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<https://homepages.uni-paderborn.de/winkler/Winkler--Geometry-of-Time.pdf>

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Processing

The third and neglected media function.

1. Introduction

Friedrich Kittler, the well-known exponent of German media theory, proposes three basic media functions, namely: *transmission*, *storage*, and *processing*.¹ Presumably, the first two will not be disputed; ‘transmission’ refers to communication and tele-communication, in other words, the media’s ability to overcome spatial distances, while the second dimension, ‘storage’, is synonymous with the overcoming of temporal boundaries, the forming of tradition, and the continuation of culture. Within media studies, the two concepts have been subject to extensive research.

Yet how about the third media function, *processing*? First of all, it is clear that there are a lot less critical inquiries, theories or ideas in this field. Equally clear is that Kittler's term derives from the realm of computers: computers not only transmit and store data, they also *process* them. But can we say, as Kittler does, that this term applies to *all* media?

Computers manipulate data and transform them. While we would expect a tape recorder to reproduce as accurately as possible what has been recorded, the reverse holds true for computers: We would be deeply disappointed if the output was precisely the same as the input. Accordingly, *operations* take place inside the machine. We associate with computers the metaphors of activity, of *work*; and, as any Dell ad informs us, there is a ‘processor’ located at the heart of every computer.

Therefore, in the area of computer technology, Kittler’s statement would not cause much controversy. What may provoke a scandal, however, is his claim that the triad of ‘transmission, storage, and processing’ should be extended to include *the media as a whole*. It seems doubtful whether this generalization is sensible and appropriate. Would we not, then, run the risk of limiting ourselves virtually automatically to a purely technicized view?

¹ “[...] Among other things, this is concerned with media technologies, with transmission, storage, processing of information”. (Kittler, Friedrich: Preface. In: Draculas Vermächtnis. Technische Schriften. Leipzig 1993, p.8). A 1984 essay by Kittler is entitled: Literatur und Literaturwissenschaft als Word Processing (Kittler, Friedrich A.: Literatur und Literaturwissenschaft als Word Processing. In: Stötzel, Georg (ed.): Germanistik – Forschungsstand und Perspektiven. Vorträge des Deutschen Germanistentages 1984. Berlin/New York 1985, part 2, 410-419. A 1989 collective volume is divided into the sections “Storage”, “Transmission”, and “Computing” (Kittler, Friedrich A.; Tholen, Georg Christoph (eds.): Arsenal der Seele. Literatur- und Medienanalyse seit 1870. Munich: Fink 1989). And finally: “First of all, there are transmission media such as mirrors [?], secondly, storage media such as films, and, thirdly, [...] machines that themselves manipulate words or numbers.” (Kittler, Friedrich. Die Welt des Symbolischen – eine Welt der Maschine. In: id.: Draculas Vermächtnis, l.c., P.61 (add. H.W.) (original edition: 1989)). What is striking is that language usage is not consistent; ‘processing’, ‘computing’, and ‘manipulating’ are used synonymously.

At least one of the German media lexica provides an article on processing: Dotzler, Bernhard J.: Processing. In: Roesler, Alexander; Stiegler, Bernd (eds.): Grundbegriffe der Medientheorie. Munich: Fink 2005, pp. 214-218.

Nonetheless, this is precisely what makes this statement so interesting. Regarding various media, we need to ask what processing actually means. Are there theories capable of dealing with the question? I will argue that the third media dimension does indeed open up an unexpected, interesting new field. Herewith I'm providing a preview of the book I am currently working on, which has the topic of processing as its primary focus.

Moreover, I would like to offer an insight into a number of theoretical projects related to this approach. Since this conference is dedicated to transatlantic knowledge transfer, I will primarily discuss approaches from the German-speaking realm of research. So I hope to also contribute to the more general discussion of the conference.

Finally, let me make a last remark on the terminology I use: It seems typical of the field that relevant phenomena are dealt with using a wide range of different terminology. Consequently, we are forced to take a more general approach and to include theories that have concepts other than 'processing' as their key focal point.

2. Operations

The fact that we are now turning our attention to processing follows a general trend that has been observed in recent years, namely that German media theory has experienced a profound change; for a long time the focus had been on reifications – texts/products, writing, discourse networks, technology or dispositives – this is now changing as the focus is shifting primarily to *practices*.

It was Sybille Krämer who trailblazed this trend by proposing a theory of 'operative writing'² that is based on the experience of computer programming languages and breaks new ground in describing writing as a self-acting device, as what is known as a 'techne' and a bundle of practices. A second important point concerns research on performativity, which, likewise conducted in Berlin and associated with the name of Krämer, draws upon Austin, Derrida and Butler to propose a more general media theory.³ What performativity and processing have in common is that they both emphasize the aspect of change and of displacement.

