA Commission on Theoretical Fields and Definitions in Cartography (1995-1999)

In 1995 the Commission on Theoretical Fields and Definitions in Cartography (Chairperson Tositomo Kanakubo) was established in Barcelona on the 17th ICC and included three Working Groups. One of these Working Groups has been the Working Group on Map Semiotics. In 1999 Chair of Working Group Hansgeorg Schlichtmann has edited the monograph "Map Semiotics Around the World". The table of contents this collection includes following articles:

SCHLICHTMANN, H.: An inventory of research in map semiotics, pp.1-14.

HEAD, C.G.: Warp and woof: carto-semiotics and carto-linguistics in the English-language literature, pp.15-64.

HUSSY, Ch.: La cartographie thématique dans i'aire francophone, pp.65-86.

KOCH, W.G.: Comments on the development and the current tasks of cartographic semiotics in the German language area, pp.87-94.

KOCH, W.G.: Annotated bibliography of cartosemiotic literature published in the German language area (Germany, Austria, Switzerland), 1970-1997, pp.95-108.

WOLODTSCHENKO, A.: Cartosemiotic literature in the Federal Republic of Germany, 1969-1996 (with emphasis on Vermessungstechnik, Kartographische Nachrichten and Kartosemiotik / Kartosemiotika), pp.109-120.

DRAPELA, M.V.: General and applied map semiotics in the Czech and Slovak Republics: a bibliographical report, pp.119-136.

NEYTCHEV, P.: Research in map semiotics in the Polish language area, pp.137-158.

WOLODTSCHENKO, A.: Cartosemiotics and map language in the Russian-language literature, pp.159-170.

LIOUTY, A.A. and KOMEDCHIKOV, N.N.: Map semiotics and theoretical process in Russian cartography in the 1990s, pp.171-179.

This collection is a successful four-year work of the Working Group on Map Semiotics and its Chair H.Schlichtmann. It accounts for about 90 per sent of the cartosemiotic literature in the English, French, German, Polish, Czech-Slovak and Russian language spaces.

4.2 Cartosemiotic Section (Subcommission) in the ICA Commission on Theoretical Cartography (1999-2003)

The Commission on Theoretical Cartography is a new Commission that was established in August 1999 in Ottawa, Canada and it was proposed on behalf of the Japan National Cartographic Committee. In accordance with terms of reference the members of commission carry out a study selected topics of theoretical interest.

There are four main sections or subcommissions:

- cartographic semiotics
- map language
- mapping as a cognitive process,
- and terminology.

On the 14th and 15th October 2000 in Dresden University of Technology (Germany), the Commission seminar was held with the motto "The Selected Problems of Theoretical Cartography 2000". It was a first seminar of cartography theorists after the last 19th ICC held in Ottawa. The two-day meeting program included 12 papers (8 are published in these proceedings). Six papers relate to cartosemiotic themes. The cartosemiotic section (subcommission) is a very active one in the Commission.

5. Cartosemiotic activities in the framework of the IASS² and DGS³

There was no direct contact between European cartosemioticians and semioticians until 1994. Early attempts of cooperation are dated to 1994; the Institute for Cartography of the Dresden University of Technology held an international colloquium on "Current problems of cartosemiotics". Two years later, several cartographers and cartosemioticians took part in the 6th International Congress of the IASS in Amsterdam. Some of the papers presented in Amsterdam were published later in the German journal "Zeitschrift für Semiotik" (vol. 20/1998, edited by D.Schmauks and W.Nöth).

In 1999 Dresden University of Technology was hosting the 9th International Congress of the German Society for Semiotic Studies and 7th International Congress of the IASS, where cartographers and cartosemioticians took an active part in. Unfortunately, both proceedings of these congresses will be published only at the end 2001.

6. Conclusion

This paper presents only a selected aspects concerning monographs with cartographic traditions, international correspondence seminars and their collections, and cartosemiotic activities in the framework of the ICA as well as activities within organisations with non-cartographic traditions. Cartosemiotics is likely to continue expansion of its research field both within cartographic and non-cartographic traditions. Here three groups of researchers in the cartosemiotic field may be recognized, namely cartosemioticians, semioticians and others (investigators adhering neither to cartosemiotics nor to semiotics). One can also call three groups of cartosemiotic models (see Fig.1) – maps, map-like images (atlases, globes, etc.), and cartographic-textual works (monographs, textbooks, dissertations, diploma theses etc.). It are the main subject of the cartosemiotic research.

Among the new tasks of cartosemiotics, its two important ones should be named:

- elaboration of methods for research of cartosemiotic models (not only conventional or traditional but also virtual ones) and
- research, writing and publishing of the cartosemiotic history of cartography.

² IASS: International Association for Semiotic Studies

³ DGS: Deutsche Gesellschaft für Semiotik (German Society for Semiotic Studies)

CARTOSEMIOTIC MODELS

(IN GRAPHIC FORM)

(IN TEXT FORM)

MAPS

MAP-LIKE IMAGES

CARTOGRAPHIC-TEXTUAL WORKS

Fig.1 System of cartosemiotic models in cartography

Not only scientific research but also the education and training in cartosemiotics play a large part in further development of cartography.

Today, one can already state that the cartosemiotic movement of the nineties has given a fresh impetus and introduced new activities to theoretical cartographic thought. It testifies that cartographic thought is not stagnating nor it is a "one-way street".

TeleCartography: Some Cartosemiotic Aspects (2004)

Abstract: Cartographic and map-like models (products) on hand held displays are a new interesting field for cartosemiotic researches. With theoretical position the selected aspects of telecartography and cartosemiotics (concerning some cartosemiotic models and their peculiarities) are discussed.

Key words: cartosemiotic models, cartosemiotic method of research, cartosemiotics, LBS, map language, mini-display maps, mobile cartography, telecartography, terminology

1. TeleCartography

New information technologies introduce in cartography not only revolutions, but also evolution. With mobile internet, mobile computing, mobile usage of sign-spatial (cartosemiotic) information etc. the modern cartography identifies its evolution in the mobile environment. All this is still "Neuland" for and in cartography. Telecartography writes today also its page in the history of mobile cartographic environment.

What is a telecartography? After GARTNER/2000/ telecartography is an exchange and transmission process of spatial information on hand held displays. Fig.1 shows a principle of telecartography. Nowadays telecartography focuses on the technology of how best to present and communicate spatial information in mobile environment. It is a new attractiv research field in modern cartography.

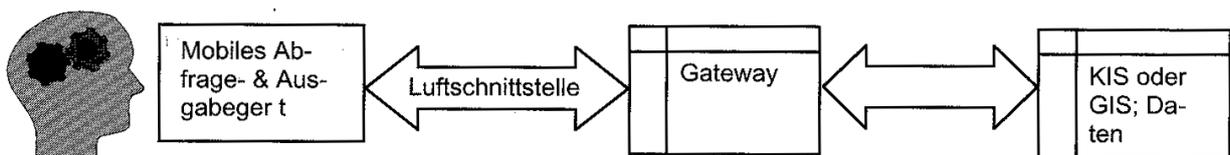


Fig.1 Principle of telecartography /after GARTNER 2003 et al./

Another new term "mobile cartography" is used in the German cartographic literature. Mobile cartography deals with theories and technologies of dynamic cartographic visualisation of spatial information on mobile devices /REICHENBACHER et al. 2002/; in general it can one consider as a geovisualisation of LBS/ REICHENBACHER, MENG 2003/. Terms, telecartography and mobile cartography are concurrent ones of just the same contents and context. Telecartography or mobile cartography deals nowadays with experts and for experts.

2. Cartosemiotics and mini-display maps ("midimaps")

Within framework of cartography the cartosemiotics is a new discipline studying features of cartosemiotic models (from the standpoint of modelling, communication and cognition) with the goal of acquisition of new spatial knowledge or revitalization of forgotten spatial information. Cartosemiotic models are cartographic, map-like, and cartographic-textual products in electronic form and non electronic one (e.g. traditional print form) of the human knowledge about earth (and its parts), planets and cosmos-referred features and relations /WOLODTSCHENKO 2003/.

Until recently cartosemiotics was engaged in research of traditional cartosemiotic models where print (or paper) maps prevailed. Cartographic and map-like models (products) on hand held displays are a new interesting field for cartosemiotic researches. In this research field the cartosemiotics forms two groups of users: mobile and immobile users (Fig. 2).

The small display maps or mini-display maps ("midimaps") are new form of cartosemiotic models /WOLODTSCHENKO 2004/. "Midimaps" on mobile phones, Pocket PC etc. have found new user, mobile one (e.g. in tourism and navigation). For many cases these "maps" represent dynamic and/or static part of maps. Usually the many "midimaps" are a part of the whole map only.

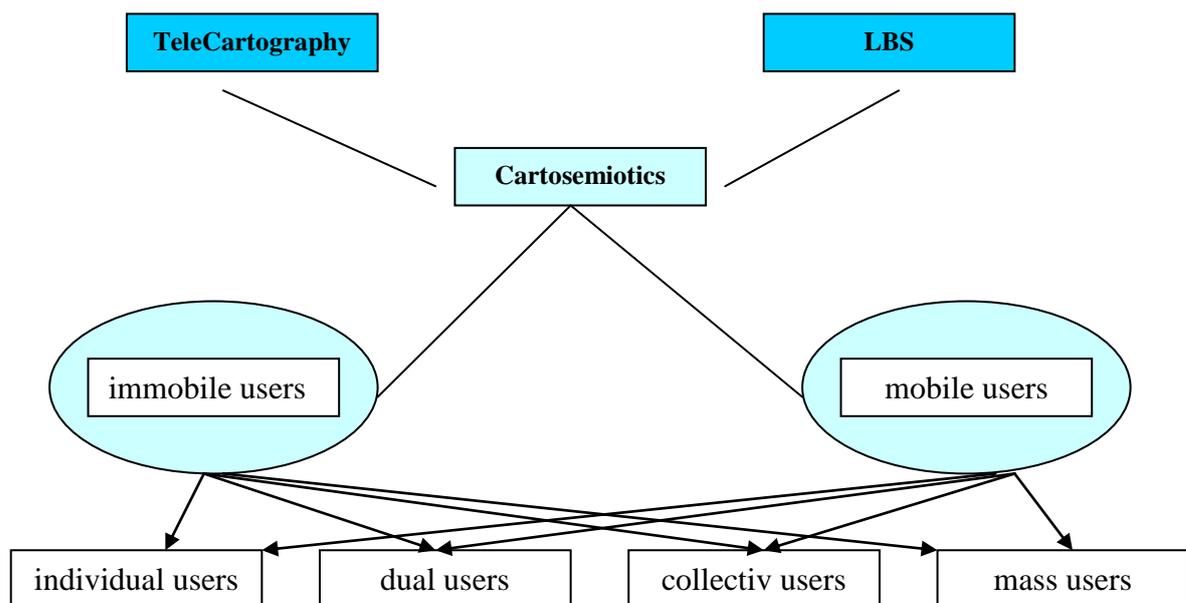


Fig. 2 Cartosemiotic users groups

3. Cartosemiotic method of research and language of "midimaps"

Cartosemiotic method of research is a way to study and understand map language and language of map-like models (products) with their cultural-historical, social and communication aspects /Fig. 3/. Cartosemiotic method of research is also a way for acquisition of new spatial knowledge and/or revitalization of forgotten spatial information with "midimaps".

In the reports and the discussions on the ICA joint seminar in Vilnius / WOLODTSCHENKO 2004; BECONYTE, WOLODTSCHENKO 2004/ repeatedly were raised the questions: Who

will teach the language of "midimaps" that to understand them for concrete context and techniques? Where is it possible to study the language of "midimaps"?

From aesthetic point of view the "midimaps" have an interesting relation to postage stamps. Postage stamps with cartographic themes are well known for philatelists-cartographers. In this connection, some analog examples of static part of "midimaps" one can compare with postage stamps of diverse cartographic and cartosemiotic motives (themes).

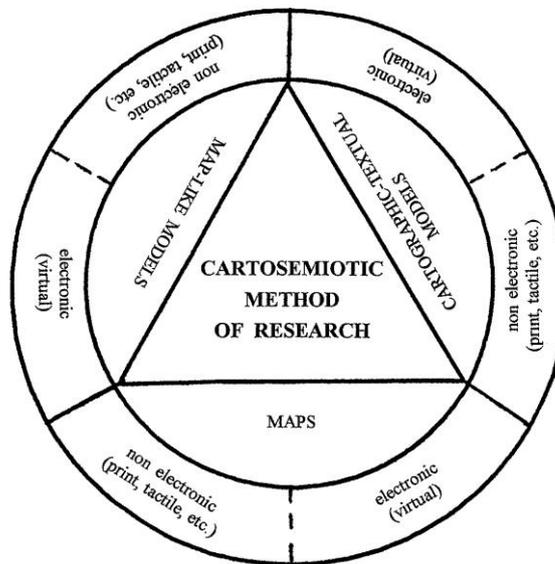


Fig. 3 Structural model of cartosemiotic method of research/WOLODTSCHENKO 2000/

4. Terminology aspects

The contemporary terminological "field" of cartography is characterized by dynamics and active intrusion or introduction of technological terms. And this is natural. New cartographic technologies change old ones with the unpredictable speed. The tele-cartographic terminological "field" is located in the stage of childhood; it is formed still. This lexis field includes cartographic, non cartographic (from other disciplines) and general scientific terms. As an example it is possible to demonstrate the list of the keywords (cartographic terms are distinguished by italics) from the site <http://www.ubimap.net/upimap2004/> "Joint Workshop on Ubiquitous, Pervasive and Internet Mapping":

ubiquitous, ubiquity, pervasive, Internet, network, *tele-cartography*, SVG, GML, G-XML, LBS, geo-cast, context awareness, situation, location, affordance, spatial cognition, perception, sensing, egocentric, homogeneous, *map*, *mapping*, spatial interaction, trans-coding, model, schema, visualization, symbology, *generalization*, virtual environment, interface, agent, voice, augmented reality, coordination, spontaneous, navigation, mobile, wearable, small personal object, IC tag, universal design, cross cultural issues, privacy, security, education, childhood development, etc.

