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Towards a Sociology of an Artifact

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THE MULTIPLE BODIES OF THE MEDICAL RECORD:  
Towards a Sociology of an Artifact

This paper argues that the medical record is an important focus for sociological research. In medical work, the modern patient's body Foucault has so aptly described is produced through embodied, materially heterogeneous work - and the medical record plays a crucial role in this production. It does not simply represent this body's history and geography: it is a central element in the material re-writing of these. Simultaneously, the record fulfills a core role in the production of a body politic. As the record is involved in the performance of the patient's body, it is also involved in the performance of the clinic in which that body comes to life. Finally, we argue that different records, different practices of reading and writing are intertwined with the production of different patient's bodies, bodies politic, and bodies of knowledge. As organizational infrastructure, the medical record affords the interplay and coordination of divergent worlds. Seen in this light, as a site where multiple stories about patients and about organizations are at stake (including the interoperability between these stories), the medical record becomes highly relevant both analytically and politically.

In his *Birth of the Clinic*, Foucault argues that the classical, pre-modern "medicine of species" required a two-dimensional table as an intermediary between the individual body and medical knowledge (1973/1963). The table would translate individual symptoms: it would yield the true nature of the disease by showing how they fitted into the eternal scheme of things. Symptoms were not the disease itself: they were pointers to this higher

truth, which merely "precipitated" in individual bodies, and which the table could decode. In contrast to the medicine of species, Foucault argues, the modern clinical gaze requires no such intermediary. Truth is no longer found and organized elsewhere in some grand nosological scheme, but rather in the pathological processes of individual bodies. The gaze deciphers this truth by following the symptoms inwards, eliciting signs, and differentiating the pathological reality that now is the disease.

Yet the development of this gaze depended crucially on the development of some new intermediaries. Writing was crucial in this new configuration. "Medicine no longer tried to see the essential truth beneath the sensible individuality; it was faced by the task of perceiving, and to infinity, the events of an open domain" (Foucault 1973, p. 98). In order to develop a body of true knowledge, medicine had to record individual cases: only in the accumulation of such experience, only in the totality of observers/observations could true knowledge be generated (Fagot-Largeault, 1989; Dagognet 1970). A cascade of inscriptions, to use Latour's term, typified and produced the possibility of this means of knowing (Latour 1987; 1993, pp. 171-225).

Although Foucault does not discuss this in the *Birth of the Clinic*, knowing in the practice of medicine is similarly dependent on writing. The power of the gaze, in other words, would not go very far if it stood isolated (cf. Atkinson 1995, pp. 60-65). No longer typified by the metaphorical two-dimensional table Foucault describes, modern medicine could not be imagined without that other object of consultation: the medical record. In this paper, we argue that the medical record is fundamental to the everyday production of that contemporary body whose archeology Foucault describes (a body which hides the essences of the disease in the pathological processes taking place in its tissues; where the symptoms and signs attest to a reality which is never completely accessible in life) and to the everyday production of the organizations which enact and treat it.

How is the patient's body produced in hospital wards? How is its specific geometry and its historicity created? How is the patient's body transformed from the lived body of Mr. Thompson into a juxtaposition of organs, parameters, rows of numbers, graphs, and so forth? Is this through a specific way of looking? Or is this a discursive transformation, achieved through talk (as is a frequent focus of social constructivist medical sociology)? [1] (see e.g. Davis 1986; ten Have 1994) We will maintain that the body is produced through embodied, materially heterogeneous work (Hirschauer 1991; Cussins 1996). Much comes into play here: urine containers, infusion pumps, nursing routines, doctor's consultations, and so forth. All these artifacts, individuals and organizational routines are intermediaries which together perform the medical body. Following recent developments in science and technology studies (Bijker and Law 1992; Clarke and Fujimura 1992; Latour 1996; Star 1995), we argue that they constitute the network, or the

dispositif within which the body acquires its specific ontology. We focus on the medical record because this artifact occupies a central niche in this network: it is where many of the nurses and physician's tasks begin, end, and are coordinated, where inscriptions accumulate, and where the specific spaces and times we will describe unfold. The record does not merely mirror the bodies it maps, we argue - but neither does it determine them. To emphasize the active role of artifacts without falling into technological determinism, we use the term "mediation" (Latour 1994): the record mediates the relations that it organizes, the bodies that are configured through it.

Following Foucault, we stress that these practices of reading and writing are not only central to the production of a patient's body: they also fulfill a core role in the production of a body politic. As the record is involved in the performance of the patient's body Foucault so aptly describes, it is also involved in the performance of the clinic in which that body comes to life. A specific configuration of the body cannot be cut loose from the specific social position different health professionals have within hospitals, and with the type of stories about the work done that can emerge from the records. To strengthen both these points, we make a third argument which departs from the Foucauldian scheme.[2] We argue that different records, different practices of reading and writing are intertwined with the production of different patient's bodies, different bodies politic, and different bodies of knowledge.

In the first section, we look in some detail at a medical record taken from an oncology ward from a Dutch University Hospital. Here we concentrate on the production of patient's bodies. In the second section, we concentrate on the way in which the medical record shapes various bodies politic. We explore some more general developments in the area of medical record keeping such as the increasing attention to coding and classification, and the attempts to produce an electronic medical record. In each section we look first at the general process of production of the body/the body politic and then look at the practice of multiplicity (managing the articulation of multiple bodies/bodies politic).