A third context would be the concept of 'cultural techniques' that expands and dissolves the previously valid notion of technology by systematically including technical practices. Erhard Schüttel summarizes:

² Krämer, Sybille: Operative Schriften als Geistestechne. Zur Vorgeschichte der Informatik. In: Scheffé, Peter; Hastedt, Heiner; Dittrich, Yvonne (eds.): Informatik und Philosophie, Mannheim: BI-Wissenschaftsverlag 1993, pp. 69-84.

- id.: Kalküle als Repräsentationen. Zur Genese des operativen Symbolgebrauches in der Neuzeit. In: Rheinberger, Hans-Jörg; Hagner, Michael; Währing-Schmidt, Bettina (ed.): Räume des Wissens: Repräsentation, Codierung, Spur, Berlin: Akademie Verlag 1997, pp. 112-122.

- id.; Bredekamp, Horst (ed.): Bild - Schrift - Zahl, Munich: Fink 2003.

- id.: Operationsraum Schrift. Ein Perspektivenwechsel im Schriftverständnis. In: Grube, Gernot; Kogge, Werner; id. (ed.): Schrift. Kulturtechnik zwischen Auge, Hand und Maschine, Munich: Fink 2005, pp. 13-32.

- id.: Zur Sichtbarkeit der Schrift oder: Die Visualisierung des Unsichtbaren in der operativen Schrift. Zehn Thesen. In: Strätling, Susanne; Witte, Georg (ed.): Die Sichtbarkeit der Schrift, Munich: Fink 2005, pp. 75-84.

- id.: OperationsSchrift. Ein Perspektivenwechsel im Schriftverständnis. In: Grube, Gernot; Kogge, Werner; id. (ed.): Kulturtechnik zwischen Auge, Hand und Maschine. Munich: Fink 2005, pp. 13-32.

³ - Fischer-Lichte, Erika; Kolesch, D. (eds.): Kulturen des Performativen. Paragana, Internationale Zeitschrift für Historische Anthropologie, Vol. 7, issue 1, Berlin 1998.

- id.; Wulf, Christoph (ed.): Theorien des Performativen. Paragana, Internationale Zeitschrift für Historische Anthropologie, Vol. 10, issue 1, Berlin 2001.

- Krämer, Sybille (ed.): Performativität und Medialität, Munich: Fink 2004.

“The German-language concept of cultural technique, a widely discussed concept in current German media theory, promises [...] to go back behind the reification of apparatuses and nouns in order to provide access to *verbs* and *operations* from which the corresponding nouns and artifacts were derived, such as writing, painting, computing, making music, and many more.”⁴

The changeover harbors the risk of once again being one-sided, in the sense that the material nature of communication, the aspect of storage and the tangibility of objects fade into the background, which is why I proposed my own theory of how to bring both sides together.⁵

What becomes most obvious, however, is that the notion of ‘processing’ will need to be separated from media processes in general, for the simple reason that it is possible to regard as processes or procedures *anything* that concerns media. In the narrow sense of the term, processing would not only be a nominalized verb (this likewise applies to storage and transmission), but something that is *necessarily* process-related. Now, if processing is all about *change*, in other words, if it is entailed that input and output are actually different entities, then it goes way beyond turning nouns into verbs.

3. Production, work

A possible first attempt of approaching this aspect of change would be by focusing on media in the context of production. There are many different ways of ‘processing’ involved in the manufacturing of media products, such as the active intervention in the material, the shaping and transformation of which culminates in the actual product. This product finally becomes the object of communication processes.

An alternative approach would be via the category of *work*, which the concept of the ‘operative’ evokes by its etymology. Surprisingly, the notion of work has been completely neglected in the debate outlined. Other than naming a widespread allergy to Marxist theory as a reason, this could be attributed to the fact that work requires a subject – and a human subject at that – which potentially may not apply to processing. That said, we routinely use anthropomorphizing metaphors each time we refer to a processor as ‘working’ at 3.2 GHz, or talk about ‘tasks’, ‘working memory’ or ‘workflow’.

This confronts us with a dilemma, namely if media processing requires a human subject per se or if this concept could likewise be attributed to an active technique. Equally, it would leave open the question of how the concept could be extended to include other media; for instance, could we regard a VCR or fax machine as actively working instances of processing?