The process of the formation of tele-mobile-ubiquitous cartographic lexis is still distant from the completion and it will be developed further.

5. Conclusion

Two proceedings "Telekartography and Location Based Services 2002" and " Location Based Services and TeleCartography 2004" edited by the Institute of Cartography and Geo-Media Techniques of the Vienna University of Technology, have been used for my analysis of Telecartography and LBS activities. Technological aspects dominate here indisputably. Diverse cartographic presentations on mobile device (or mini display maps) require not only the improvement of their technological realization and identification, but also the theoretical-conceptual comprehension as new cartosemiotic models. These presentation forms are not yet classified with cartosemiotic characteristics. The mini-display maps are to be investigated under semiotic angles further.

References

REICHENBACHER, T., ANGRÜSSER, S., MENG, L. (2002): Mobile Kartographie - eine offene Diskussion. In: Kartographische Nachrichten, 4/2002, S.164-166.

REICHENBACHER, T., MENG, L. (2003): Mobile Kartographie - ein Annaehrungsversuch an ein neues Forschungsthema. In: Kartographische Nachrichten, 1/2003, S.4-6.

WOLODTSCHENKO, A.(2000): On prospects in theoretical cartography. In: Schlichtmann, H. and A.Wolodtschenko (ed.). Diskussionsbeitraege zur Kartosemiotik und zur Theorie der Kartographie. Band 3. Dresden 2003, S.37-54.

WOLODTSCHENKO, A. (2003): Cartography and Cartosemiotics: Interaction and Competition. In: Proceedings of the 21st ICC in Durban/South Africa. ICA 2003, pp.1976-1980, (Cd-version).

WOLODTSCHENKO, A. (2004): Cartosemiotics in TU Dresden. In: ICA Joint Seminar (paper presentation), June 29, 2004, Vilnius/Lithuania.

Biographical sketch

Alexander Wolodtschenko

1987 - promotion in Institute of Cartography at the TU Dresden.

1995-1999 member of the ICA Commission "Theoretical fields and definitions in cartography" and Working Group "Map Semiotics"

1999-2003 and 2003-2007 chairman of the ICA Commission on Theoretical Cartography

1991-1995 co-editor of the issue "Kartosemiotik/Kartosemiotika"

Since 1998 co-editor of the issue "Diskussionsbeitraege zur Kartosemiotik und zur Theorie der Kartographie"

Author of more than 100 publications, among them 5 cartosemiotic monographic works.

From J. Bertin's graphic semiotics to multimedia meta-cartosemiotics: development of theoretical cartography (2010)

Abstract. The analytical-critical article deals with Bertin's graphic sign system, its impact on the development of cartography theory in the last thirty years (1980-2010). Some paradoxes in recent cartography are discussed. The new theoretical conception-metacartosemiotics is proposed and discussed. Accumulation of cartosemiotic and map language-related knowledge is presented with help of selected monographic works.

Keywords: graphic semiotics, theoretical cartography, meta-cartosemiotics, pioneers of cartosemiotics, paradoxes in cartography

Preamble

This paper is dedicated to Jacques Bertin, the famous French cartographer, geographer and cartosemioticist. In my opinion, Jacques Bertin belongs together with Michael Bocharov and Alexander Aslanikashvili to "Pioneers of Cartographic Semiotics". These three scientists formed basics of graphic and cartographic semiotics in the middle of 1960s. They developed also diverse conceptions in theoretical cartography with semiotic and map language profiles.

This paper also based on my selected activities related to Jacques Bertin:

- presentation "Jacques Bertin: one of the Pioneers of Cartosemiotics". ICA Workshop, Polytechnic University Hong Kong, 23-25 September 2010.
- article "J.Bertin and graphic semiotics". In: special issue vol.4. Kiev 2010
- poster for ICC2011: Quo vadis graphic semiotics of J.Bertin. Paris 2011
- monograph: "30 years with and for cartosemiotics/1981-2011/", (Dresden 2011, in progress)

The paper tries to present some new conception-theoretical ideas and proposals based on the new cartosemiotic knowledge and thinking in cartography.

1. Bertin's graphic sign system and "Pioneers of Cartosemiotics"

1.1. About term "Pioneers of Cartosemiotics"

The term "Pioneers of Cartosemiotics", as well a term cartosemiotics are new and exotic ones of cartography. In Russian cartographic publications the term "pioneer of cartosemiotics" was used by Salischev (1982) and related to J.Bertin only. The term "Pioneers of Cartosemiotics" was used at the time from 1995-2011 in my special lectures related to several scientists as "pioneers" (see part 1.2.). In Dresden, in year 2000, I got the opportunity to start a new cartosemiotics course with seven thematic lectures; one of themes was "Pioneers of Cartosemiotics. Unfortunately, it was only an optional course "Basic of Cartosemiotics" for Dresden students. This optional course of cartosemiotics dies in 2011 together with unique higher education of the Diplom-Engineers in Dresden and in Germany.

In the years 2005, 2008 (in print form) and 2009 (electronic version in internet), I published an encyclopedic glossary "cartosemiotics"; it included the assey entitled "Pioneers of Cartosemiotcs and their Followers". The monograph "Cartosemiotics in Europe" (Wolodtschenko 2002, in German) documented significantly an innovative character of the pioneers of cartosemiotics and their successors. The new monograph "30 years with and for cartosemiotics (1981-2011), Wolodtschenko (2011, in progres, in German) also includes a chapter with activities of the cartosemiotic pioneers.

1.2. Who are the "Pioneers of Cartosemiotics"?

The "Pioneers of Cartosemiotics" are three European scientists (**Fig.1**): two east-cartographers and one west cartographer (in alphabetic order):

Aslanikashvili, Alexander (1916-1981) Tbilisi, former USSR/Georgia

Bertin, Jacques (1918-2010) Paris, France and,

Bocharov, Michael (1914-1997) Moskau, former USSR/Russia.



**A.Aslanikashvili
(1916-1981)
Tiflis,
USSR/Georgia**



**J.Bertin
(1918-2010)
Paris,
France**



**M.Bocharov
(1914-1997)
Moskau,
USSR/Russia**

Fig. 1 Pioneers of Cartosemiotics

J. Bertin is a recognized and popularized person in France, Europe and in the cartographic world. His "Semiologie Graphique" had leaved an enormous shadows in cartographic theory and has influence for recent cartography and cartosemiotics

M. Bosharov was a cartographic dissident in Soviet Union and a victim of Salischev's system. (Wolodtschenko 2009). Konstantin.Salischev was a pope of Soviet Cartography in 1970s-1980s. Salischev made a no name for M.Bocharov.

A.Aslanikashvili was not a cartographic dissident but Salishev has not approved to translate from Russian into English his monograph "Metacartography"(Aslanikashvili 1974). But 1998 Japanese cartographer Tositomo Kanakubo made translation from Russian into Japanese the monograph "Metacartography". Fig. 2 shows selected monographs on cartosemiotics investigations.

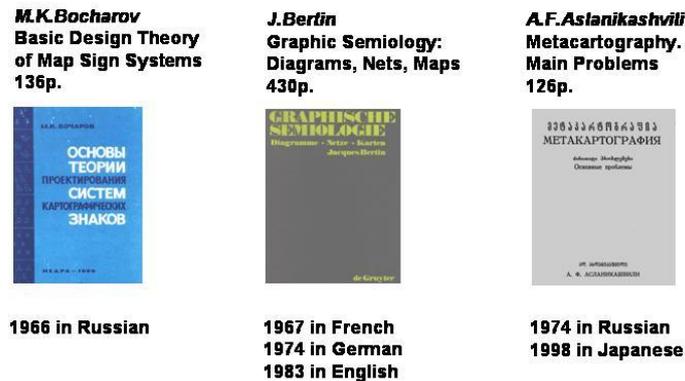


Fig. 2 Selected monographs of Pioneers of Cartosemiotics in the TU Dresden library (SLUB)

The monographs of Bocharov (1966) and Aslanikashvili(1968, 1974) were published in the Soviet Union or beyond “iron curtain” and had not have a big succes by west cartographers. Independent of that three monographic books by Bocharov (1966), Bertin (1967) and Aslanikashvili (1968) were the first-semiotically releted ones in the cartography of the 1960s. Tab. 1 includes main contents parts of this three monographs. Since end 1970s the library of the Dresden University of Technology (SLUB) has all three monographs and offers it to readers.

Tab. 1 Contents of three monographs by Bocharov/ Bertin/ Aslanikashvili

Bocharov 1966	Bertin 1967	Aslanikashvili 1968/1974
§1 General questions of the theory of sing system, 5-41pp (28%) §2 Criteria for estimation of information content, 42-52pp (8%) §3 Criteria for estimation of cartographic information content, 53-79pp. (20%) §4 Project of sign system for vegetation of topographic maps, 80-131pp (35%)	Part 1: Semiology of Graphic System, 7-199 pp. (46%) Part 2: Using of Graphic System 200-421, pp.(51%)	§1 Introduction,3-19pp. §2 Map language, 20-51pp. §3 Cartographic method, 52-121pp

1.3. Bertin’s graphic semiotics: some its restrictions

This part of articles focuses on classic graphic semiotics or its parts and deals with Bertin’s graphic system or graphic semiotics that was presented in his monographic work (Bertin 1967) as one of the classical works of graphical visualisation. The graphic system or “graphic language” after Bertin (1967) included six graphic

variables (shape, size, brightness, grain, colour, direction) with rules its using and oriented on pragmatic goals of optimal creation and transfer of visual information. It was related to three graphic models: nets/networks, diagram and maps. Fig. 3 shows a diagram of chapter “Using of Graphic System” (200-421 pp.) of Bertin’s monograph with pages proportion: 16 pp.(8%) for nets, 76 pp.(34%) for diagrams and 128 pp.(58%) for maps.

After Bertin (1967) this system was closed and independent one. That is, this graphic system developed in “autonomic modus” and had some restrictions. One can call several restrictions of this graphic system:

- focus on print cartosemiotic models only;
- only three cartosemiotic models are considered (maps, diagrams and nets);
- maps are main spatial models but not sole one. Atlases, globes, anamorphoses, panoramas, aerial/satellite images etc. don’t accept ;
- domination of statistical, analytical maps;
- domination of static and not dynamic maps.

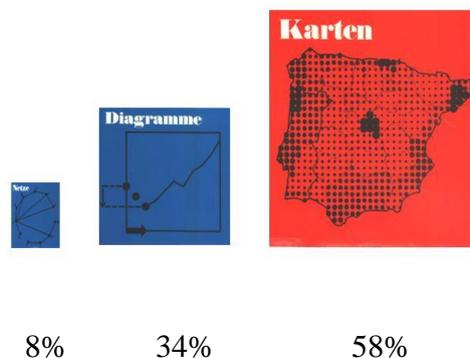


Fig.3 Pages proportion of nets, diagrams and maps by Bertin (1967)

1.4. How maps work: map semiotic, map language and cartosemiotic aspects

Within the two last decades of the 20th century several monographic works were published (see Schlichtmann 1999). The exceptional merit in the investigation of problems of map language in the 1960s and 1970s belongs to the A.F.Aslanikashvili and L.Ratajski. H.Schlichtmann, A.A.Liouty and J.Pravda continued in the 1980s, each in its own way, the search of map language theory. The cartonomic conception by A.Liouty was theoretical and conceptual engine that made a breakthrough of cartographic stagnation in Soviet Cartography in the 90s. In the 1990s A. Wolodtschenko continued cartosemiotic research and began to study atlases as semiotic models.

What is typically in the cartosemiotic research for the 20th century? And cartographers and cartosemioticists were in “captivity” of topographic, thematic and special maps as cartographic sign systems. The graphic semiotics of the 20th century was also classic graphic sign-system oriented on the print and visual products-maps.

From technological point of view the “internet paradigm” has changed a map priority at the first decades of the 21st century (e.g. Google-Earth with maps, air/satellites images and terrains). Also the monopol of analogic maps was changed from the side of digital maps.

Two selected examples of monographic publications of the 20th century and namely, by Liouty (1988) and MacEachren (1995) will be briefly considered only. Tab. 2 shows content parts in pages and (%) of both monographs.