Throughout, we will be using a broad definition of the medical "record" as all written, typed or electronically stored traces of any aspect of patient treatment that has official status within the hospital system and is in principle stored for a period of time (at least equal to the patient's stay in the hospital; see e.g. Huffman 1990). More often than not, this implies that the "medical record" is not one single object: rather, it is the record the physicians keep in one folder at the outpatient clinic together with the (also often physically separate) nursing and physician's "in house" record, with the separate forms created and used in the hospital administration offices - and so forth.

This paper is not primarily concerned with practices of reading and writing

which bring the record to life (see Berg 1996 for this approach); it is concerned, rather, with mapping the configurations it helps bring into being. We will thus not be looking at the real-time articulation work that links the record to the ongoing work, or at the informal organizations that interpenetrate the more formal body politics. These are crucial issues (see e.g. Suchman 1987; Star 1995), but we want to explore here how the structuring of the record speaks to the structuring of the bodies we investigate. It is a synchronic exercise to explore just how a mundane, boring artifact like a medical record is involved in the politically charged production of human bodies, organizational hierarchies, and selective memories.

The paper is based on two lines of research. Marc Berg has spent several months in different wards in various hospitals in the Netherlands, focusing on the role of artifacts such as records and protocols in the ongoing processes of medical work (see e.g. Berg 1997). Geoffrey Bowker has studied the history of medical records and has through a series of interviews and observations traced the development of a nursing classification scheme designed for incorporation within hospital information systems.

## PRODUCING BODIES

Mr. Wood is a patient on the Dutch University Hospital oncology ward. Imagine a newly arrived oncologist, who begins her shift on this ward. She meets Mr. Wood without having his medical record to hand. She sees a middle aged, somber looking man, probably suffering from cancer since this is the oncology ward. Questioning him or the personnel on the ward, she may elicit a story of Hodgkin's disease, which has been treated once before, but which has recurred. Investigating him might yield some more clues as to the spread of the disease, the side effects of his treatment, his general condition. Without the record, she might sense the damage the cancer has done, and conclude that the prognosis is poor. Yet she would excuse herself and not take any action before having seen the record. Without the record, she is without memory, without a device to structure her thought; despite all her years of experience, she is barely more able to proceed than the recently graduated resident who stands besides her.[3]

With the record, things are different. This record comprises some 120 pages, producing a fascinating, detailed yet jagged and dispersed memory of the patient. It starts with the temperature list (Figure 1): an unfolding sheet which is structured like a flow-chart, wherein blood pressure, pulse, temperature, medications and so forth are logged. Next is the order form, on which physicians write down any diagnostic steps and changes in treatment for nursing staff to effectuate. Then come the physician's progress notes, starting with a few pre-structured forms which summarize the patient's medical history at the date of admission, and followed by over twenty, unstructured pages of daily notes. These are followed by computer print outs

from the laboratory information system (listing rows of numbers indicating outcomes of laboratory tests performed on the patient's blood and urine), results from bacteriological tests and X-rays (altogether over twenty pages), letters written about Mr. Wood, and so forth.

FIGURE 1 HERE

## History

The record produces a patient with a medical history: the accumulation of sets of traces configures a medical past for a specific patient.[4] The temperature list maps the different parameters against time - the x-axis of this flow chart. Lines divide the sheet into weeks and days, and thinner lines divide the upper, graphical part of the sheet even further into eight-hour periods. Temperature, pulse and respiration rate can be entered along the y-axis. Below this, the y-axis changes its role. It becomes a list of different parameters: tension, weight, specific gravity of the urine, bleeding time (both not filled in on this form), and the medication given. Presenting them in this way clarifies how changes in one are temporally related to changes in another - yet their vertical order is arbitrary. Further below, the y-axis changes again: here it incorporates a mathematical operation. The different infusions listed add up to total fluid intake ("totale vochtopname"), followed by the different varieties of fluid loss that result in total fluid loss. These totals are then subtracted, resulting in the last row on this sheet: the fluid balance.

The forms listing the laboratory results are structured in a similar fashion: columns of figures, each column indicating a time at which the blood was tested. Reading such forms from left to right, one enters the past in a most orderly fashion: step by step, day by day, or even hour by hour, the same variable is followed back through time. This produces a linear, stable history; this activity performs the temporality that Foucault saw as a crucial innovation of the modern, clinical gaze. It generates a body with a set of variables whose mutual interrelations and deviations can be traced. The body acquires a double continuity: it acquires a past through recurring variables distributed throughout an evenly flowing time, and this past itself remains constant over time. Whether a doctor looks at these traces one day or one month later, this past does not change. (As we will see later, this constancy is not characteristic of all the histories produced in the record, nor does it imply a unified history).