4. Communication

What has been said above leads us to consider the issue in a wider context. It has become apparent that the operative side of the media – which includes processing – at first glance has nothing to do with the dimension of *communication*. Surprisingly so, given the fact that the majority of media definitions use concepts of ‘communication’ as their unquestioned premise. This is the point at which the three media functions crucially separate: While ‘transmission’ is

⁴ Schüttpelz, Erhard: Die medienanthropologische Kehre der Kulturtechniken. In: Engell, Lorenz; Siegert, Bernhard; Vogl, Joseph (eds.): Kulturgeschichte als Mediengeschichte (oder vice versa?). Weimar: Universitätsverlag 2006, pp. 87-110, p. 87 (emph. H.W.).

⁵ W., H.: Discourses, Schemata, Technology, Monuments. Outline for a Theory of Cultural Continuity. In: Configurations, Vol. 10, no. 1, winter 2002, pp. 91-109, and also: Bradley, Arthur; Armand, Louis (eds.): Technicity. Prague 2006, pp. 129-151.

almost synonymous with communication and ‘storage’ could likewise be regarded as ‘communication along the time axis’, strangely, the approach does not fit the notion of processing. Whatever it may be, processing has *abandoned* communication; even manufacturing – working on a product – is quite a lonely process,⁶ at least when compared to mass-media product proliferation.

The attempt to relate processing and communication to one another will lead us to Bühler.⁷ As early as 1934 (which is 15 years before Shannon), he developed his famous ‘Organon Model of Language’, which at first sight resembles Shannon’s sender/receiver model but differs in that it includes a third dimension relating to ‘objects and states of affairs’:

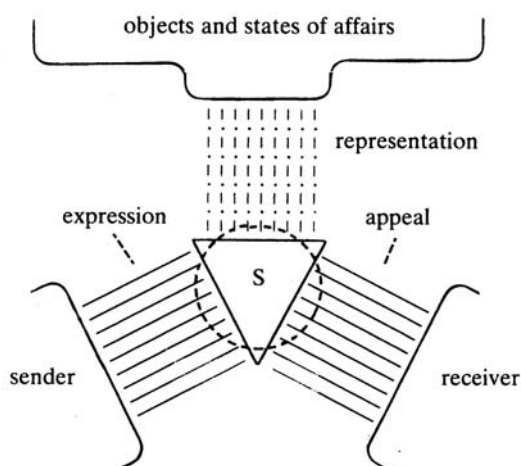


Fig. 1: Bühler, Organon Model⁸

In Bühler’s approach, the sign takes center stage, which in media studies equals the message, or media product. Employing different line patterns, Bühler emphasizes the axis of communication (depicted as the horizontal line in the diagram) that connects the sender and the receiver:

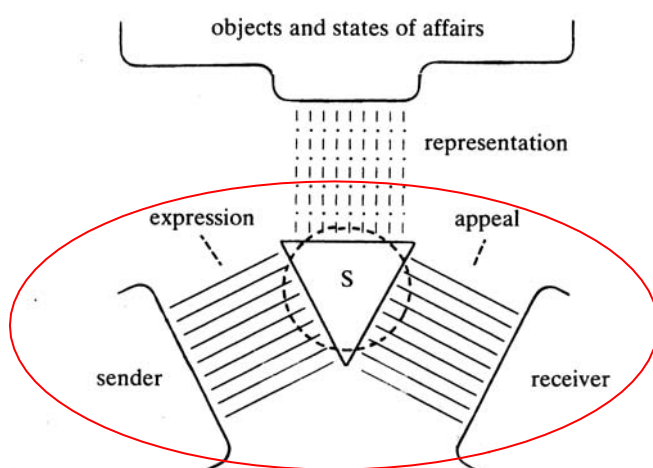


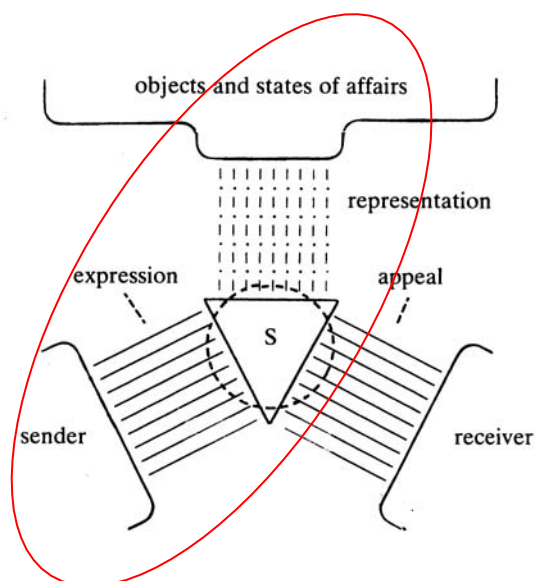
Fig. 2: Axis of communication

The notion of ‘processing’ would induce a change in emphasis, however: Now the vertical axis – leading from the sender to the objects / states of affairs – becomes important:

⁶ ...lonely, unless we are dealing with collective products, such as movie...