Tab. 2 Contents of monographs by Liouty and MacEachren

Liouty 1988	MacEachren 1995
Part 1: Map language: essence and system, 14-123pp. (34%)	Part 1: How meaning is derived from maps, 21-212pp. (41%)
Part 2: Main functions of map language, 124-282pp. (49%)	Part 2: How maps are imbued with meaning, 213-354 pp. (31%)
Part 3: Theory of map language and cartographic science, 283-310pp. (8%)	Part 3: How maps are used, 355-462 pp. (26%)

Today one can confirm that Liouty (1988) continued development of the map language theory after Aslanikashvili, and MacEachren (1995) developed Bertin's graphic system through new map functions and structures of representation, visualization, and design of maps.

The main Bild-focus (illustration-focus) by Bertin (1967, 1974) were six graphic (visual) variables located in two-dimentional coordinat system; the main Bild-focus by MacEachren (1995) was a cubic map-use space for cartography visualization and communication; the main Bild-focus by Liouty was double-united structure of map language with two-sublanguages system (language of mathematic graphics and language of graphic communication). Later I proposed (Wolodtschenko 1999) four-sublanguages system with verbal language and language of Bildes/pictures/ that extended Liouty's double-united structure of map language. All four selected illustration-foci (Fig. 4) have map focus.

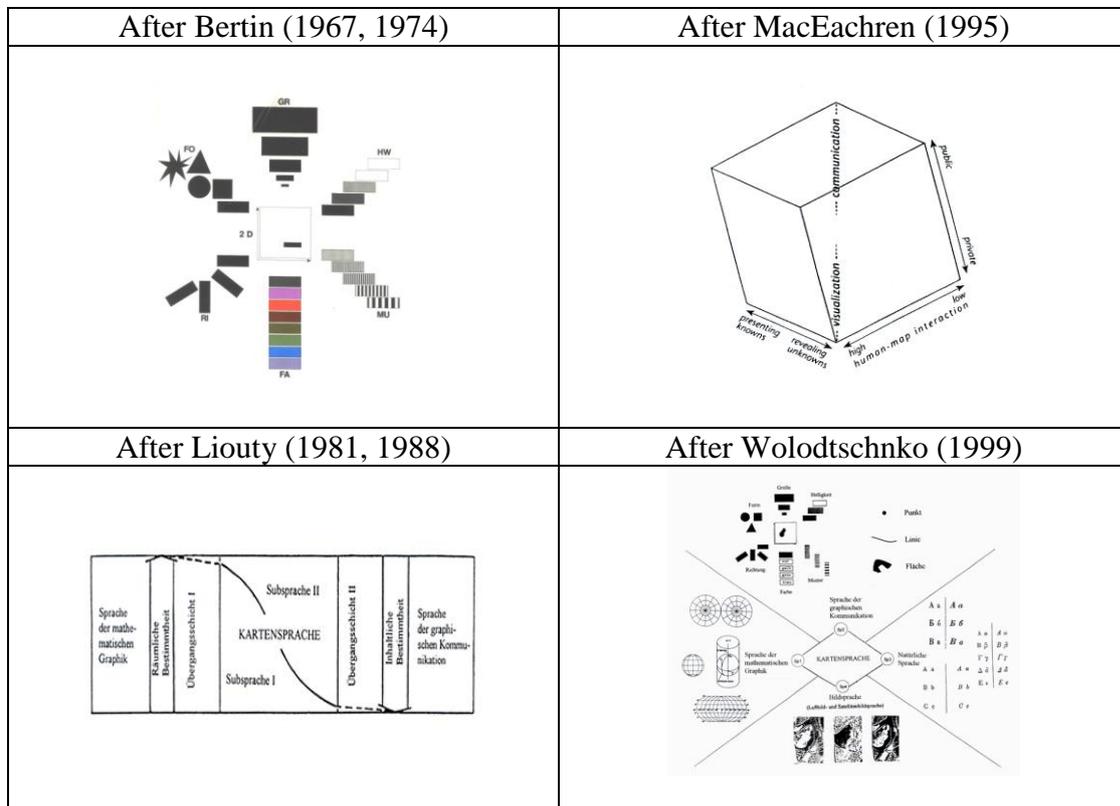


Fig.4 Main Bild-foci (illustration-foci) of the selected monographs

2. Some paradoxes in cartography

The theme of paradoxes is considered and discussed several times on the web-journal Meta-Carto-Semiotics (Wolodtschenko 2009, 2010). Paradoxes in cartography one can present as metaphor. In reality, they can leave a deep tracks or traces as well a success and satisfaction, and as disappointment.

Only three paradox-related themes will be briefly considered: three generations problem; “contradictions“ cartography and a “one-sided“ or “one track” cartography.

2.1. Paradox of generations

This subtopic illuminates an interesting generation’s problem or generation’s paradox in resent cartography (and in society on the whole). At the moment one can distinguish three main generation groups in cartography (Tab. 4): classics, half-digital/half-classics (HD/HC) and digital generation (DG). The half-digital/half-classics generation has dominate positions government and private institutions (universities, mapping agencies, commercial cartographic publishers etc.). A particular conflict exists between HD/HC and digital generations at the universities and academic institutes.

In about 10 years, this digital generation will dominate. In ca. 40 years, an absolute dominance of the digital generation will be reality. Where and how to go cartography under DG leadership in 10-15 years? It remains today a large and open question.

Tab.4 Modern generations (after Wolodtschenko 2010)

Time	Generation group I (>65 years)	Generation group II (35-65 years)	Generation group III (<35 years)
2010	Classics (Pensioners) 15-20%	Half-digital/Half-classics 50-60%	Digital Generation 30-35%
ca. 2020	-	Half-digital/Half-classics 30-40%	Digital Generation 60-70%
ca. 2050	-	-	Digital Generation 95-100%

2.2. Paradox of “cross-road“ or “cross centuries” of cartography

The resent cartography has situation that characterize its change and contradictions. Tab. 5 demonstrates selected “contradictions“ of cartography for both centuries 20th and 21st ones. This situation reflects cartography in the fracture; this situation reflects also its binarisation process (cartography and geographic information/GI science).

The “cross-road” of contradictions and changes ona can consider as a time metaphor and “barometer” of stagnation or development of cartography.

Tab. 5 Selected “contradictions“ of cartography

20th Century	21st Century
„Contradictions“ of cartography	
Cartography	Geovisualisation/Geomatics/Neogeography
Science	Management (Science management)
Authorship	Anonymity
Personality	Top-Manager
Professional cartographer	Cartographer and GIScientist(Geomaticist)
„Aspirations for independence“ (of geodesy und geography)	„Aspirations for dependance“ (of geoinformatics or geomatics)
With ICA Yearbook(1961-1990)	Without ICA Yearbook
Continually forms of education	Split up forms of education

2.3. Paradox of “one-sided“ or “one track” cartography

This paradox is characterize modern cartography with dominance of geospatial technologies. The technological cartography (with five “geospatial technics”: internet-cartography, neogeography, ubiquitous cartography, LBS and augmented reality) forms structure of modern cartography /Gartner, Schmidt 2010/. It is not difficult to see the term GIS is not illuminated. Tab. 6 shows a possible structure of modern cartography which includes theoretical and methodological fundamentals in declaration form only. In article /Gartner, Schmidt 2010/ was proposed to define the theoretical and methodological fundamentals and to integrate the recent technological development of modern cartography. That appeal is very needful for modern cartography in the time of dominance of the “one-sided“ technological cartography.

What are the theoretical and methodological fundamentals of modern cartography? Which discipline deals with theoretical questions? One of this discipline can be cartographic semiotics. This discipline is subdivided into general and applied cartosemiotics and deals with diverse cartosemiotic models as spatial knowledge models with cartographic and non cartographic traditions.

Tab.6 Structure of modern cartography

Modern cartography		
Technological cartography		Theoretical cartography
geospatial technics: internet- cartography, neogeography, ubiquitous cartography, LBS and augmented reality	geospatial data	Theoretical and methodological fundamentals

3. Quo vadis theoretical cartography?

This question will illuminate a number of the new and old problems in cartography. Several themes related to development of theoretical cartography were considered and discussed in / Wolodtschenko 1999/. Here, the selected themes and questions will be briefly and exemplarily presented and explained.

3.1. Technology vs. theory

The question: Quo vadis theoretical cartography? illuminates also the new and old problems between technological and theoretical cartographies. It was in the 20th century, when cartography pleaded its “independence” of geodesy and geography. And it is also in the present century, when cartography pleads its “dependence” of GIScience, geomatics and informatics.

An example from ICA Research Agenda (2007) illustrates the “forefront” of present cartography and geoinformation (GI) science. Tab. 7 shows 10 keywords of the ICA research agenda, when technological fields occupy seven positions from ten. This table illustrates two vocabulary areas with priorities in present cartography and geoinformation (GI) science. The group topics with technology-related vocabulary have domination in cartography at last years particularly.

Tab.7 Keywords of the ICA research agenda (2007)

Keywords of the ICA research agenda	
1. Geographic Information (GI)	7. Cartographic theory
2. Metadata and SDIs	9. Education
3. Geospatial analysis and modelling	10. Society
4. Usability of maps and GI	
5. Geovisualisation and visual analytics	
6. Map production	
8. History of cartography and GI science	
Information technology vocabulary	Cartographic vocabulary

The modern cartography or neo-cartography after Gartner, Schmidt (2010) includes technological development (internet-cartography, neogeography, ubiquitous cartography, LBS and augmented reality) and implications. The question: what is the theoretical and methodological fundament of neo-cartography? stays open in the article by Gartner, Schmidt (2010).

3.2. Cartographic management vs. cartographic science

The change from cartographic science to cartographic management does not mean stopping the development of theoretical cartography. The management “philosophy” dominated over cartography science in the first decade of the 21st century and will dominate further. It is a new style in the era of globalisation, and not for cartography only. In this time, the cartography advanced new leaders as a rule-managers of cartography. Unfortunately this style brings also a cartographic dilettantism. Cartographic leaders-managers are there in many countries. Here, one can make a generalization that what are the leaders, such are cartographies in their countries.

After nearly 100-years development cartography as science, one can state that the time of outstanding or strong personalities as Arnberger, Imhof, Salischev etc. has passed. It was a time of classic and “polarization” cartography. It was time of the 20th century. Cartography in the future (after Konecny, 2007) will be an ubiquitous mapping, e.g. adaptable cartography, mobile cartography and sensor cartography. This is not feasible without cartographic management.

3.3. Selected monographs (1988-2008)

At the last twenty years were published diverse monographic works with cartosemiotic und map languages aspects (Wolodtschenko 2008). The tab. 9 shows selected monographs in chronological order (with information to author, year, title and L(anguages)). The list of publications reflects a theoretic-oriented accumulation of cartographic and cartosemiotic knowledge in last decade of the 20th century and first decade of the 21st century. A short statistics: 35% of monographs are in Slavic languages; 30% in German and 25% in English; 18 from 20 authors are from Europe. The roots of theoretical cartography have also European origin.

Tab. 9. List of selected theoretical monographs (1988-2008)

Author, year	Titel	L
Liouty, A.A.(1988)	Map language: essence, system and function. Moscow 1988. (in Russian).	R
Pravda, J.(1990)	Zaklady koncepcie mapoveho jazyka. Bratislava 1990 (in Slovak).	S
Wolodtschenko A.(1993)	Map language problems and cartosemiotics. Dresden 1993 (in Russian)	R
Kekelia D.I.(1995)	Cartosemiotics. Tbilisi 1995 (in Georgian).	G
MacEachren, A.(1995)	How Maps Work. New York and London 1995	E
Neytchev, P.(1997)	Jezyk czy kod kartograficzny? University of Warsaw 1997 (in Polish).	P
Wolodtschenko A.(1997)	Cartosemiotics and prehistoric maps. Barnaul-Dresden 1997 (in Russian).	R
Hussy, C.(1998)	La Carte, un Modele, un Langage. Geneve 1998.	F
Schlichtmann, H.(Ed. 1999)	Map Semiotics Around the World.) Regina, ICA 1999	E
Wolodtschenko, A.(1999)	Kartosemiotische und konzeptionelle Aspekte der 90er Jahre. Dresden 1999.	G
Casti, E.(2000)	Reality as representation. The semiotics of cartography and the generation of meaning. Bergamo 2000.	E
Brodersen, L.(2001)	Map as Communication. Allerod 2001.	E
Wolodtschenko, A.(2002)	Kartosemiotik in Europa. Dresden 2002.	G
Wolodtschenko, A.(2003)	Ausgewahlte Beitrage zur Kartosemiotik und zur Theorie der Kartographie 1993-2003. Dresden 2003.	G
Wolodtschenko, A.(2005)	Mini-Glossary. Cartosemiotics. Dresden 2005, 2008 (in Russian)	R
Hruby, F.(2006)	Semiotische Begründbarkeit kartographischer Signaturen. München 2006.	G
Wolodtschenko, A.(2006)	Atlas cartosemiotics. Dresden 2006 (in Russian)	R
Wolodtschenko, A.(2007)	Nationalatlas Deutschland: ein kartosemiotisches Portraet. Dresden 2007	G
Brodersen, L.(2008)	Geo-communication and information design. Allerod 2008	E
Jobst, M.(2008)	Ein semiotisches Modell für die kartographische Kommunikation mit 3D. Wien 2008.	G

3.4. Ranking of the theoretical cartography (1995-2011)

The ICA conferences reflecte theoretical and technological front research, activities and traditions of cartographic community. The ICC-themes of the ICA conferences(1999-2009) were analysed and presented in tab. 8. The "Ranking" of Theoretical cartography in themes list of the five last ICA conferences illustrates it can occupy and the first, and the last (31) places.