History is also produced by putting new forms (such as X-ray reports) in front of the previous form in that section. This does not produce the graphical oversight that a flow sheet format provides, but through for example flipping through the bacteriology reports, the doctor again finds herself traveling back and forth through linear time, accelerating and decelerating where necessary. Through compressing several weeks of reports

into a few seconds, the doctor leaves the time zones of everyday medical work and enters the temporal order of pathological processes of Foucault's body: the record produces textbook time. The growth of a tumor as witnessed on successive X-rays, the battle between microorganisms and antibiotic regimes, and the rise and fall of blood cells as the chemotherapy does its work - these are not events which take place within the time zones of a working day. Fluctuations in blood cell levels only become meaningful over a several day period, and the "growth of a tumor" unfolds over several weeks. Since the rows of blood cell levels on one page cover some ten days, and the X-ray reports over a two month period usually only cover a few pages, the record elegantly affords this crossing between time zones.[5]

The physician's progress notes and letters, finally, generate a history in a somewhat different way. As the pages of the progress notes fill up, the sequence of entries can certainly be read much as the sequence of bacteriology reports or laboratory tests: re-winding time backwards to generate an image of events taking place in a different temporal order. Yet most entries themselves start out with a short "summary" of the case, as follows:

Now 8 days post-reinfusion (of his bone marrow cells)[6]

Last night started amica 2 x 700 (these are antibiotics)

ripera 4 x 4 gr.

Origin? (... of the fever)

(From Mr. Wood's record)

In these summaries, the "current situation" is deduced from other entries in the record, the new laboratory results, information from nurses and the patient, and so forth. The starting point of that day's deliberations is formulated in a single phrase uninterpretable out of the context of the other entries. These summaries are read, re-read, re-written in the light of new events, summarized again, and continually constitute a brief patient's history as relevant at that particular juncture (Berg 1996). Glancing through a few recent pages of progress notes, then, is often the preferred way for a novel physician to "eyeball" a patient's current situation: to build a multi-layered history of pathological processes, diagnostic and therapeutic procedures, intertwined with organizational routines (such as who was the responsible physician when, where was the patient sent to), and so forth.

Geography

The record also produces an anatomical geography. Its different sections

detach the blood from its vessels, split its constituents, juxtapose the organs. The case history form separates several "organ systems", as do the nursing history forms; the X-ray reports delineate the "thorax", the "abdomen", and all the structures that can be seen within these bodily cavities. Orthogonal to the creation of a linear history, here anatomical orders are produced which perform the textbook medical body. The record thus also performs a dislocation in space (Latour 1987): it performs an in-vivo dissection, fleshing out a map to the terrain that is hidden under the patient's skin. This map affords a linkage of anatomical realities analogous to the time travel described above. Juxtaposing the radiographic reports from Mr. Wood with the physical examination and the laboratory results allows the physician to trace the spread of the cancer and to weigh the damage done by the chemotherapy.

But what does it mean, exactly, to say that the record "produces" a patient's history or geography? Of course, Mr. Wood's record is productive of narrative in the banal sense that people tend to read a narrative structure into any set of facts and figures: Boland (1993) has shown how, read by accountants, two different sets of balances sheets can give rise to the most varied conjectures about the personal lives and professional competence of their peers. Yet we want to go further. We are not arguing that the record produces a history or geography by creating a specific representation of the body, while leaving the "real" patient's body untouched. It is not a matter of merely producing a particular discourse, a specific rhetoric about a body. The medical record is not simply a post hoc depiction of times passed and spaces explored: it feeds into the very constitution of these times and spaces. The medical record is a distributing and collecting device (Berg 1996): work tasks begin and end there. It produces the patient's history by sequentially demanding that the same measurements be made again and again (according to the density of the x-axis). In order to produce the evenly distributed graphs and tables, these measurements have to be meticulously timed: every day, standard blood tests are performed, bacteriological cultures are taken; and every eight hours, nurses measure the temperature and the pulse. Every day, physicians produce a new summary of the situation which forms the basis for that day's diagnostic and therapeutic interventions. The end result is not a "medical" history which is clearly distinguishable from the history of Mr. Wood. The production of this representation can only occur with the concurrent transformation of that which is represented. The meticulous organizational routines into which the patient is "hooked" totally transform and control the patient's previous time zones - determining when the patient sleeps, structuring the days, and transforming the very experience of the flow of time (Frankenberg 1992; Roth 1979/1963; Star and Bowker 1994). The body is thus re-written in bureaucratic format: the weekly, daily and eight-hour cycles which now structure the patient's time closely match the doctor's and nurses' shifts, the opening and closing hours of the laboratory, and the measurement units of the financial administration (Zerubavel 1979). Again,



this is not merely a different, professional "reading" of the body. The body is materially reconfigured - its flesh is part and parcel of the discursive transformations we witness here. In Star and Bowker's terms, we witness a convergence between body and representation: in its production, the representation inscribes itself in the body it represents (1994).

It is this re-written body, subsequently, which is the site of the diagnostic and therapeutic interventions. At this point, it becomes meaningless to debate whether these interventions address the body "itself" or its representation, since it is in and through this representation that the body "itself" is known, surveyed and intervened upon. Peaks in the temperature curve will prompt the administration of a certain antibiotic - whose effect subsequently is also monitored in that graph, and in the temporal changes in the laboratory values registering the organ functions that might be affected by this drug. Not only do the record's pre-formatted time zones inscribe itself into the patient's body: all medical activities are started, followed up and evaluated within the time zones produced by the record. Most of the relevant historical events in the hospitalized patient's life become events triggered by orders written in the record - procedures set in motion by specific forms; therapeutic dosages re-adjusted because of an increase in a certain laboratory variable - as gleaned from the record.