⁷ Bühler, Karl: Theory of Language. Amsterdam 1990, p. 35 (original edition: id.: Sprachtheorie. Die Darstellungsfunktion der Sprache. Jena 1934); despite its year of publication, Bühler’s book is not concerned with the philology in Nazi Germany; he had been teaching in Vienna since 1922 before he was arrested by the Nazis in 1938 and was able to emigrate to the United States via London in 1940.

⁸ Ibid., p.28.

Fig. 3: Processing axis⁹

Here, communication and receiver are pushed aside to the edge of the diagram. Tentatively, the model could be modified as follows:

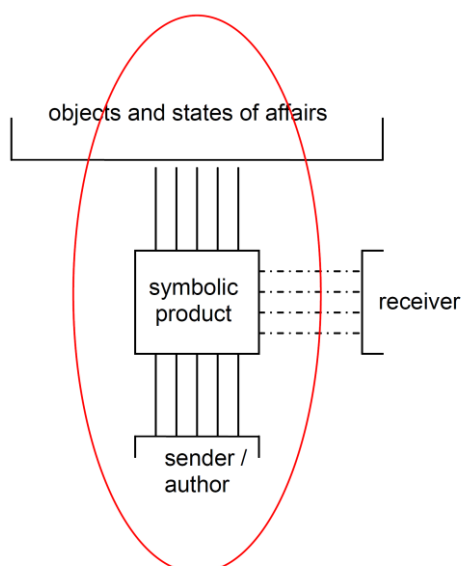


Fig. 4: Bühler, modified

At least on this level of ‘processing’, it is not the sender and receiver interacting but the sender as producer interacts with the product. And possibly, via the product, she communicates with the ‘objects and states of affairs’ the product refers to.

5. The medium as *opposite*

This change in perspective also changes the role of the media. No longer the channel of communication, they themselves occupy the position of the communicator. Whether you are writing a text, designing a layout or editing a movie, it means that you are processing your product and intervening with this product in a formative way. Physically you are facing media technology; alongside with the bundle of rules and codes, the laws of the system of signs, in which the product is articulated.

⁹ Dotzler points out that processing can also occur on the receiver’s side: “Communicative acts, of any kind, not only have [...] a channel – a medium – as a precondition, but on both the sender’s and receiver’s side they also rely on operations that produce and process information.” (Dotzler, *Processing*, l.c., p. 215).

In German research, this new positioning has been propagated first and foremost by Reinhard Keil.¹⁰ That Keil is a computer scientist is no accident: The field of computer science locates itself within the engineering sciences and, as is well known, engineers tend to concern themselves with objects rather than communication processes. We all spend a large part of our lives in front of a computer screen. Which is yet another reason why it is plausible that we communicate with technology.

However, Keil's argument goes far beyond this; basing his approach on Gibson¹¹ and Gregory¹² he demonstrates that the process of cognition necessarily depends on a material opposite. Only the material opposite will enable an 'experience of differentiation', and along with it surprise and the awareness of what is new. Potential opposites are, for one, 'nature', such as in scientific experiments; or, and this is the second option, products that man has created himself, whether in the form of symbolic products or as three-dimensional technology, which in itself provides a material opposite for experiments.

Such a concept relates cognition to action, in other words, to the act of consciously engaging with objects; and it polemically distances itself from the concept of 'pure' thought and the traditional dualism between body and mind.¹³

6. Ordering, organizing, logistical media

Engineers plan and organize, managers manage, while the far larger fleet of white collar workers sorts, organizes and pushes signs back and forth in a wide variety of media. If all this can be subsumed under the heading of *processing*, we see a range of media functions emerge that is almost impossible to grasp under the primacy of communication: First and foremost,

¹⁰ Keil, Reinhard: Von der Zeichentransformation zur Wissensarbeit. Digitale Medien eröffnen neue Potenziale für die Wissensarbeit. In: Forschungsforum Paderborn, 4, 2001, pp. 12-17.

- id.: Medienqualitäten beim eLearning: Vom Transport zur Transformation von Wissen. Bibliothek Forschung und Praxis 31 (1), 2007, pp. 41-50.

- id.: Das Differenztheater. Koaktive Wissensarbeit als Selbstorganisation. In: Bublitz, Hannelore et.al. (eds.): Automatismen. Munich: Fink 2010, pp. 205-230.

¹¹ Gibson, James J.: The Ecological Approach to Visual Perception. Hillsdale, NJ: Erlbaum 1986, p. 258 ff. (original edition: 1979) (German: id.: Wahrnehmung und Umwelt. Der ökologische Ansatz in der visuellen Wahrnehmung. Munich/Vienna/Baltimore: Urban&Schwarzenberg 1982, p. 276 ff.).