For the ICC 2011 in Paris were nominated 38 themes (T0-T37); the terms: theory, neocartography, neogeography, cartosemiotics etc. are not to find on the list. One can assume that two themes T0 (Jacques Bertin: Cartographic work and influences) and T1 (Semiotics, map perception, cognition and knowledge) cover all questions of cartography theory in Paris.

Tab. 8 "Ranking" of theoretical cartography

ICA Conferences		"Ranking" of Theoretical cartography in themes list	Number of papers/posters
1999	Ottawa/Canada	-	-
2001	Beijing/China	5	14
2003	Durban/South Africa	11	18
2005	A Coruna/Spaine	1	26
2007	Moscow/Russia	1	52
2009	Santjago/Chile	31	7

3.5. Theoretical conceptions in cartography of the 20. and 21. centuries

The 20th century has left for theoretical cartography diverse conceptions (tab. 10). They reflect semiotic and map language related trends and map-focused traditions in cartography of last century. All conceptions have maps as basis researched reference models. But Bertin's graphic semiotics as conception was a first semiotic-basic conception that included three basic models: maps, diagrams and networks. His conception of graphic semiotics takes an important place in the theoretical cartography. Two other conceptions by Aslanikashvili (1968) and Ratajski (1976) formed accordingly, gnoseological (map language related) and linguistic directions. In my opinion, the generation of theoretical conceptions in the 1980s and 1990s (by Schlichtmann, Liouty, Pravda, Wolodtschenko etc.) included diverse map-related componets with new semiotic-methodical focuses.

The first decade of the 21st century brought a conceptional lull in the theoretical cartography. This can be explained by the growing priority of technology over theory and conception. But as it known, tools not generate conceptions. The conceptions are born in the depths of the scientific disciplins.

Tab. 10 Selected theoretical conceptions

Author	Conception	Year	Reference models
J. Bertin	Graphic Semiotics	1967	Maps, diagrams, nets
A.F.Aslanikashvili	Metacartography	1968	Maps
L. Ratajski	Cartology	1976	Maps
H.Schlichtmann	Map symbolism	1985	Maps
A.A.Liouty	Cartonomy	1988	Maps
J. Pravda	Map language	1990	Maps
A.Wolodtschenko	Cartographic "paradigm"	1996	Maps
A.Wolodtschenko	Meta-cartosemiotics	2009	Cartosemiotic models (maps, atlases, globes, etc.)

3.6. New conception „meta-cartosemiotics“

2009 I proposed a new conceptions in theoretical cartography - meta-cartosemiotics (Wolodtschenko 2009). Each new theoretical concept need for its nomination and approval a powerful accumulation of knowledge and its practical use. For meta-cartosemiotics it is the beginning process. It has a formation phase.

The conception has semiotic-methodical basis: cartographic (maps related) method (CM), cartosemiotic method (CSM) and meta-cartosemiotic method (Meta-CSK) (fig. 5). The methods biuld a semiotic chain. The cartographic (maps related) method of research was main method in cartosemiotics of the 20th cetury; the maps as sign-element-models and knowledge models were a focus in cartosemiotic research.

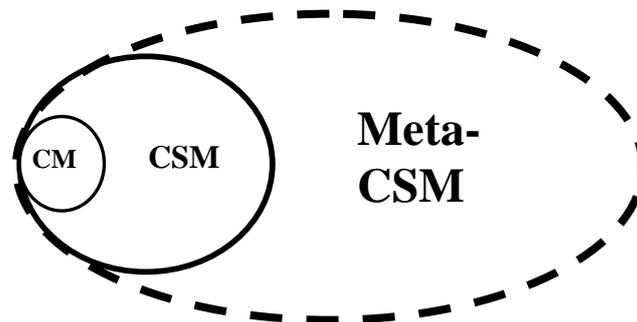


Fig. 5. Semiotic-methodical research fields of modern theoretical cartography /Wolodtschenko 2008/

The first decade of the 21st centure the cartosemiotic method dominated as research method with cartographic and not cartographic traditions. The CSM characterise change of sign-element-model (map) into poly-system model (atlas, 3D globe etc.) The Meta-CSM deals with meta-knowledge models or models of the semiotic knowledge models. The visual and mental communications will be dominate in these models. These models present a - cartosemiotic meta-knowledge. Tab.11 presents main model system characteristics with communication priorities in the time perspective: visual communication in 20.century visual, acoustic and haptic communication in the first half of 21st century and visual, acoustic, haptic and mental interactions (communication) in the second half of 21st century.

Tab. 11 Selected model system characteristics with interaction priorities

Model system characteristics	20th Century	21st Century	
		Semiotics of multimedia spatial models	Semiotics of meta-models
Dominant semiotics	Semiotics of map signs	Semiotics of multimedia spatial models	Semiotics of meta-models
Dominant language	Map languages	Languages of cartosemiotic models	Languages of cartosemiotic meta-models
Dominant variables	Visual graphic variables (shape, size, brightness, grain, colour, direction)	Semiotic meta-variablen (Map, Text, Bild)	Semiotic meta-metavariablen: Meta-Maps, Meta-Texts, Meta-Bilds
Priority interactions	visual communication	visual, acoustic and haptic communication	visual, acoustic, haptic and mental communication

The conception meta-cartosemantics does not claim to general conception of cartography. This goal was by conceptions: Metacartography (A.Aslanikashvili), Cartology (L.Ratayski), Cartonomy (A.Loity) and Map language (J.Pravda).

The conception meta-cartosemantics has also several pragmatic goals, e.g. “semiotic-analytical monitoring” of the cartography-applications (tab.12) and cartosemantics developing, creation of conditions for new applied disciplines with cartosemantic profiles, for example, atlas cartosemantics which studies analog and electronic atlases as models of semiotic knowledge etc. Tab. 10 shows some semiotic components of modern geospatial technologies e.g. Google-Map and Google-Earth.

The “Universal-Atlas” as a knowledge system of sub-atlases can be a new perspective technologies with Earth and non Earth-related, spatial and non spatial poly-systems. Semiotic concept for this project has to include atlas-related structure (thematic content and meta-variables architecture) based on three-viewing display principle (Wolodtschenko 2010). I hope the recent information technologies have potential for realisation this “Super-Atlas” for mobile and non mobile users in next years. Only visualisation of geospatial data is not to be as “last station” for this conception. The knowledge acquiring and an effective recovery of competent knowledge has to be focus of this atlas conception.

Tab. 12 Semiotic components in new technologies

Selected geospatial technologies	Semiotic components		
	System models (spatial/ non spatial)	Meta-variables (virtual)	Pragmatic aspects
Google-Map	Earth-related spatial poly-systems	Map, Bild (maps, terrains and landscapes)	Middle level of the knowledge acquiring
Google-Earth	Earth/non Earth-related spatial poly-systems	Map, Bild (globes, maps, landscapes etc.)	Middle level of the knowledge acquiring
“Universal-Atlas”	Diverse Earth and non Earth-related, spatial and non spatial poly-systems (sub-atlases system)	Map, Bild, Text (diverse cartosemantic applications)	High level of the knowledge acquiring

Conclusion

The 20th century was a century of the Bertin’s graphic semiotics with visual cartographic applications. It was a century of map-focused and map language semiotics. Map language was and remains an important object of the study of diverse maps and cartography, but not the only one. Within the cartosemantics not only once raised questions that were discussed the relation of cartography competence for atlases. Atlases are an object of study of many disciplines, not just cartography. What are the language of the atlas, the language of the atlas information system, the language of geoportals etc. as a phenomenon of human culture?

Semiotic potential of maps. What is it? And what semiotic potential does have an atlas information system? What semiotic potential has Google Map? And what semiotic potential has Google Earth? These and many others questions wait their answers and analytical investigations.

In the 21st century will dominate technological cartography with geospatial applications; the cartosemiotics of the 21st century will be cartosemiotics of multimedia knowledge models. It is a new discipline with theoretical and applied profiles and enormous potentials; it is a “bridge” between classical and modern sign systems. It needs also to collaborate, cooperate and integrate the technological cartography. Unfortunately cartosemiotics was not requested and accepted by modern society.

In the second decade of this century the generation change of cartography will be realized. The digital generation will occupy the “cartographic Olympus and villages”. It is an important question: where leads further the digital generation the modern cartography with or without theoretical cartography?

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Notes: I would like to thank Prof. Zhilin Li for his initiation to hold the special session dedicated to J.Bertin during the ICA Workshop in Hong Kong in September 2010; I also thank members of my commission Prof. Takashi Morita and Prof. Alberta Bianchin for contributions of this session. I think the Commission on Theoretical Cartography made a good contribution to the further popularization, recognition and importance of J.Bertin's Visual Graphical Theory for Cartography of the 21st Century.

On the new generation of digital mini-atlases (2012)

ABSTRACT: Each atlas is a main object of the atlas semiotics. Digital atlases on smartphones (mini-atlases on screens with 3”- 5”) are considered as a new generation of semiotic models of knowledge. These atlases still are an “exotic” subject of research on atlas design and atlas semiotics.

KEYWORDS: digital mini-atlases, semiotic classification of atlases, semiotic meta-variables, atlassing, atlas semiotics

0. Preamble

User-oriented creation and acquisition of space/time/theme-related knowledge is an important challenge of the 21st century. Digital atlases can play a decisive role in meeting this challenge. These atlases are an object of study and research of many disciplines, not just cartography. During the last year, the map has lost its monopoly position in communication geospatial information. It is still an important but no longer the only source of spatial information. Google Maps exemplifies this situation: map, satellite image and terrain are presented as equivalent space-related products. Unfortunately, alternative space-related applications such as “Google Thematic-Atlases” or “Google Mini-Atlases” are not yet available.

1. On atlas cartography and atlas semiotics

1.1. Terminological aspects

The term “atlas cartography” has been introduced in the 1960s into traditional cartography’s literature. The following definition of atlas cartography was proposed by Denk (2001): “The atlas cartography is a part of cartography, which deals with planning, organizing, production and actualization of atlases.” According to Churkin (1974), atlas cartography focuses on theory and practice of atlas creation. In the realm of cartography, atlases often are considered as map systems or systematic collections of various maps. The term “atlas cartosemiotics” is a new concept for cartography and cartosemiotics. Wolodtschenko (2006) describes atlas cartosemiotics as a part of applied cartosemiotics, which is engaged in research, interpretation and thematic/modular analysis (T-M analysis) of analog and electronic atlases. The term “atlas semiotics” is another new concept for cartosemiotics, semiotics and cartography (Wolodtschenko 2010c). It deals with all analogic and electronic atlases with both cartographic and non-cartographic traditions.

1.2. Semiotic classification of atlases

Every atlas is a main object of atlas semiotics. How can one classify atlases semiotically? From a semiotic model-building point of view, atlases can be classified into four groups based on the definitions of three semiotic meta-variables (Wolodtschenko, 2007): text, image and map. These three visual meta-variables (text, image, and map) can be complemented by accordant acoustic variables (text, music, sounds, etc.). Table 1 shows four sets of atlases where the following groups of semiotically classified atlases can be distinguished: - Map-based atlases (maps dominate over 50%) - Picture (illustrative) atlases (images dominate over 50%) - Text-based atlases (texts dominate over 50%) and - Mixed atlases (text, images and maps are combined).

Table 1: Semiotic classification of atlases, after Wolodtschenko (2010)

Semiotic groups of atlases			
Map-based atlases	Picture-based atlases	Text-based atlases	Mix-atlases

2. Why do small screen atlases move into the focus of semiotics?

Modern users of mobile spatial knowledge models have experience primarily with maps and atlases on mono-display. Traditional information architectures for maps and atlases on monodisplays are based on sequentially ordered pages and page layouts. From an atlas semiotic and atlas cartographic point of view, such atlases on mobile small screen devices (smartphones, media-players etc.) are special media models that have been hardly examined so far.

2.1. Mobility, minimality, multimedia and multidisplaying as “4M-comfort”

Mono-screen smartphones are and will be the classic device for many users. Mobility, minimality and multimedia are traditional features of single-screen smartphones. However, double-screen smartphones like the “Kyocera Echo”, which has entered the mass market in 2010 have the potential to revolutionize the information comfort for many users. As a new feature for mobile devices, multidisplaying has caused great interest, for example, among cartographic semioticians. But the user has not yet been able to evaluate new semiotic advantages of multidisplaying for mini-atlases. Customized applications for mini-atlases on multi-display smartphones are still missing.

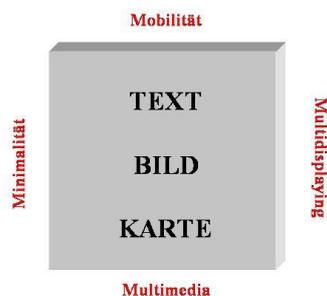


Figure 1: Semiotic model of „4M comforts“(Wolodtschenko 2011a)

The combination of three displays and three semiotic meta-variables (TEXT, IMAGE/BILD in German/, MAP) form a new semiotic-organized presentation form of space-related analytical, complex and synthetic information. It is also a new information 4M-comfort for mobile users of atlases.