While the patient's time is morphed into the record's time, the patient's geography is rewritten as well. As Hirschauer has so beautifully argued, the surgeon who operates on a body meticulously prepares and carves out the tissues so that they map the anatomical atlas. The atlas does not simply figure as the "ground" of objective knowledge, immediately visible in individual patient's bodies. Rather, this visibility is the outcome of the surgeon's "scriptured practice": "the proper anatomy of the ideal body is engraved ... into the patient-body" (1991). In an analogous fashion, the record inscribes a geography. The forms physicians and nurses use in their investigations of the patient body invariably delineate the organ systems. A form used in an intensive care unit, for example, listed the categories under "physical examination" as follows:

general impression

central nervous system

cardial

pulmonal

abdomen

urogenital

extremities

Similarly, many laboratory tests are categorized anatomically: "liver function", "renal function", "pulmonary function". In this way, through categorizing observations and substances from the body, the record carves out an anatomy. And it is this "geographicalized" body which is subsequently intervened upon: drug dosages are adjusted to correct a decreasing liver function, antibiotics are geared towards a possible focus for infection seen on an X-ray, and tubes and monitor cables are put in place to monitor the cardio-vascular circulation. As above, in an ever tightening cycle, the patient's body becomes its representation. Information required by the record or written in the record leads to interventions on the patient's body as it is represented in the record. Again, the record does not simply describe a patient's body: it structures the way the patient's body is rewritten. The categorization of observations and substances is only a first step in a continuing sequence of events, in which the individual anatomical systems become the center for specific interventions by different specialists. Fluids and medication are given to correct urogenital problems, a chest is punctured to restore a deflated lung to its proper form, and postures have to be taken to shoot the X-ray right: in mapping the patient, the patient's body is reconfigured so that it matches its map.

The record is of course not the only element active in these rewriting processes. Only as a part of a interlocked series of elements does the record come to life; only when linked to nursing and laboratory routines, tubes, infusion bags and cables, the hospital information system and so forth does a network emerge which as a whole performs the transformations described. And the record's structure does not "determine" the nursing routines in any simple way: these routines and the record's current structure have emerged together, mirroring one another and interlocking in historically specific ways (Berg forthcoming). Yet the record is one turning point in the cycle of inscriptions that circulate through these interlinked entities. It is where the inscriptions end up, are matched and rearranged, and where new inscription-yielding activities begin.

### Multiplicity

The rewriting processes described above do not produce a single coherent and transparent patient's body, mapped into Euclidean space. Medical practice is not a unitary apparatus "disciplining" the patient's body into some free-floating, similarly unitary biomedical entity (Haraway 1991; Hirschauer and Mol 1995). Focusing again on the medical record, we could say that it constitutes multiple histories. It encompasses multiple layers: time flows faster in some sections than in others. The temperature curve exists in time measured in hours, while X-ray's exist in time measured in days.

Some pages capture a time span of two months, while other pages cannot hold even a single day.

And these histories do not simply fold into one another. The flow chart links several histories by mapping them on a similar x-axis - yet even here the histories remain relatively self-contained. The fluid balance, for example, is produced as a closed system, with a rhythm and an internal logic which is transparent. Daily, a single number results which "represents" the fluid balance of this particular patient. And the temperature curve is similarly clear-cut: it is a graph mapping the evolution of the patient's body temperature over eight-hour periods. Yet the interrelation between these two histories is not self-evident. The only direct linkage (Mol forthcoming) produced by the record is a temporal co-occurrence. But how are the peaks related to the numbers? Are they? What is their joint history?

Such links are sometimes made in other parts of the record: especially in progress notes. A high temperature reading may be linked to a negative fluid balance record by the story that the former causes dehydration. Yet the progress notes only refer to a fraction of all the data listed in the record. More often than not, the X-ray reports, temperature curve, fluid balance, laboratory values and so forth remain unconnected, in their own time zones. And even if they are connected through the progress notes, another complication of the image of a fully integrated, unitary, Euclidean body arises. Where the flow chart and the series of X-ray reports produce a series of - often separate - linear histories, the progress notes contain non-linear histories. The summaries extract and condense time to match the current situation. Moreover, they continually reconstruct these histories whenever the current situation is changed. The progress notes do not build up linear histories like a flow chart does. Rather, a history of the patient evolves in the progress notes, changing whenever the current situation changes. Links are forged to the linear histories evolving elsewhere in the record, but these links are constantly reconstructed, removed and retrofitted whenever the current situation alters. What is a crucial temperature peak at time  $t$ , may become a singular, non-relevant reading later, and be forgotten in the next summary. And what is described as a sequenced chain of events at some stage in the progress notes, gets summarized into a singular "event" later on. At the eighth day after the reinfusion of Wood's bone marrow cells, the summary in the progress notes starts out with "now 8 days post-reinfusion", and then states "last night started amica & ripera" (see the fragment of his record above). A whole evening of doctor's deliberations on the right antibiotics to prescribe is summarized in this last sentence. And the eight days between reinfusion and last night flash by unevenly, only to slow down "last night", and to stop in the present, where the search for the "origin" of the fever is the order of the day. Time loops and swirls in these reconstructions: post hoc rationalizations after a sequence of dispersed occurrences become prior reasons for a "decision", and episodes get condensed, stretched and

rearranged. Although the progress notes do sometimes tie the histories evolving in different sections of the record together, they produce a history which is non-linear, constantly rewritten, and constantly emergent.