¹² Gregory, Richard L.: Eye and Brain. The psychology of seeing. Oxford: Oxford Univ. Press 1995 (original edition: 1966) (German: id.: Auge und Gehirn. Zur Psychophysiologie des Sehens. Munich: Kindler 1966).

¹³ This thought may equally refer to Arnold Gehlen, who in 1957 depicted acts of gaining knowledge in the form of a 'circle of actions': "[T]he circle of action is quite easy to show [...]: If you are trying a key in a lock, a sequence of factual changes occurs at the level of key and lock, such as, for example, if the lock is jammed and you need to keep trying a little longer. On the factual level, we have a series of successes and failures that you are able to see and hear and feel, in other words, they *provide feedback* to you and can be perceived; and on the basis of this perception you will change your actions accordingly, in other words, you may move the key in the lock in a different way until, finally, you will experience success on the factual level – the lock opens. This is a circular process, i.e., a process that can be imagined a single circular process that necessarily runs via mental intermediate elements, perceptions, and intermediate motor elements, a person's own movements, and progresses in the factual level before it returns. [...] Splitting this process further into its physical and mental components would not add anything; quite the opposite, it would only hamper the description, in the same way that each conscious reflection upon this difference while the action (i.e., fiddling with the key) takes place would only be counterproductive. *The action itself, as I would suggest, is a complex circular movement that is controlled by facts of the external world*". (Gehlen, Arnold: Zur Geschichte der Anthropologie. In: id.: Anthropologische Forschung. Zur Selbstbegegnung und Selbstentdeckung des Menschen. Reinbek: Rowohlt 1961, p. 18 (transl. and 2nd emph. H.W.) (original edition: 1957)). The above model is reminiscent of a closed loop, while the influence of cybernetics is evidenced in the fact that Gehlen makes reference to 'feedback'.

media are machines that enable us to generate and to test certain orders, in other words, machines that project orders onto our world.

Krämer demonstrated this for techniques of written computation: Only the written form enables us to break down the process of computing into single steps, which are then handled successively. It is for the simple reason that intermediate results are recorded that individual steps become comprehensible, and are hence saved.¹⁴ Once again the opposite is a medium; paper in this case. A dialog ensues between the person doing the computing and the paper, during the process of which order gradually takes shape.

John Peters made the suggestion to study the media's *logistic* function and with calendar, clock, and tower named rather unusual examples of media.¹⁵ Drawing upon Innis, he relates the logistic function to the control of space and time; my suggestion would be to broaden the concept and to include the term 'logistic' as referring to media's general function to organize the world, and to process orders in the realm of symbolic trial action. We may assume with certainty that, prior to writing and computing, language had the same role and ordering function.

7. Exploration of the world, media of perception, experience, cognition

There are further options in what I have said so far. Quite unexpectedly, it now becomes possible to re-conceptualize those 'media of perception' that had previously been condemned to a rather odd marginal existence in the world of media. If a German introduction to the media places "media of observation (and, more general, perception)" – such as, for example, telescope, microscope, and X-ray machine – ahead of four types of media, and hence before "storage/processing", "transmission", and "communication",¹⁶ their status remains somewhat unclear. Characterizing media of perception as "expanding and enhancing human sense organs",¹⁷ or, in the words of McLuhan, viewing them as prostheses, does not seem very helpful to me. However, it cannot be disputed that telescope and microscope do, in fact, have a media side to them,¹⁸ and Benjamin, for example, had likewise emphasized the function of heightening and training perceptive skills also in the fields of photography and film.¹⁹

¹⁴ Krämer, Sybille: Operative Schriften als Geistestechnik. Zur Vorgeschichte der Informatik. In: Scheffe, Peter (ed.): Informatik und Philosophie. Mannheim 1993, pp. 69-83.

¹⁵ Peters, John Durham: Calendar, Clock, Tower. <http://web.mit.edu/comm-forum/mit6/papers/peters.pdf>, last accessed on: March 3, 2010, p. 16 ff.

¹⁶ Hickethier, Knut: Einführung in die Medienwissenschaft. Stuttgart: Metzler 2003, p. 21.

An idea on the media of perception is also proposed by Gibson: "[telescope, microscope:] The discovery of these instruments in the seventeenth century enabled men to know much more about very large bodies and very small bodies than they had before. But this knowledge was almost like seeing. The mountains of the moon and the motions of a living cell could be observed with adjustments of the instrument not unlike those of the head and eyes. The guarantees of reality were similar. You did not have to take another person's word for what he had seen." (Gibson, *The Ecological Approach to Visual Perception*, l.c., p. 279 (emph. & add.: H.W.)).