The three semiotic meta-variables: text, image (“Bild” in German) and map promote a new semiotic-organized form of space-related analytical, complex and synthetic information. It is also a new model of 4M-comforts for mobile users of mini-atlases (Fig. 1).

2.2. Mini-display atlases for students

Mini-display atlases on mobile devices are still “exotic”. But not for long! Personal research and experience with students of cartography, geography, geodesy and computer science in Dresden, Vilnius, St. Petersburg, Barnaul, Kyiv, Tokyo and Hong Kong show that smartphones are convenient and popular among students (Wolodtschenko 2010 a, b). A first training project and crash course “Conceptions of mini-atlases for smartphones” at the Dresden University of Technology (TU Dresden) has demonstrated an interdisciplinary interest. The course was organized for students of informatics and geography for the summer semester 2011. First results have been already published (Koren, Wolodtschenko 2011, Koren, Wolodtschenko 2012) and demonstrate that development and creation of miniatlas-oriented applications are not only tasks of specialists of informatics. Joint work of IT-specialists, media designers, cartographic semioticians, cartographers, geographers, surveyors, etc. will promote the optimized and rapid solutions of problem tasks of atlas semiotics. But where can we learn map languages and the languages of images, atlases or geoportals? Where does a university with professors or departments for atlas semiotics as an interdisciplinary field of research in the realm of GIS orientated faculties exist?

An atlas-semiotic department or laboratory as an interdisciplinary interface for the Faculty of Forest, Geo and Hydro-sciences was proposed at the Dresden University of Technology (Wolodtschenko 2010). Until now, there seems to be no respond and interest to discuss these themes at the TU Dresden. Hence, the interdisciplinary atlas semiotic discipline is still missing in geographic, geodetic, cartographic education and training both at the University of Technology in Dresden and other universities.

2.3. Illustrated mini-atlases for wider use

In the future, a particular interest of users will be dedicated to illustrative mini-atlases (MiniBildatlanten in German). In modern cartography, the concepts of “illustrated atlases” or “atlases of images” are related with the usage of aerial photos or satellite images. This limited view can be semiotically reinterpreted in a broader way. Any illustrated atlas (i.e.: any collection of icons, aerial photos or satellite images, etc.) with or without cartographic traditions has its own cultural and / or scientific importance. Hence, these atlases and atlas information systems are of main importance in modern society, not only as information and research media, but also as cultural assets of civilizations. Figure 2 shows a cover of the illustrative atlas “ICA Presidents 1961-2011” as cultural-historical atlas. This mini-atlas is also available online in the e_journal <meta-carto-semiotics>, volume 4/2011, in rubric: New publications.



Figure 2: Illustrative mini-atlas “ICA Presidents 1961-2011” (German version).

2.4. On the “semiotic evolution” of triple or quadruple touch screens

As we have mentioned above, first smartphones with dual touch screens are already available. Hence, practical questions arise for many users, such as: What benefits have the multi-display smartphones compared with one-screen mobile phones? How easy are they to use?

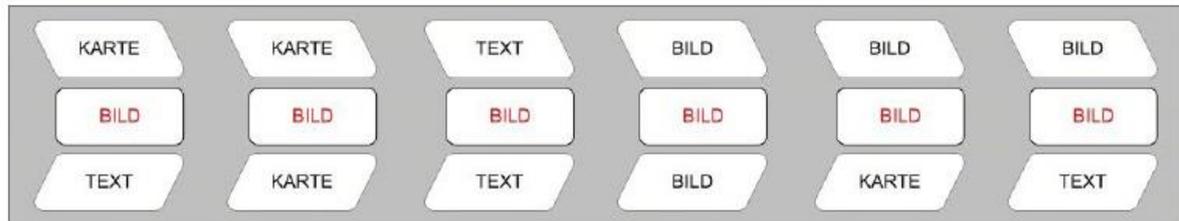


Figure 3: Combinations of meta-variable image (Bild in German) with text and map (after Wolodtschenko 2010b)

Combinations of three displays and three semiotic meta-variables (text, image and map (Figure 3) allow for new semiotically organized forms of presentations of space-related analytical, complex and synthetic information. Figure 4 demonstrates diverse models of illustrative miniatlases on one, two and four screens.



Figure 4: Diverse models of illustrative mini-atlases (Koren, Wolodtschenko 2011)

From a semiotic-pragmatic point of view, the trend from pocket to mini-display atlases is evident. Mini-atlases address a different user-group, e.g. in science, tourism, culture, media, ecology, military, etc.. However, it is difficult to predict, how and when IT developers will build the next generation of smartphones with three or four screens.

From a theoretical point of view, the three meta-variables (text, image and map) seem to be suitable to describe and guide the “semiotic evolution” from single- to multiple-screen devices since every (printed or digital) page-related atlas, encyclopedia, dictionary, journal (or journal articles), newspaper, etc. can be characterized by means of the these meta-variables quantitatively, comparatively and analytically. The quantitative method is based on the semiotic tri-axial system of meta-variables (Wolodtschenko 2007). Figure 5 exemplifies the semiotic potential of an ecological atlas compared with an illustrative atlas and an

encyclopedia. Here, the semiotic potential is demonstrated in quantitative form (in %) as a media "barometer" of any atlas, encyclopedia, book etc.

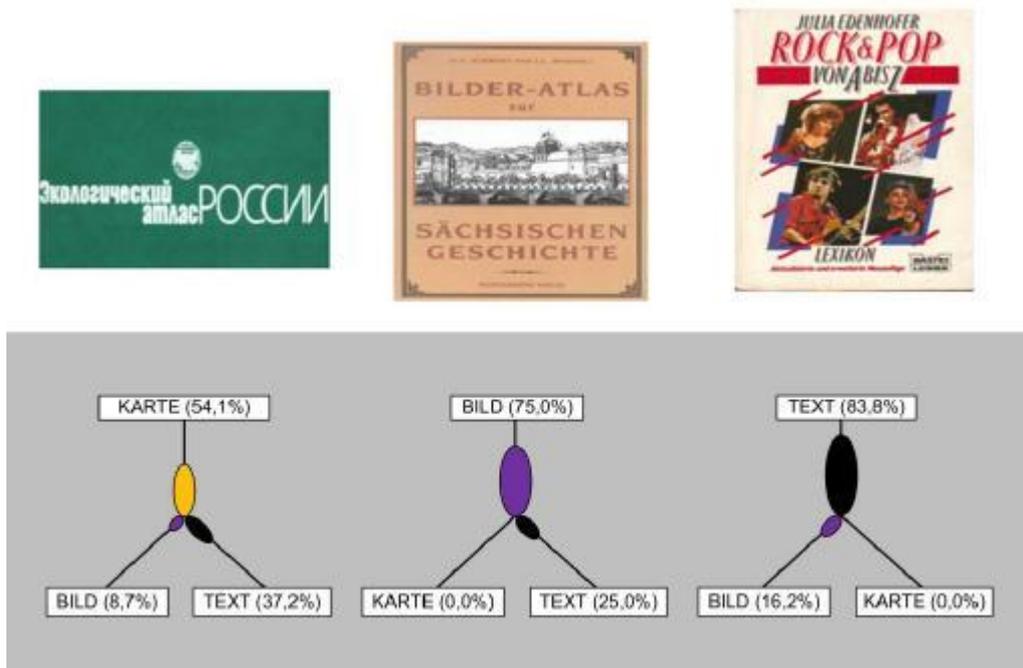


Figure 5: Semiotic potential of three different semiotic documents (Wolodtschenko 2011)

3. Contrasts as “driving forces”

As "driving forces" of modern cartography, various striking contrasts or contradictions characterize trends in the last 20 years' cartography (Wolodtschenko 2011). Two semiotic opposites are presented here only briefly, showing new perspectives for atlas semiotics.

3.1. Atlas semiotics vs. atlas cartography

Atlas cartography is a part of cartography and deals with theory and practice of atlas creation. In cartography, atlases are presented as a system of various maps. However, not all atlases include maps. Regarding these atlases with non-cartographic traditions, cartography has no competence. In contrast, atlas semiotics has competence for all atlases since it is not limited to maps. Instead, atlas semiotics deals with all analogic and electronic atlases with cartographic and non-cartographic traditions. What is the significance of atlases for the International Cartographic Association (ICA)? One can answer this question by analyzing the focus of the 28 ICA Commissions during the 2011-2015. The term "atlases" is mentioned only once in the Commission on Atlases, which forms part of the varia-related group of ICA commissions in table 2. My proposal to form a new ICA Working Group on "Mini-atlases and atlas-semiotics" for the period 2011-2013, was not accepted by the ICA Executive Committee.

Table. 2: ICA- Commissions (2011-2015)

Cartography-related Commissions (9)	Map-related Commissions (8)	Varia-related Commissions (11)
Commission on Art and Cartography Commission on Cartography and Children Commission on Cartography in Early Warning and Crisis Management Commission on Digital Technologies in Cartographic Heritage Commission on the History of Cartography Commission on Mountain Cartography Commission on Neocartography Commission on Planetary Cartography Commission on Theoretical Cartography	Commission on Map Design Commission on Map Production and Geo-Business Commission on Map Projections Commission on Mapping from Remote Sensor Imagery Commission on Maps and Graphics for Blind and Partially Sighted People Commission on Maps and Society Commission on Maps and the Internet Commission on Ubiquitous Mapping	<i>Commission on Atlases</i> Commission on Cognitive Visualization Commission on Data Quality Commission on Education and Training Commission on Generalisation and Multiple Representation Commission on Geoinformation Infrastructures and Standards Commission on Geospatial Analysis and Modeling Commission on Geovisualization Commission on GI for Sustainability Commission on Open Source Geospatial Technologies Commission on Use and User Issues

3.2. Atlassing vs. mapping

"Atlassing" is a new term in atlas semiotics and atlas cartography. It includes a semiotic analysis and portraying of selected atlases and, if necessary the creation of new atlases with cartographic or non-cartographic traditions (Table 3).

Table 3: Structural model of atlassing

Atlassing		
Semiotic (T-M) analysis	Semiotic portraying	Creation
Selected existing atlases		New atlases

The confrontation “atlassing vs. mapping” does not mean that atlases should replace maps. Rather, the map as a meta-variable is a basic component of each map-based atlas. Today, designing and creating an attractive mini-atlas is not only a question of technology and, therefore, not only a task for IT-developers. Mini-atlases have different purposes of use. Hence, semiotic analysis and evaluation of existing mini-atlases is part of the design and conception for new atlases.

4. Conclusions

Analogue and digital atlases as semiotic models of knowledge (i.e.: space, time and thematic knowledge models) take an important place in the modern information society. Electronic atlases probably won't replace analogue atlases completely, but they will dominate more and

more in modern society. From a semiotic point of view it is important to consider not only technical issues but also take into account and develop theoretical and conceptual aspects. A new generation of mini-atlases has been outlined for mobile devices with double-displays; mobile devices with three or four displays are still in a prototype phase and special apps for mini-atlases are still work in progress. Beside technical restrictions, also conceptual-semiotic deficits need to be taken into consideration: Mini-atlases could offer a new atlas culture or atlas-semiotic culture to the user – but which one? The new generation of mini-atlases represent the new semiotic conception of “metacartosemiotics” (Wolodtschenko 2011b). Now this conception has a formation phase. While cartography's competence for atlases is limited on map-related atlases, cartosemiotics has competence for all atlases as semiotic models. Atlases are an object of study for many disciplines, not just cartography. The new generation of mini-atlases has a semiotic base reflecting the following informational-semiotic characteristics:

- new **semiotic classification** (with four types of atlases: map-based, image-based, text-based and mixed atlases)
- 4M (mobility, multimedia, minimality, multidisplaying)-categories of **information comfort** or convenience.
- **semiotic architecture** with meta-variables (text, image, map) in static and dynamic forms
- **semiotic portraits** (with diagrams, tables and text-forms)
- **semiotic potential** (in quantitative and qualitative forms)
- 3x3 combination (3-displays/3-metavariablen) as a new **semiotically organized presentation form** of space-related analytical, complex and synthetic information
- compatible with cartographic and non-cartographic **traditions**.

Current users need compact, qualitative and ubiquitous space/time/theme-related knowledge or information. The need for such information in modern communication society is both urgent and increasing. As geographical, historical, statistical, encyclopaedical etc. informationsemiotic models, digital mini-atlases form a new approach to meta-knowledge of the 21st century.

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Mini-atlases for Google Maps: why ever not? (2014)

Abstract. The 20th century was a century of the classic cartography with graphic semiotics and visual cartographic applications. It was a century of map-focused and map language semiotics.

The maps and mapping are and will be an important geoinformation source. But the map's role in communication of geospatial information is changed.

Digital or electronic atlases won't replace analogue atlases completely, but they will dominate more and more in modern society. Digital atlases are an object of study and research of many disciplines, not just cartography. During the last years, the map has lost its monopoly position. Google Maps exemplifies this situation: map, satellite image and terrain are presented as equivalent space-related products. Unfortunately, alternative space-related applications such as "Google Thematic-Atlases" are not yet available (Wolodtschenko 2012). The new thematic space-related web-service, for example, "Ubiquitous Google Mini-Atlases" could play an important role in the forming of new atlas-semiotic culture to the user of the 21st century.