There is, then, no simple mapping between these histories. Mr. Wood's record portrays an array of histories, which do not fold into one another to produce one overall history of a medical body. Rather, the different histories co-exist, self-contained, sometimes touching and interlinked, but often going their own way. The record performs multiple histories: a series of parallel trajectories, through parallel but also often disconnected time-zones, and a series of statements in which an integrative, historical narrative constantly rewrites itself.

The multiplicity of the patient performed by the medical record is prominent when we look at the patient's geography. Juxtaposing the different parts of the record does not provide an evenly distributed, three dimensional map of the body. The travel through bodily space is discontinuous, and filled with indeterminacy. The different sections all stand for a series of probes (the blood tests, the radiographic procedures, the physical examination) that are let down into body that, in Foucault's felicitous phrase, hides its inner pathological truth as long as it remains.

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## PRODUCING BODIES

Mr. Wood is a patient on the Dutch University Hospital oncology ward. Imagine a newly arrived oncologist, who begins her shift on this ward. She meets Mr. Wood without having his medical record to hand. She sees a middle aged, somber looking man, probably suffering from cancer since this is the oncology ward. Questioning him or the personnel on the ward, she may elicit a story of Hodgkin's disease, which has been treated once before, but which has recurred. Investigating him might yield some more clues as to the spread of the disease, the side effects of his treatment, his general condition. Without the record, she might sense the damage the cancer has done, and conclude that the prognosis is poor. Yet she would excuse herself and not take any action before having seen the record. Without the record, she is without memory, without a device to structure her thought; despite all her years of experience, she is barely more able to proceed than the recently graduated resident who stands besides her.[3]

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## Geography

The record also produces an anatomical geography. Its different sections detach the blood from its vessels, split its constituents, juxtapose the organs. The case history form separates several "organ systems", as do the nursing history forms; the X-ray reports delineate the "thorax", the "abdomen", and all the structures that can be seen within these bodily cavities. Orthogonal to the creation of a linear history, here anatomical orders are produced which perform the textbook medical body. The record thus also performs a dislocation in space (Latour 1987): it performs an in-vivo dissection, fleshing out a map to the terrain that is hidden under the patient's skin. This map affords a linkage of anatomical realities analogous to the time travel described above. Juxtaposing the radiographic reports from Mr. Wood with the physical examination and the laboratory results

allows the physician to trace the spread of the cancer and to weigh the damage done by the chemotherapy.

But what does it mean, exactly, to say that the record "produces" a patient's history or geography? Of course, Mr. Wood's record is productive of narrative in the banal sense that people tend to read a narrative structure into any set of facts and figures: Boland (1993) has shown how, read by accountants, two different sets of balances sheets can give rise to the most varied conjectures about the personal lives and professional competence of their peers. Yet we want to go further. We are not arguing that the record produces a history or geography by creating a specific representation of the body, while leaving the "real" patient's body untouched. It is not a matter of merely producing a particular discourse, a specific rhetoric about a body. The medical record is not simply a post hoc depiction of times passed and spaces explored: it feeds into the very constitution of these times and spaces. The medical record is a distributing and collecting device (Berg 1996): work tasks begin and end there. It produces the patient's history by sequentially demanding that the same measurements be made again and again (according to the density of the x-axis). In order to produce the evenly distributed graphs and tables, these measurements have to be meticulously timed: every day, standard blood tests are performed, bacteriological cultures are taken; and every eight hours, nurses measure the temperature and the pulse. Every day, physicians produce a new summary of the situation which forms the basis for that day's diagnostic and therapeutic interventions. The end result is not a "medical" history which is clearly distinguishable from the history of Mr. Wood. The production of this representation can only occur with the concurrent transformation of that which is represented. The meticulous organizational routines into which the patient is "hooked" totally transform and control the patient's previous time zones - determining when the patient sleeps, structuring the days, and transforming the very experience of the flow of time (Frankenberg 1992; Roth 1979/1963; Star and Bowker 1994). The body is thus re-written in bureaucratic format: the weekly, daily and eight-hour cycles which now structure the patient's time closely match the doctor's and nurses' shifts, the opening and closing hours of the laboratory, and the measurement units of the financial administration (Zerubavel 1979). Again, this is not merely a different, professional "reading" of the body. The body is materially reconfigured - its flesh is part and parcel of the discursive transformations we witness here. In Star and Bowker's terms, we witness a convergence between body and representation: in its production, the representation inscribes itself in the body it represents (1994).

It is this re-written body, subsequently, which is the site of the diagnostic and therapeutic interventions. At this point, it becomes meaningless to debate whether these interventions address the body "itself" or its representation, since it is in and through this representation that the body "itself" is known, surveyed and intervened upon. Peaks in the

temperature curve will prompt the administration of a certain antibiotic - whose effect subsequently is also monitored in that graph, and in the temporal changes in the laboratory values registering the organ functions that might be affected by this drug. Not only do the record's pre-formatted time zones inscribe itself into the patient's body: all medical activities are started, followed up and evaluated within the time zones produced by the record. Most of the relevant historical events in the hospitalized patient's life become events triggered by orders written in the record - procedures set in motion by specific forms; therapeutic dosages re-adjusted because of an increase in a certain laboratory variable - as gleaned from the record.