The notion itself, as Campe points out, is of course much older: "In the accompanying letters on Aesthetica [1750], [Baumgarten] likewise recommended the study of the instruments employed by natural scientists in their experiments. Telescope and microscope, hygrometer and barometer and their use in experiments were as closely entwined with the nursery of aestheticism as the poetology." (Campe, Rüdiger: *Technik im Geist. Kommentar zu Geoffrey Winthrop-Young*. In: *Zeitschrift für Kulturwissenschaften*, no. 2, Dec. 2008, pp. 133-138, 135).

¹⁷ Ibid.

¹⁸ See e.g.: Vogl, Joseph: Medien-Werden: Galileis Fernrohr. In: *Archiv für Mediengeschichte*, no. 1, 2001, pp. 15-123.

¹⁹ Benjamin, Walter: The work of art in the age of mechanical reproduction [1936]. In: id.: *Illuminations*. London: Fontana Press 1992, pp. 211-244. (German: *Das Kunstwerk im Zeitalter seiner technischen Reproduzierbarkeit*. In: *Gesammelte Schriften*. Frankfurt/M.: Suhrkamp 1974).

Measuring devices, such as thermometers, would need to be discussed in the same register as they are anchored both in nature and in the realm of signs;

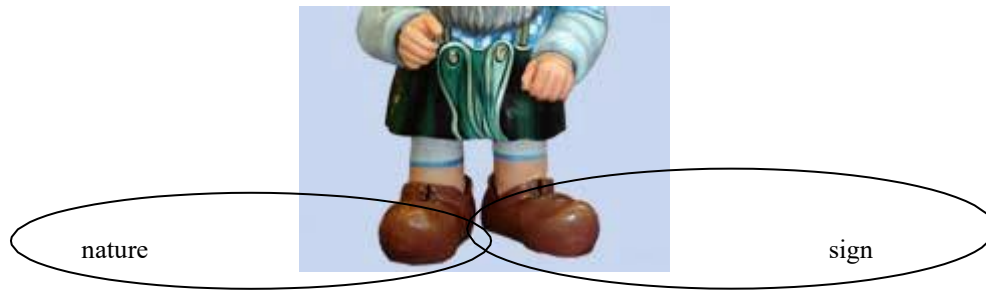


Fig. 5: Measured data

Once technically programmed, they convert natural phenomena into data. In the diagram, I would locate media of perception on the vertical axis described above:

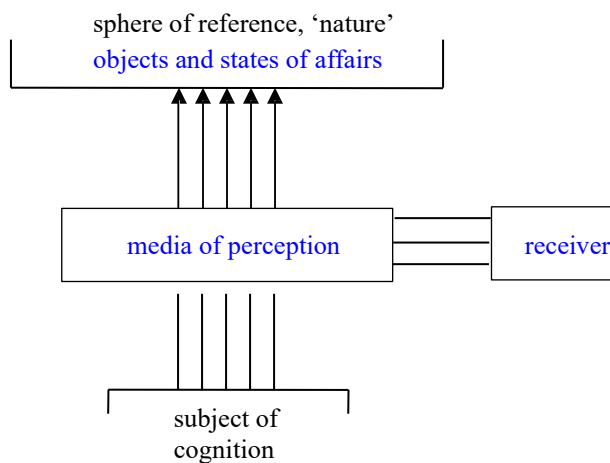


Fig. 6: Media of perception

More generally, this is about the power of the media *to explore the world*:

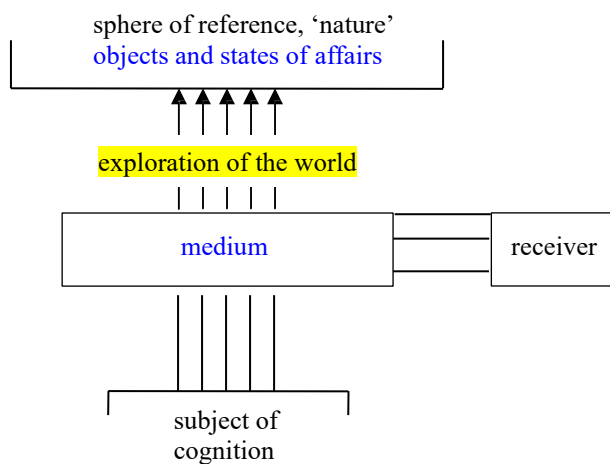


Fig. 7: Exploration of the world

For a long time, the question as regards reference, the media's relation to the world, was simply *out of fashion*, not to say, taboo. The fact that German media theory is now increasingly concerning itself with the theory and history of science, and issues in the theory of cognition –

always related to the media – are playing an increasingly important role, is a clear indication that things have changed.