Keywords: ubiquitous mini-atlases, iconic atlasing, Google Maps + mini atlases

1. Why do mini-atlases move into the focus of semiotics?

From a semiotic model-building point of view, all atlases can be classified into four groups based on the definitions of three semiotic meta-variables (Wolodtschenko, 2007): map, image ("Bild" in German) and text. These three visual meta-variables can be complemented by accordant acoustic variables (text, music, sounds, etc.). Fig. 1 shows four sets of atlases where the following groups of semiotically classified atlases can be distinguished:

- Map-based atlases (maps dominate over 50%)
- Picture (illustrative) atlases (images dominate over 50%)
- Text-based atlases (texts dominate over 50%) and
- Mixed atlases (text, images and maps are combined).

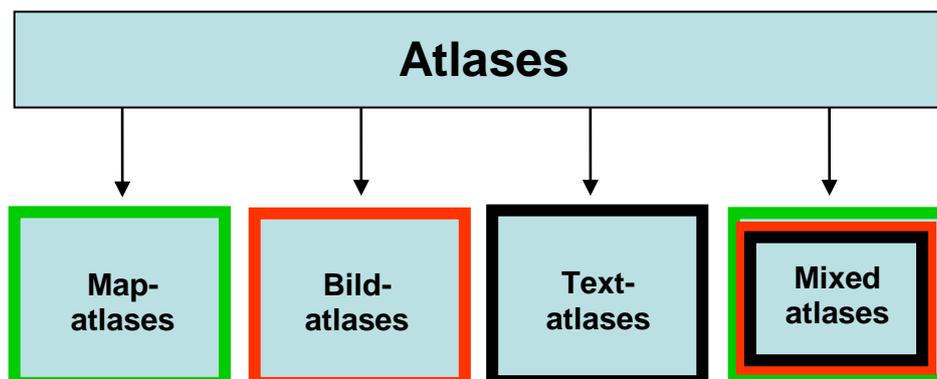


Fig. 1 Semiotic classification of atlases (after Wolodtschenko 2007)

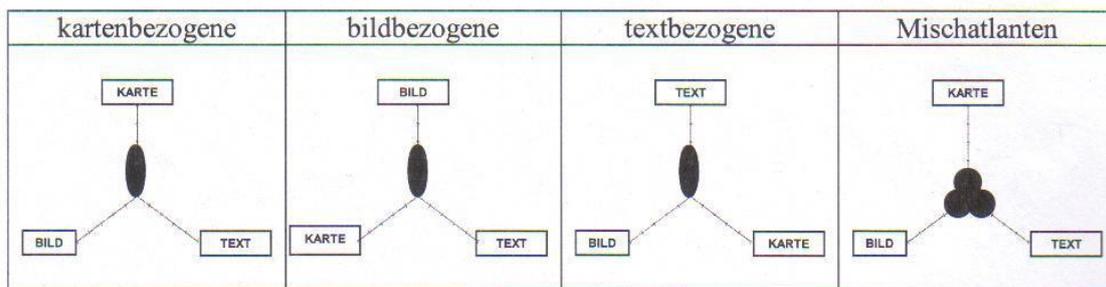


Fig. 2 Atlas classification system and semiotic three axel co-ordinate system (after Wolodtschenko 2010)

The three semiotic meta-variables (fig. 2) or semiotic tri-axial system of meta-variables: map, image (“Bild” in German) and text promote a new semiotic-organized form of space-related analytical, complex and synthetic information, which compatible with cartographic and non-cartographic traditions.

2. From „Maps + Photographs“ and Maps + Webcams” to „Maps + Mini-atlases“

Modern users of mobile spatial knowledge models have experience primarily with maps and atlases on mono-display devices. In the future, a particular interest of users will be dedicated to ubiquitous thematic mini-atlases (illustrative and mixed atlases with diverse static and dynamic information). Google Maps has really possibility to add a new application “Maps + Mini-atlases” for users of “Maps + Photographs”. Mini-atlases as semiotic models of knowledge (i.e.: space/time and thematic knowledge models) will take an important place in the modern information society.

Figures 3 and 4 show two selected screenshots, which illustrate the iconic web-products of Google Maps. Mini-atlases as iconic web-products of Google Maps are not yet available.



Fig. 3 All photograph themes of the world (Screenshot of Google Maps)

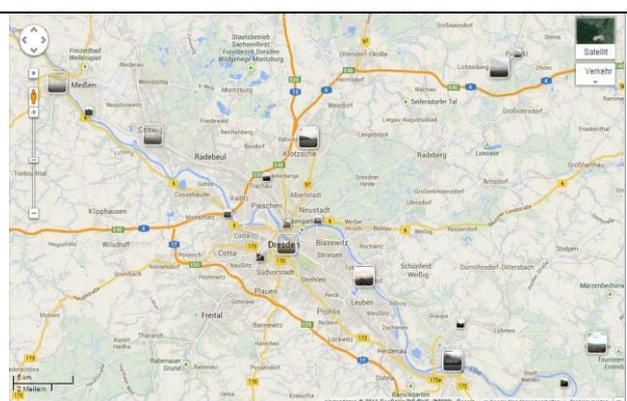


Fig.4 Web-cams dates around of Dresden city (Screenshot of Google Maps)

3. About conception „Iconic Atlassing“ for ubiquitous mini-atlases

The conception „Iconic Atlassing“ for ubiquitous mini-atlases includes some proposals for new web-project (Wolodtschenko 2012, Lebezova, Semichastny, Wolodtschenko 2013). This web-project has a formation phase. Four thematic groups of atlas-interests (students mini-atlases, thematic mini-atlases, mini-atlases of scientific events and dual-display atlases) will be briefly described.

3.1. Students activities

Personal research and experience with students of cartography, geography, geodesy and computer science in Dresden, Vilnius, St. Petersburg, Barnaul, Kyiv, Tokyo and Hong Kong show that smartphones are convenient and popular among students (Wolodtschenko 2010, 2011). A first training project and crash course “Conceptions of mini-atlases for smartphones” at the Dresden University of Technology (TU Dresden) has demonstrated an interdisciplinary interest. The course was organized for students of informatics and geography for the summer semester 2011. First results have been already published (Koren, Wolodtschenko 2011) and demonstrate that development and creation of miniatlas-oriented applications are not only tasks of specialists of informatics. Joint work of IT-specialists, media designers, cartographic semioticians, cartographers, geographers, surveyors, etc. will promote the optimized and rapid solutions of problem tasks of atlas semiotics.

At the Donetsk Institute of Tourism (Ukraine) was organized crash course “Ubiquitous thematic atlases” for the winter semester 2013. Students created digital illustrative atlases with touristic themes and participated in the new project „Iconic Atlassing for Donetsk city and Donetsk region” (Lebezova, Semichastny, Wolodtschenko 2013).

3.2. Thematic mini-atlases

In the future, a particular interest of users can be dedicated to illustrative thematic mini-atlases. In modern cartography, the concepts of “illustrated atlases” or “atlases of images” are related with the usage of aerial photos or satellite images. This limited view can be semiotically reinterpreted in a broader way. Any illustrated atlas (i.e.: any collection of photographs, aerial photos or satellite images, etc.) with or without cartographic traditions has its own cultural and / or scientific importance. Hence, these atlases and atlas information systems are of main importance in modern society, not only as information and research media, but also as cultural assets of civilizations. Figure 5 exemplifies four selected illustrative atlases as cultural-historical mini-atlases of author. These atlases were conceptualized and created for one screen devices.

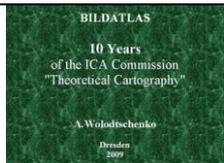
One-display mini-atlases	
Wolodtschenko A. (2009): Mini-atlas " 10 Years of the ICA Commission Theoretical Cartography". Dresden 2009.	
Wolodtschenko A. (2010): Mini-atlas "Prehistoric maps and sign systems. Dresden 2010 (in Russian).	
Wolodtschenko A. (2011): Mini-atlas "ICA Presidents 1999-2011". Dresden 2011. (http://meta-carto-semiotics.org/index.php?page=current-4)	
Wolodtschenko A. (2012): Mini-Atlas. 30 Jahre der orthodoxen Gemeinde in Toksovo. Dresden 2012(in Russian).	

Fig. 5 Cultural-historical mini-atlases of author

3.3. Mini-atlases of scientific events

Mini-atlases of scientific events (conferences, seminars, workshops etc.) present a new form of web-documentation. These atlases reflect diverse scientific activities in illustrative form. Figure 6 shows selected one-display mini-atlases of scientific events themes.

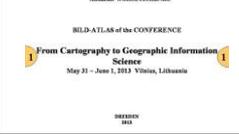
One-display mini-atlases	
<p>Wolodtschenko A. (2012): Mini-atlas. 11. Semiotischer Weltkongress in Nanjing, China „Ausgewählte Photo-Impressionen“. Dresden 2012. (http://rcswww.urz.tu-dresden.de/~wolodt/ATLAS/)</p>	
<p>Wolodtschenko A. (2012): „Illustrated Atlas AutoCarto 2012: selected photo-moments“. Dresden 2012. (http://rcswww.urz.tu-dresden.de/~wolodt/ATLAS/)</p>	
<p>Wolodtschenko A. (2012): Bildatlas of the Conference “From Cartography to Geographic Information Science”, May 31 – June 1, 2013 Vilnius, Lithuania. Dresden 2013. (http://rcswww.urz.tu-dresden.de/~wolodt/ATLAS/)</p>	
<p>Wolodtschenko A. (2012): Mini-atlas. „Seminar Neogeographie und Metakartosemiotik“. Dresden 2013. (http://rcswww.urz.tu-dresden.de/~wolodt/ATLAS/)</p>	

Fig. 6 Events-related mini-atlases of author

3.4. Dual - display atlases

Dual - display atlases were conceived and created for double screen devices. In the future, a particular interest of users will be dedicated to illustrative mini-atlases on mobile devices with double and triple touch screens. Figure 7 exemplifies three selected illustrative atlases as cultural-historical mini-atlases of author.

Dual - displays atlases	
<p>Wolodtschenko A. (2013): Mini-atlas "ICA Presidents 1999-2011". 2nd ed. Dresden 2013. (http://rcswww.urz.tu-dresden.de/~wolodt/ATLAS/)</p>	
<p>Wolodtschenko A. (2013, with Shevchenko V.): Mini-atlas "Prehistoric maps of the Ukraine". Dresden 2013 (in ukrainischer Sprache). (http://rcswww.urz.tu-dresden.de/~wolodt/ATLAS/)</p>	
<p>Wolodtschenko A. (2013, with Eremchenko E.): Mini-atlas "Stone graves". Dresden 2013 (in Russian). (http://rcswww.urz.tu-dresden.de/~wolodt/ATLAS/)</p>	

Fig. 7 Dual - display mini-atlases of author

4. Atlasing as integrate direction

"Atlasing" is a new term in atlas semiotics and atlas cartography. It includes a semiotic analysis and portraying of selected atlases and, if necessary the creation of new atlases with cartographic or non-cartographic traditions (Fig. 8).

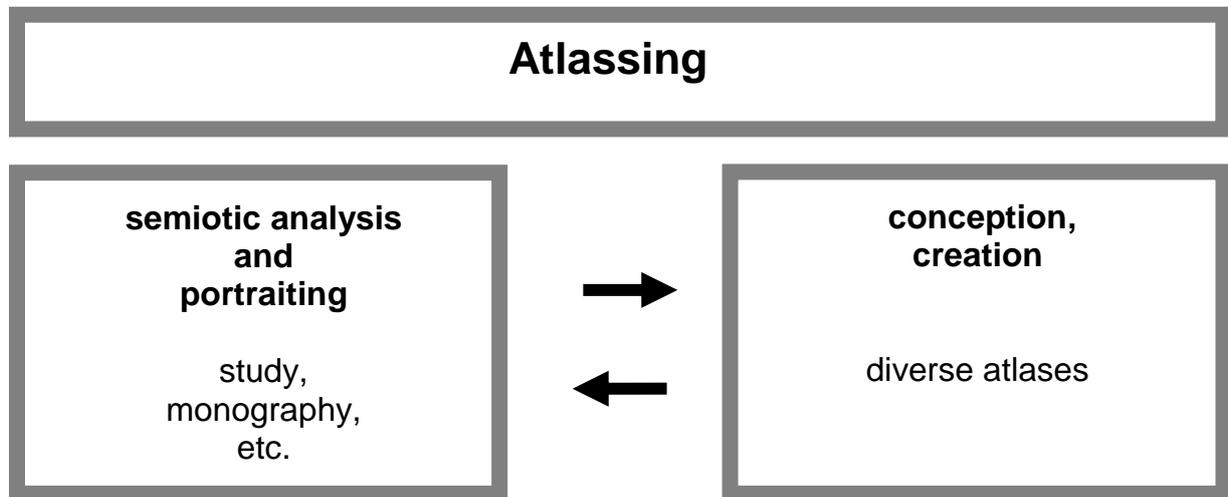


Fig. 8 Structural model of atlasing (after Wolodtschenko 2012)

Atlasing does not replace mapping and maps. Rather, the map as a meta-variable is a basic component of each map-based atlas. Today, designing and creating an attractive mini-atlas is not only a question of technology and, therefore, not only a task for IT-developers. Mini-atlases have different purposes of use. Hence, semiotic analysis and evaluation of existing mini-atlases is part of the design and conception for new atlases.