While the patient's time is morphed into the record's time, the patient's geography is rewritten as well. As Hirschauer has so beautifully argued, the surgeon who operates on a body meticulously prepares and carves out the tissues so that they map the anatomical atlas. The atlas does not simply figure as the "ground" of objective knowledge, immediately visible in individual patient's bodies. Rather, this visibility is the outcome of the surgeon's "sculptured practice": "the proper anatomy of the ideal body is engraved ... into the patient-body" (1991). In an analogous fashion, the record inscribes a geography. The forms physicians and nurses use in their investigations of the patient body invariably delineate the organ systems. A form used in an intensive care unit, for example, listed the categories under "physical examination" as follows:

general impression

central nervous system

cardial

pulmonal

abdomen

urogenital

extremities

Similarly, many laboratory tests are categorized anatomically: "liver function", "renal function", "pulmonary function". In this way, through categorizing observations and substances from the body, the record carves out an anatomy. And it is this "geographicalized" body which is subsequently intervened upon: drug dosages are adjusted to correct a decreasing liver function, antibiotics are geared towards a possible focus for infection seen on an X-ray, and tubes and monitor cables are put in place to monitor the cardio-vascular circulation. As above, in an ever

tightening cycle, the patient's body becomes its representation. Information required by the record or written in the record leads to interventions on the patient's body as it is re presented in the record. Again, the record does not simply describe a patient's body: it structures the way the patient's body is rewritten. The categorization of observations and substances is only a first step in a continuing sequence of events, in which the individual anatomical systems become the center for specific interventions by different specialists. Fluids and medication are given to correct urogenital problems, a chest is punctured to restore a deflated lung to its proper form, and postures have to be taken to shoot the X-ray right: in mapping the patient, the patient's body is reconfigured so that it matches its map.

The record is of course not the only element active in these rewriting processes. Only as a part of a interlocked series of elements does the record come to life; only when linked to nursing and laboratory routines, tubes, infusion bags and cables, the hospital information system and so forth does a network emerge which as a whole performs the transformations described. And the record's structure does not "determine" the nursing routines in any simple way: these routines and the record's current structure have emerged together, mirroring one another and interlocking in historically specific ways (Berg forthcoming). Yet the record is one turning point in the cycle of inscriptions that circulate through these interlinked entities. It is where the inscriptions end up, are matched and rearranged, and where new inscription-yielding activities begin.

### Multiplicity

The rewriting processes described above do not produce a single coherent and transparent patient's body, mapped into Euclidean space. Medical practice is not a unitary apparatus "disciplining" the patient's body into some free-floating, similarly unitary biomedical entity (Haraway 1991; Hirschauer and Mol 1995). Focusing again on the medical record, we could say that it constitutes multiple histories. It encompasses multiple layers: time flows faster in some sections than in others. The temperature curve exists in time measured in hours, while X-ray's exist in time measured in days. Some pages capture a time span of two months, while other pages cannot hold even a single day.

And these histories do not simply fold into one another. The flow chart links several histories by mapping them on a similar x-axis - yet even here the histories remain relatively self-contained. The fluid balance, for example, is produced as a closed system, with a rhythm and an internal logic which is transparent. Daily, a single number results which "represents" the fluid balance of this particular patient. And the temperature curve is similarly clear-cut: it is a graph mapping the evolution of the patient's body temperature over eight-hour periods. Yet the interrelation between

these two histories is not self-evident. The only direct linkage (Mol forthcoming) produced by the record is a temporal co-occurrence. But how are the peaks related to the numbers? Are they? What is their joint history?

Such links are sometimes made in other parts of the record: especially in progress notes. A high temperature reading may be linked to a negative fluid balance record by the story that the former causes dehydration. Yet the progress notes only refer to a fraction of all the data listed in the record. More often than not, the X-ray reports, temperature curve, fluid balance, laboratory values and so forth remain unconnected, in their own time zones. And even if they are connected through the progress notes, another complication of the image of a fully integrated, unitary, Euclidean body arises. Where the flow chart and the series of X-ray reports produce a series of - often separate - linear histories, the progress notes contain non-linear histories. The summaries extract and condense time to match the current situation. Moreover, they continually reconstruct these histories whenever the current situation is changed. The progress notes do not build up linear histories like a flow chart does. Rather, a history of the patient evolves in the progress notes, changing whenever the current situation changes. Links are forged to the linear histories evolving elsewhere in the record, but these links are constantly reconstructed, removed and retrofitted whenever the current situation alters. What is a crucial temperature peak at time  $t$ , may become a singular, non-relevant reading later, and be forgotten in the next summary. And what is described as a sequenced chain of events at some stage in the progress notes, gets summarized into a singular "event" later on. At the eighth day after the reinfusion of Wood's bone marrow cells, the summary in the progress notes starts out with "now 8 days post-reinfusion", and then states "last night started amica & ripera" (see the fragment of his record above). A whole evening of doctor's deliberations on the right antibiotics to prescribe is summarized in this last sentence. And the eight days between reinfusion and last night flash by unevenly, only to slow down "last night", and to stop in the present, where the search for the "origin" of the fever is the order of the day. Time loops and swirls in these reconstructions: post hoc rationalizations after a sequence of dispersed occurrences become prior reasons for a "decision", and episodes get condensed, stretched and rearranged. Although the progress notes do sometimes tie the histories evolving in different sections of the record together, they produce a history which is non-linear, constantly rewritten, and constantly emergent.