8. Transforming, translating

Let us return again to the narrower field of ‘processing’. Texts focusing on the media’s *transforming* power as their central issue provide yet another approach that will further illuminate the question at hand.



Fig. 8: Transformers

Quoted below once again is a passage from the above-cited introduction:

“The transformation of signs. [...] In media communication, signs can [...] go through multiple media transformation processes as regards their bearers and symbolic character. [...] Movies are usually projected onto a screen so as to make their signs visible. [...] If a movie is shown on television, its analog image is translated into an electronic image, i.e., it is scanned by cathode rays and converted into electrical impulses, which in turn are modulated onto frequencies and sent, received and retransformed into an electronic image on the screen. [...] For this reason, the transition from the digital storage of image and sound is merely a transformation.”²⁰

The above examples illustrate that media in general act as ‘translators’. They construct *process chains* during which signs are repeatedly transformed as they pass through various stations, both at the technical level and the precarious interface where media intersect with their users; both within single media and in the space between media, i.e., during media transfer. Each of these translation steps can be understood as particular procedures of media ‘processing’.²¹

²⁰ Hickethier, Knut: Einführung in die Medienwissenschaft. Stuttgart: Metzler 2003, p. 77 f.

²¹ Within the so-called apparatus theories, the argument is accorded systemic significance; according to Baudry, the complexity of technical translation in the medium of film defies any claim to realism. He outlines the individual steps by way of illustration: [Réal - objectif (lumière)] → [scénario, découpage] → [Pellicule/camera (enregistrement sonore)] → [montage] → [projecteur (lumière)] → [écran, projection, réflexion] → [spectateur]. (Baudry, Jean-Louis: effets idéologiques produits par l'appareil des base. In: Cinéthique, no. 7/8, 1970, pp. 1-8, 2). (German: id.: Ideologische Effekte erzeugt vom Basisapparat. In: Riesinger, Robert F. (ed.): Der Kinematographische Apparat. Geschichte und Gegenwart einer interdisziplinären Debatte. Münster: Nodus 2003; the English version contains the argument but not the illustration (id.: Ideological Effects of the Basic Cinematographic Apparatus. In: Film Quarterly, no. 27, winter 1974/75, pp. 39-47).

On a more general level, Michel Serres, who has based an extended media theory on the notion of ‘translation’, deserves a mention,²² as does, in Germany, Robben in his attempt to conceive computers as a paradigmatic ‘medium of translation’.²³

9. Transcribing

The theory of ‘transcriptivity’ developed in Cologne by Jäger/Jarke closely touches upon translation and transformation.²⁴ However, their approach is not concerned with technical process chains, but once again with media production, in other words, the activity of authors. According to Jäger/Jarke, authors do not write but *rewrite*. This claim is particularly evident with regard to academic writing: Scholars access an archive in order to read, select and re-organize material until, finally, from a wealth of old texts an individual new text emerges, including the aspects that are actually new. Once completed, the text is once again stored in the archive where it awaits its reactivation in the next cycle.

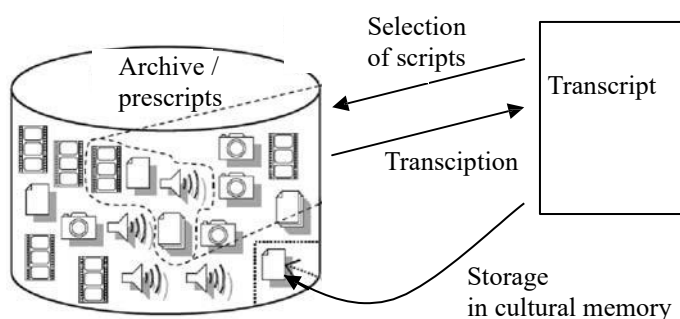


Fig. 6: Jäger/Jarke: authorship as transcription²⁵

The theory of ‘transcriptivity’ attempts to illuminate the reciprocity between active production and archive. If indeed writing can be considered as rewriting – transcribing, precisely – it follows that media production is part of a *discourse*; by no means is it ‘lonely’ in the above sense, but always dependent on the conditions in which it finds itself, and is moreover the foundation for all that is to follow.

This is a very powerful model that, in my opinion, can be equally applied to acquire an understanding of the notion of ‘processing’. Initially, in that media production is radically *processualized*; not merely because each activity resembles a process and is therefore time-dependent, but first and foremost at a macro level that incorporates a single production into the discourse as a larger temporal structure.

9. Addressing, forwarding

Transcription theory demonstrates that processing remains systematically connected to the other two media functions. Transcription itself – an active interference – is processing; however, the

²² Serres, Michel: *Hermès III. La traduction*. Paris: 1974 (German: id.: *Hermes III, Übersetzung*. Berlin: Merve 1992).