5. Conclusion

User-oriented creation and acquisition of space/time/theme-related knowledge is an important challenge of the 21st century. The 21st century will be a dominant century of digital atlases with focus on iconic, spatial and multimedia atlasing. Digital mini-atlases can play a decisive role in meeting this challenge. These atlases are an object of study and research of many disciplines, not just cartography. During the last year, the map has lost its monopoly position in communication geospatial information. Digital atlases probably won't replace analogue atlases completely, but they will dominate more and more in modern society.

Mono-screen smartphones are and will be the classic device for many users. Mobility, minimality and multimedia are traditional features of single-screen smartphones. However, double-screen smartphones like the "Kyocera Echo", which has entered the mass market in 2010, have the potential to revolutionize the information comfort for many users. As a new feature for mobile devices, multidisplaying has caused great interest, for example, among cartographic and atlasing semioticians. But the user has not yet been able to evaluate new semiotic advantages of multidisplaying for mini-atlases. Customized applications for mini-atlases on multi-display smartphones are still missing. Thematic ubiquitous mini-atlases are also missing as Google applications.

Thematic mini-atlases as semiotic models of knowledge (i.e.: space, time and thematic knowledge models) can take an important place in the modern information society. The new alternative space-related web-service, for example, "Ubiquitous Google Mini-Atlases" could play an important role in the forming of new atlas culture or atlas-semiotic culture to the user of the 21st century.

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Conception of a mini-atlas “Virtual museum of Leo Bagrow“ (2015)

Based on conceptual-semiotic modelling (atlassing), the author created a small collection of thematic atlases (Bild/image atlases, event atlases, historical atlases etc.) for mobile mono- and double-display devices (Wolodtschenko 2012). The following three mini-atlases on history related topics (fig. 1)

- Die IKV/ICA Präsidenten 1961-2011
- Prehistoric Maps of the Ukraine (in Russian)
- Prehistoric signs and artefacts (in Russian)

are freely available from:

- http://rcswww.urz.tu-dresden.de/~wolodt/ATLAS/ICA_P-ATLAS-1ab.pdf
- <http://rcswww.urz.tu-dresden.de/~wolodt/BILD-ATLAS/2015-PreMaps.pdf>
- <http://rcswww.urz.tu-dresden.de/~wolodt/ATLAS/2013-DoKarUk1.pdf>



Fig. 1 Three mini-atlases on history related topics

The first proposal to initiate a research project focused on a museum of Leo Bagrow was made during the 13th Kartographie-historisches Coloquium in Dresden (September 20-23, 2006), (Wolodtschenko 2012). Unfortunately, due to a lack of detailed information and archival data, I could not start working actively on the project before 2010 (Wolodtschenko 2010).

The creation of any museum is a long and difficult process. The updated project realized 2014-2016 includes the production of a mini-atlas “Virtual museum of Leo Bagrow“ for tablet computers and smartphones. Conceptually, the mini-atlas “Virtual Museum of Leo Bagrow“ is based on three time segments or periods:

- Leo Bagrow in Russia/St.Petersburg (before 1918)
- Leo Bagrow in Berlin (1918- 1945)
- Leo Bagrow in Stockholm (1945- 1957).

The first part of this entitled “Leo Bagrow and St.Petersburg (1898-1918)“ (Fig. 1) will be presented on the occasion of 135th birthday of Leo Bagrow in 2016.

The nobleman Leo-Edward Semenovich Bagrow, better known as Leo Bagrow (1881-1957) was lieutenant of the Russian Imperial Navy (1905-1917), hydrographer, collector of old maps, co-founder and editor of the international journal „Imago Mundi“ from 1935 until

1957 (Wolodtschenko, 2010). He was an active promoter of maps, geography, and military-historical knowledge, author and publisher of books, entrepreneur, organizer and participant of exhibitions and special missions, as well as a member of military and civilian circles and associations.

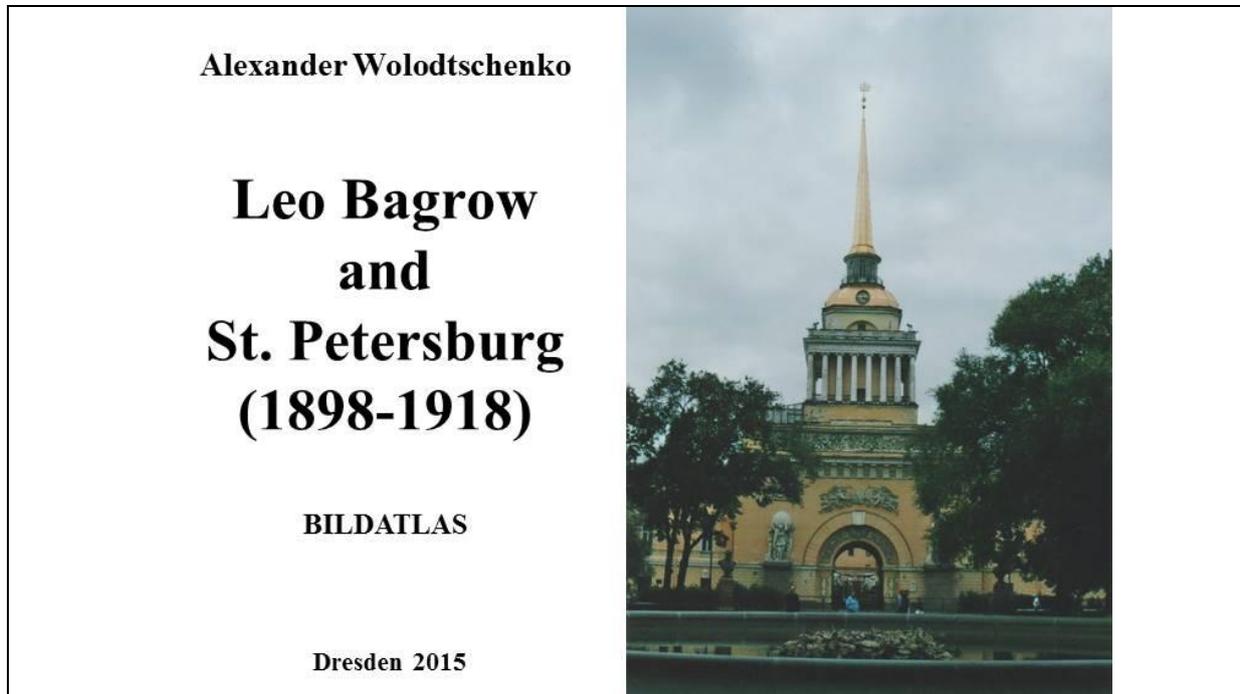


Fig. 2 Cover of the Bildatlas „Leo Bagrow and St.Petersburg (1898-1918)”

Table of contents		
Title	Slide	1
Table of contents	Slide	2
Preface	Slide	3
The teachers of Leo Bagrow	Slides	4-5
Ya.Gurevich private gymnasium	Slide	6
Classmates at gymnasium	Slides	7-8
Friends of youth	Slide	9
Fellow students	Slides	10
Leo Bagrow and the higher geographical education in St. Petersburg	Slides	11-19
List of slides with photographs	Slide	20
References	Slide	21
About the author	Slide	22

Fig. 3 Table of contents of the Bildatlas “Leo Bagrow and St.Petersburg (1898-1918)”

The talented Russian-Swedish scientist has been widely forgotten in Russia and Sweden, but also in the world. A short biographical reference in English can be found in the obituary published in *Imago Mundi*, vol.14/1959 (Skelton, 1959) and, more recently, in an article published by Heffernan and Delano-Smith (2014). Biographical information about Leo Bagrow provided by traditional and electronic encyclopaedias is very scarce and often contradictory. Moreover, no complete biography of Leo Bagrow has been published yet.

The concept of the atlas “Virtual Museum of Leo Bagrow“ is a pilot project, which includes facts, events and documents of the life of Leo Bagrow (1881-1957), organized within several thematic sections: a biographical sketch, publications, correspondence, photo-gallery (in form of a Mini-Bildatlas) of individual lists, and bibliography (Wolodtschenko 2015).

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From analog atlases to ubiquitous atlasing (2015)

0. Preamble

A user-oriented creation/acquisition of space/time/theme-related knowledge is a mayor challenge of the 21st century. In view of this, the digital atlases can be an important format of knowledge transfer. Currently, atlases are the object of study and research of many disciplines, not just cartography. Analogue and digital (electronic) atlases in terms of semiotic (space-, time- and theme-related) knowledge models assume an important role in modern information societies. As holds true for other media, the digital atlas has started to replace its analogy pendant. However, from a semiotic point of view it is important to consider not only technical issues but also to develop theoretical and conceptual aspects as well.

1. Definitions of atlases

Different definitions of the term “atlas” have been proposed during the last decades, approaching this concept from cartographic, semiotic, encyclopaedic etc. viewpoints.

1.1. Map-related definitions

The German cartography textbook by Hake et al. (2002, p. 509) specifies *atlas* as follows: “Atlases are systematic collections of topographical and / or thematic maps at selected scales, of a particular area, and with a particular objective.” (authors’ translation). The English textbook by Kraak & Ormeling (2010) supports this notion, defining atlases as “... intentional combinations of maps or data sets, structured in such a way that specific objectives are reached”. Consequently, we can consider any approach understanding atlases as system of maps to be an “orthodox” definition, widely accepted during the 20th century among cartographers and geographers.

1.2. Semiotic definitions

From a semiotic point of view, an atlas can be understood as an analogue or electronic knowledge model. Map, text and image are the meta-variables used to conceptualize and create this model (cf. Wolodtschenko, 2012). One might notice that – in contrast to the cartographic notion – an atlas seen from the semiotic perspective not necessarily has to be built upon maps. Regarding these atlases with non-cartographic traditions, cartography cannot claim any particular competence.

1.3. Ubiquitous atlases

We define ubiquitous atlases as semiotic knowledge models designed for mobile devices (e.g. smartphones or tablets), accessible anywhere and anytime. These atlases focus on operational and mobile search, visualization, structural analysis and interpretation of spatial and temporal information (map/map-like, textual and illustrative forms, or a combination thereof) and the acquisition of new spatio-semiotic knowledge.

2. Semiotic classification of atlases

From a user's perspective, one can subdivide the different types of atlases regarding purpose, content, structure, design, etc. Any atlas is a subject matter of atlas semiotics. Hence, these studies comprise atlases in both cartographic and non-cartographic terms.

For a semiotic classification we can subdivide all atlases in a fourfold manner, being the predominance of the semiotic meta-variables (map, text, image) the distinguishing feature (cf. fig. 1); additional, e.g. acoustic variables can be added when relevant:

- map-based atlases (> 50% maps)
- picture-based atlases (> 50% images)
- text-based atlases (> 50% text)
- mixed-atlases (each meta-variable <50%).

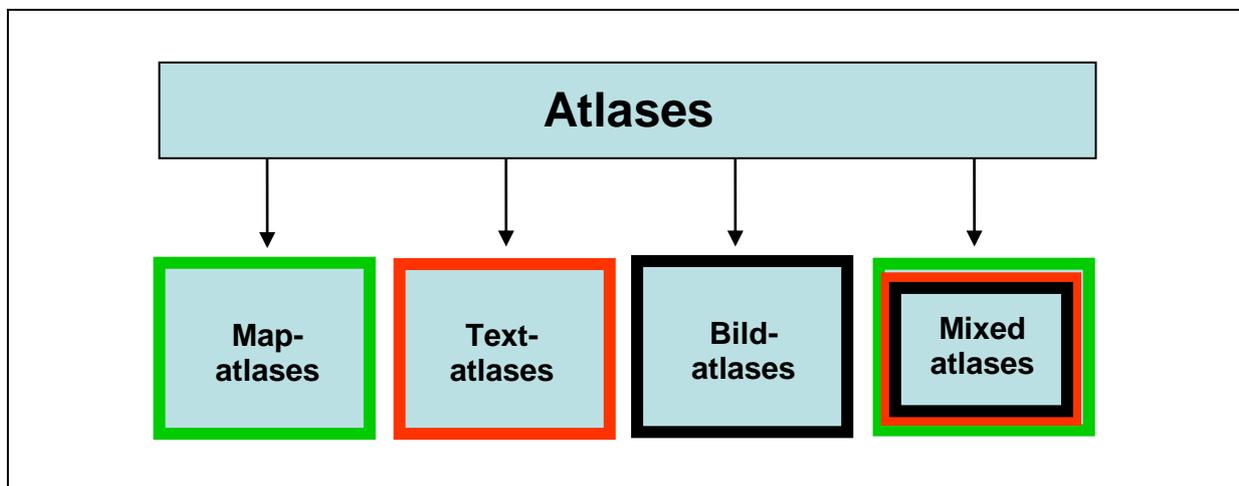


Fig. 1 Semiotic classification of atlases (after Wolodtschenko 2007)

3. Ubiquitous atlases, atlassing and cloud-computing

3.1. Atlases within the semiotic coordinate system

From a cartographic point of view, the 20th century was the century of Bertin's graphic semiotics, based on visual cartographic applications and six graphic variables (cf. fig. 2a, left). After more than 50 years of development and principles of syntactic and logical rules for the use of map graphics, the graphic semiotics of the 20th century passed on to multimedia semiotics.