There is, then, no simple mapping between these histories. Mr. Wood's record portrays an array of histories, which do not fold into one another to produce one overall history of a medical body. Rather, the different histories co-exist, self-contained, sometimes touching and interlinked, but often going their own way. The record performs multiple histories: a series of parallel trajectories, through parallel but also often disconnected time-zones, and a series of statements in which an integrative, historical

narrative constantly rewrites itself.

The multiplicity of the patient performed by the medical record is prominent when we look at the patient's geography. Juxtaposing the different parts of the record does not provide an evenly distributed, three dimensional map of the body. The travel through bodily space is discontinuous, and filled with indeterminacy. The different sections all stand for a series of probes (the blood tests, the radiographic procedures, the physical examination) that are let down into body that, in Foucault's felicitous phrase, hides its inner pathological truth as long as it remains

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This paper argues that the medical record is an important focus for sociological research. In medical work, the modern patient's body Foucault has so aptly described is produced through embodied, materially heterogeneous work - and the medical record plays a crucial role in this production. It does not simply represent this body's history and geography: it is a central element in the material re-writing of these. Simultaneously, the record fulfills a core role in the production of a body politic. As the record is involved in the performance of the patient's body, it is also involved in the performance of the clinic in which that body comes to life. Finally, we argue that different records, different practices of reading and writing are intertwined with the production of different patient's bodies, bodies politic, and bodies of knowledge. As organizational infrastructure, the medical record affords the interplay and coordination of divergent worlds. Seen in this light, as a site where multiple stories about patients and about organizations are at stake (including the interoperability between these stories), the medical record becomes highly relevant both analytically and politically.

In his *Birth of the Clinic*, Foucault argues that the classical, pre-modern "medicine of species" required a two-dimensional table as an intermediary between the individual body and medical knowledge (1973/1963). The table would translate individual symptoms: it would yield the true nature of the disease by showing how they fitted into the eternal scheme of things. Symptoms were not the disease itself: they were pointers to this higher truth, which merely "precipitated" in individual bodies, and which the table could decode. In contrast to the medicine of species, Foucault argues, the modern clinical gaze requires no such intermediary. Truth is no longer found and organized elsewhere in some grand nosological scheme, but rather in the pathological processes of individual bodies. The gaze deciphers this truth by following the symptoms inwards, eliciting signs, and differentiating the pathological reality that now is the disease.

Yet the development of this gaze depended crucially on the development of some new intermediaries. Writing was crucial in this new configuration. "Medicine no longer tried to see the essential truth beneath the sensible individuality; it was faced by the task of perceiving, and to infinity, the events of an open domain" (Foucault 1973, p. 98). In order to develop a body of true knowledge, medicine had to record individual cases: only in the accumulation of such experience, only in the totality of observers/observations could true knowledge be generated (Fagot-Largeault, 1989; Dagognet 1970). A cascade of inscriptions, to use Latour's term, typified and produced the possibility of this means of knowing (Latour 1987; 1993, pp. 171-225).

Although Foucault does not discuss this in the *Birth of the Clinic*, knowing in the practice of medicine is similarly dependent on writing. The power of



the gaze, in other words, would not go very far if it stood isolated (cf. Atkinson 1995, pp. 60-65). No longer typified by the metaphorical two-dimensional table Foucault describes, modern medicine could not be imagined without that other object of consultation: the medical record. In this paper, we argue that the medical record is fundamental to the everyday production of that contemporary body whose archeology Foucault describes (a body which hides the essences of the disease in the pathological processes taking place in its tissues; where the symptoms and signs attest to a reality which is never completely accessible in life) and to the everyday production of the organizations which enact and treat it.

How is the patient's body produced in hospital wards? How is its specific geometry and its historicity created? How is the patient's body transformed from the lived body of Mr. Thompson into a juxtaposition of organs, parameters, rows of numbers, graphs, and so forth? Is this through a specific way of looking? Or is this a discursive transformation, achieved through talk (as is a frequent focus of social constructivist medical sociology)?<sup>[1]</sup>(see e.g. Davis 1986; ten Have 1994) We will maintain that the body is produced through embodied, materially heterogeneous work (Hirschauer 1991; Cussins 1996). Much comes into play here: urine containers, infusion pumps, nursing routines, doctor's consultations, and so forth. All these artifacts, individuals and organizational routines are intermediaries which together perform the medical body. Following recent developments in science and technology studies (Bijker and Law 1992; Clarke and Fujimura 1992; Latour 1996; Star 1995), we argue that they constitute the network, or the dispositif within which the body acquires its specific ontology. We focus on the medical record because this artifact occupies a central niche in this network: it is where many of the nurses and physician's tasks begin, end, and are coordinated, where inscriptions accumulate, and where the specific spaces and times we will describe unfold. The record does not merely mirror the bodies it maps, we argue - but neither does it determine them. To emphasize the active role of artifacts without falling into technological determinism, we use the term "mediation" (Latour 1994): the record mediates the relations that it organizes, the bodies that are configured through it.

Following Foucault, we stress that these practices of reading and writing are not only central to the production of a patient's body: they also fulfill a core role in the production of a body politic. As the record is involved in the performance of the patient's body Foucault so aptly describes, it is also involved in the performance of the clinic in which that body comes to life. A specific configuration of the body cannot be cut loose from the specific social position different health professionals have within hospitals, and with the type of stories about the work done that can emerge from the records. To strengthen both these points, we make a third argument which departs from the Foucauldian scheme.<sup>[2]</sup> We argue that different records, different practices of reading and writing are intertwined with the production of different patient's bodies, different

bodies politic , and different bodies of knowledge.