²³ Robben, Bernard: *Der Computer als Medium. Eine transdisziplinäre Theorie*. Bielef.: Transkript 2006, p. 11 f.

²⁴ Jäger, Ludwig; Jarke, Matthias; Klamma, Ralf; Spaniol, Marc: *Transkriptivität. Operative Medientheorien als Grundlage von Informationssystemen für die Kulturwissenschaften*. In: *Informatik Spektrum* 31, 1(2008), pp. 21-29.

²⁵ Ibid., p.23 (transl.: H.W., fig. slightly modified).

interaction ensuing between author and archive can only be perceived as *transmission*, while the archive in turn represents the *aspect of storage*.

Pursuing this path further, it becomes clear that, conversely, transmission procedures likewise require multifarious kinds of ‘processing’ to take place at the nodes of the network; consider, for example, the distribution of letters at a central post office, a switchboard or an Internet hub: Every single delivery implies certain acts to take place, such as decision-making, addressing, reordering – in short, ‘logistics’ in the more direct sense of the word.



Fig. 7: Switchboard²⁶



Fig. 8: Internet hub in Frankfurt, Germany²⁷

Intuitively, we would subsume these processes under the heading of ‘processing’, except for one crucial difference: Above, we defined processing as interfering modification; however, by no means can this definition be extended to hold for acts of delivery, which do not interfere with the internal structure of what is delivered.²⁸ Only individual, self-contained texts whose integrity is to be ensured by the very process of delivery can actually be transmitted/delivered

²⁶ Image: <http://www.jackson.army.mil/Museum/History/pix/image305.jpg>, last accessed on February 25, 2010.

²⁷ In 2008, the web exchange point DE-CIX situated in Frankfurt/Main was upgraded to a capacity of 1.4 terrabits per second (Chip online, April 9, 2008). As regards traffic, it currently places second in the world (status: March 2010).

²⁸ This was shown most of all by Siegert in his analysis of the history of the postal system (Siegert, Bernhard: *Relays: literature as an epoch of the postal system*. Stanford, Cal.: Stanford University Press 1999).

and stored. Likewise, the switching and forwarding processes at an exchange point keep the forwarded products intact. Must we hence assume that there are, in fact, two different, clearly distinct kinds of ‘processing’?

Provided that nodes in the communication network are switchboards and switching is a particular type of media processing, we are faced with the task of bringing together the logic of switching, delivering, and processing.

10. Address space

Let me say that, to date, I have not come upon a satisfactory solution. What has become clear by this point is that the two concepts – namely, processing as interfering modification and processing as switching/forwarding – each relate to a different *space*: Processing in the sense of interfering modification remains within the creative space of an individual text, hence the interference manipulates the internal structure of its elements. On the other hand, processing in the sense of switching/forwarding relies on the constitutive text and thus relates to a far larger space that is geography.

I propose that, despite all their differences, it is nonetheless possible to describe both spaces by using a common framework of concepts. The key concept here would be that of *address*:²⁹ If I am editing a movie (i.e., modifying it by interference), it is up to me to decide on the point in the movie, the physical *location*, to which a particular sequence is to be moved. If I am forwarding/processing a letter, the address is a far-away, geographical place. If I am saving a file, I am interested in the location in which it is precisely and physically stored.

What is spectacular about it is that each case actually involves *address spaces*. Admittedly, geography may compare to a memory chip’s architecture as macro compares to micro; however, even our everyday experience of working with computers clearly points to the fact that the difference between the two spaces is diminishing, for example, in that a local search on your own private PC increasingly resembles a global search done on the Internet.

Obviously, this suggestion has a limited scope. What has been illustrated above only applies if processing (as a first provisional attempt) is reduced to purely syntactic operations; semantic operations or processes in the minds of those involved could hardly be perceived as the pushing back and forth of texts, textual passages, or individual signs.

However, this is not my concern. Because what seems to be emerging here could still be something very general: the possibility to relate processing, transmission and storage to the common frame of a general *logistic system*. Provided that processing in the sense of manipulating interference is essentially *reordering*, and ‘switching’ actually takes place at the nodes of the net (a precondition on transmitting content or forwarding it to storage locations), it follows that media are ‘logistic’ in an unexpectedly extended sense. When John Peters presented this concept to me for the first time, I argued that ‘logistics’ is tied to an instrumental perspective. But in the meantime, I admit, I have changed my mind.

²⁹ Some research has been done in German media theory on the subject of address (see e.g.: Andriopoulos, Stefan; Schabacher, Gabriele; Schumacher, Eckard (eds.): *Die Adresse des Mediums*. Cologne: DuMont 2001).