Against this background and in accordance with the aforementioned classification of atlases, the six graphic variables (cf. fig. 2a, right) can be extended both conceptually and methodologically by a triaxial coordinate system of semiotic meta-variables (Wolodtschenko 2007). This coordinate system defines all atlases, including ubiquitous atlases, as semiotic models built and set in the threeness of map, text and image (cf. fig. 2b).

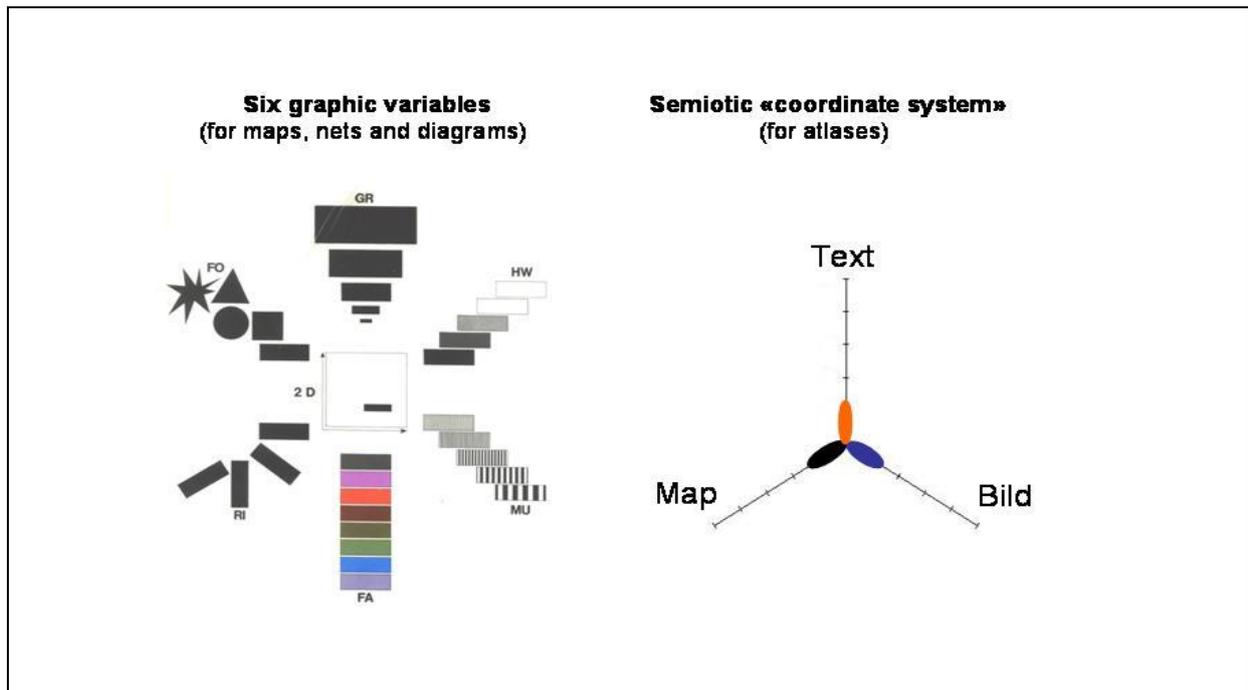


Fig. 2a Graphic variables (for maps) and semiotic meta-variables (for atlases)

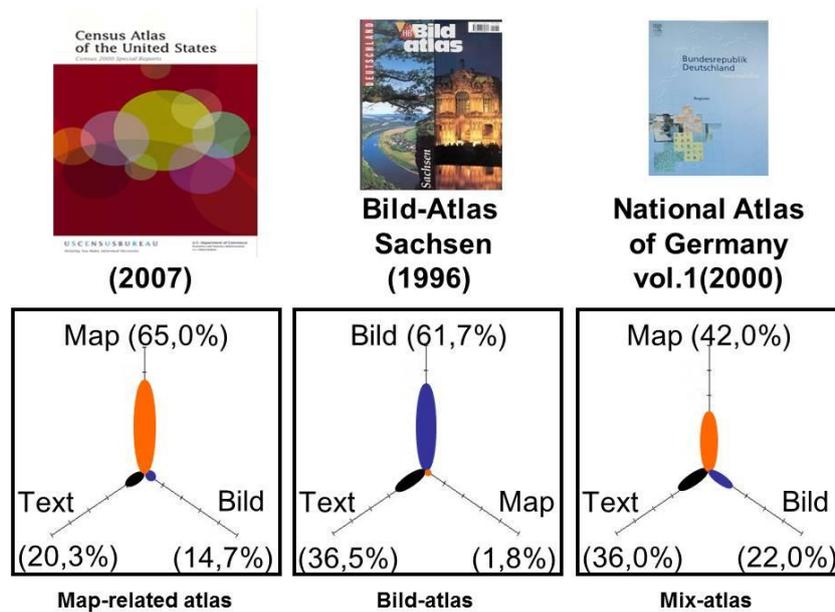


Fig. 2b Application of semiotic meta-variables for the analyses of atlases

3.2. Atlassing

Atlassing is a relative new term in the realm of atlas semiotics and cartography. Including semiotic analysis and portraying of atlases, atlassing also describes the transition of atlas *products* to atlas *processes*: “an atlas no longer needs to be understood as a *product* consisting of a combination of already existing maps, but rather as a *process* including data

acquisition and mapmaking as well.” (Hruby et al., 2015) As a new methodical-semiotic approach, atlassing is open for both cartographic and non-cartographic concepts.

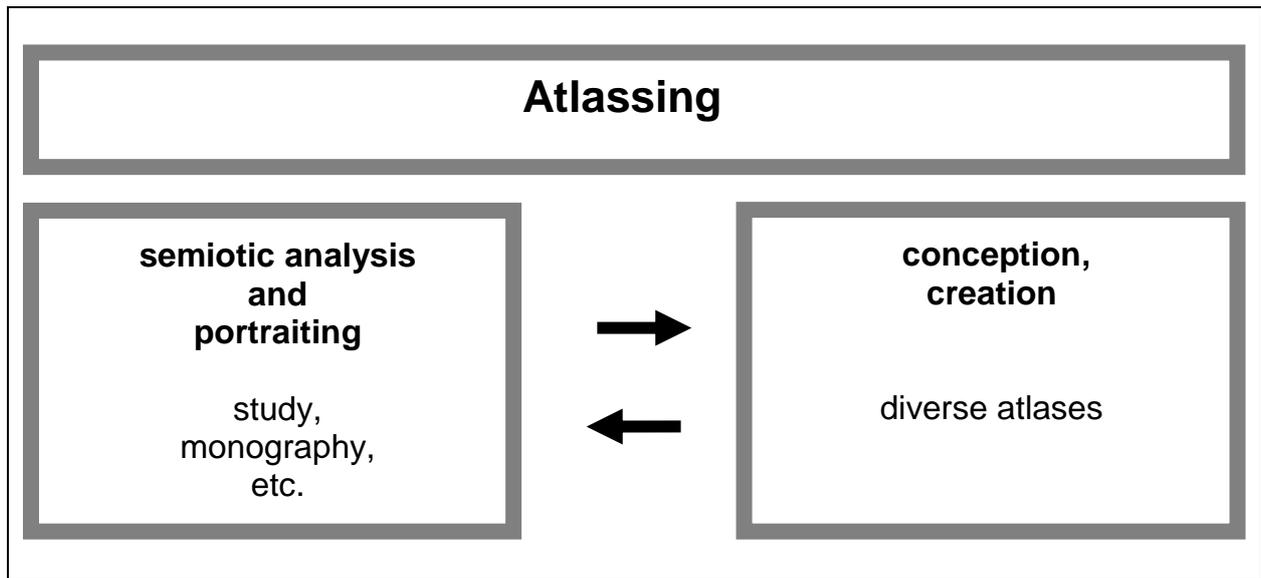


Fig. 3 Structural model of atlassing (after Wolodtschenko 2012)

3.3. Cloud-based atlassing

The Internet has evolved into a powerful tool for cartographic and non-cartographic users. Cloud computing is taking these benefits even a step further.

In recent papers, Hruby (2015) and Hruby et al. (2015) proposed and discussed methodological usage of atlassing and cloud technologies for map-related atlases. Cloud technology is now one of the most popular topics in the IT-sphere; concerning atlas cartography, cloud computing is still at an early stage.

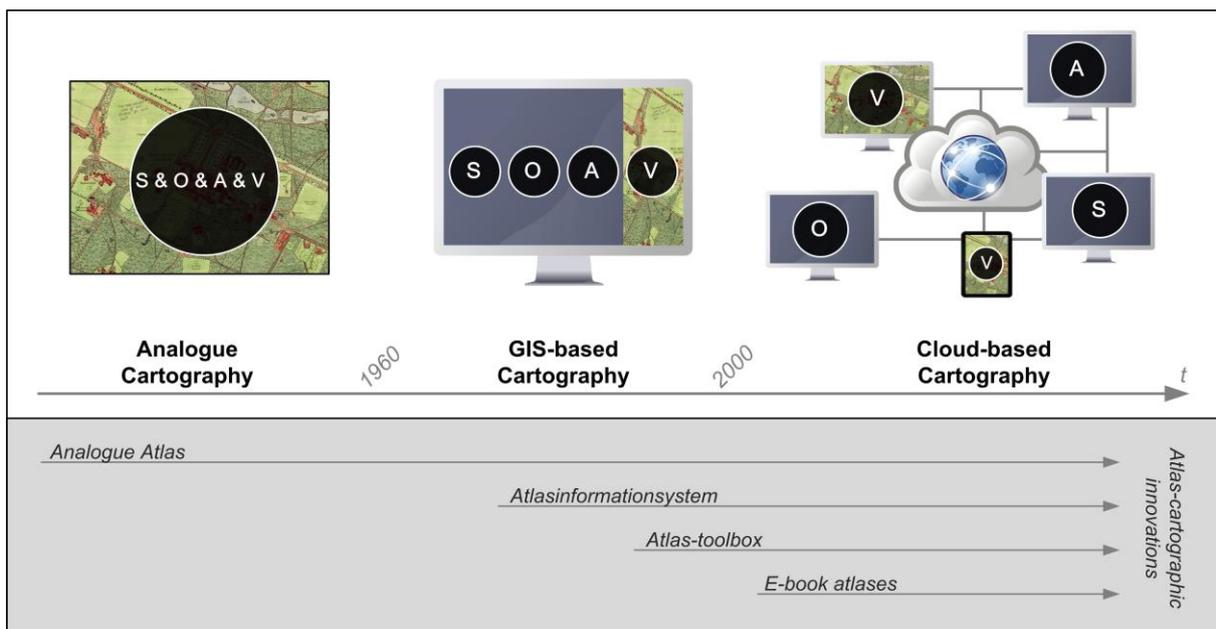


Fig. 4 From analogue to cloud-based cartography –basic tasks of analogue maps [(store (S), organize (O), analyse (A) and visualize (V)], and their transformation into the cloud; paralleled with selected atlas-cartographic innovations (modified after Hruby et al., 2015)

Cloud-based atlasing can bring, on the one hand, economic benefits for its users: They don't need to afford hard- or software, nor care about maintenance issues. Rather they can lease necessary capacities on a pay-per-use basis, or even make usage of free (incl. open source) solutions. Moreover, cloud-based depositories allow ubiquitous access to a wide range of data – both as producer and user of data.

On the other hand, cloud computing profits by the multiplied processing power of data centers, facilitating compute-extensive tasks, e.g. mobile real-time applications (e.g. Yang et al., 2011).

4. Conclusion

In this paper, we tried to show how the atlas as a semiotic knowledge model evolved from a paper print product to a cloud-based process; the term atlasing has been proposed to label this transition. As we have outlined, this development can be approached from a both cartographic and non-cartographic viewpoint. In either case, atlasing can take advantage of cloud computing technology, which implies more processing and communicational power at lower costs.

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Summary

Atlases are the object of study and research of many disciplines, not just cartography. Ubiquitous atlases, in terms of semiotic knowledge models designed for mobile devices (e.g. smartphones or tablets), are accessible anywhere and anytime. Representing a new methodical-semiotic approach, atlasing is open for both cartographic and non-cartographic concepts and includes the transition from atlases-as-products to atlases-as-processes (e.g. cloud-based processes).

Zusammenfassung

Atlanten sind Forschungsgegenstand vieler Disziplinen, nicht nur der Kartographie. Ubiquitäre Atlanten als semiotische Wissensmodelle für mobile Geräte (z.B. Smartphones oder Tablets) sind jederzeit zugänglich und überall verwendbar. Als neuer methodisch-semiotischer Ansatz ist Atlasing für kartographische und nicht-kartographische Konzepte offen und beschreibt den Übergang von Atlas-Produkten zu Atlas-Verfahren (z. B. zu im Rahmen eines cloud-basierten Prozesses).

Резюме

Атласы являются объектом изучения и исследования многих дисциплин, а не только картографии. Юбиквитные атласы как модели семиотических знаний, предназначены для мобильных устройств (например, смартфоны или планшеты), доступны везде и в любое время. Как новый методико-семиотический подход, атлассинг открыт для картографических и не картографических концепций, и включает переход от атлас-продукта к атлас-процессу (например, на основе «облачных технологий»).

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