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In these summaries, the "current situation" is deduced from other entries in the record, the new laboratory results, information from nurses and the patient, and so forth. The starting point of that day's deliberations is formulated in a single phrase uninterpretable out of the context of the other entries. These summaries are read, re-read, re-written in the light of new events, summarized again, and continually constitute a brief patient's history as relevant at that particular juncture (Berg 1996). Glancing through a few recent pages of progress notes, then, is often the preferred way for a novel physician to "eyeball" a patient's current situation: to build a multi-layered history of pathological processes, diagnostic and therapeutic procedures, intertwined with organizational routines (such as who was the responsible physician when, where was the patient sent to), and so forth.

## Geography

The record also produces an anatomical geography. Its different sections detach the blood from its vessels, split its constituents, juxtapose the organs. The case history form separates several "organ systems", as do the nursing history forms; the X-ray reports delineate the "thorax", the "abdomen", and all the structures that can be seen within these bodily cavities. Orthogonal to the creation of a linear history, here anatomical orders are produced which perform the textbook medical body. The record thus also performs a dislocation in space (Latour 1987): it performs an in-vivo dissection, fleshing out a map to the terrain that is hidden under the patient's skin. This map affords a linkage of anatomical realities analogous to the time travel described above. Juxtaposing the radiographic reports from Mr. Wood with the physical examination and the laboratory results allows the physician to trace the spread of the cancer and to weigh the damage done by the chemotherapy.

But what does it mean, exactly, to say that the record "produces" a patient's history or geography? Of course, Mr. Wood's record is productive of narrative in the banal sense that people tend to read a narrative structure into any set of facts and figures: Boland (1993) has shown how, read by accountants, two different sets of balances sheets can give rise to the most varied conjectures about the personal lives and professional competence of their peers. Yet we want to go further. We are not arguing that the record produces a history or geography by creating a specific

representation of the body, while leaving the "real" patient's body untouched. It is not a matter of merely producing a particular discourse, a specific rhetoric about a body. The medical record is not simply a post hoc depiction of times passed and spaces explored: it feeds into the very constitution of these times and spaces. The medical record is a distributing and collecting device (Berg 1996): work tasks begin and end there. It produces the patient's history by sequentially demanding that the same measurements be made again and again (according to the density of the x-axis). In order to produce the evenly distributed graphs and tables, these measurements have to be meticulously timed: every day, standard blood tests are performed, bacteriological cultures are taken; and every eight hours, nurses measure the temperature and the pulse. Every day, physicians produce a new summary of the situation which forms the basis for that day's diagnostic and therapeutic interventions. The end result is not a "medical" history which is clearly distinguishable from the history of Mr. Wood. The production of this representation can only occur with the concurrent transformation of that which is represented. The meticulous organizational routines into which the patient is "hooked" totally transform and control the patient's previous time zones - determining when the patient sleeps, structuring the days, and transforming the very experience of the flow of time (Frankenberg 1992; Roth 1979/1963; Star and Bowker 1994). The body is thus re-written in bureaucratic format: the weekly, daily and eight-hour cycles which now structure the patient's time closely match the doctor's and nurses' shifts, the opening and closing hours of the laboratory, and the measurement units of the financial administration (Zerubavel 1979). Again, this is not merely a different, professional "reading" of the body. The body is materially reconfigured - its flesh is part and parcel of the discursive transformations we witness here. In Star and Bowker's terms, we witness a convergence between body and representation: in its production, the representation inscribes itself in the body it represents (1994).

It is this re-written body, subsequently, which is the site of the diagnostic and therapeutic interventions. At this point, it becomes meaningless to debate whether these interventions address the body "itself" or its representation, since it is in and through this representation that the body "itself" is known, surveyed and intervened upon. Peaks in the temperature curve will prompt the administration of a certain antibiotic - whose effect subsequently is also monitored in that graph, and in the temporal changes in the laboratory values registering the organ functions that might be affected by this drug. Not only do the record's pre-formatted time zones inscribe itself into the patient's body: all medical activities are started, followed up and evaluated within the time zones produced by the record. Most of the relevant historical events in the hospitalized patient's life become events triggered by orders written in the record - procedures set in motion by specific forms; therapeutic dosages re-adjusted because of an increase in a certain laboratory variable - as gleaned from the record.

While the patient's time is morphed into the record's time, the patient's geography is rewritten as well. As Hirschauer has so beautifully argued, the surgeon who operates on a body meticulously prepares and carves out the tissues so that they map the anatomical atlas. The atlas does not simply figure as the "ground" of objective knowledge, immediately visible in individual patient's bodies. Rather, this visibility is the outcome of the surgeon's "sculptured practice": "the proper anatomy of the ideal body is engraved ... into the patient-body" (1991). In an analogous fashion, the record inscribes a geography. The forms physicians and nurses use in their investigations of the patient body invariably delineate the organ systems. A form used in an intensive care unit, for example, listed the categories under "physical examination" as follows:

general impression

central nervous system

cardial

pulmonal

abdomen

urogenital

extremities

Similarly, many laboratory tests are categorized anatomically: "liver function", "renal function", "pulmonary function". In this way, through categorizing observations and substances from the body, the record carves out an anatomy. And it is this "geographicalized" body which is subsequently intervened upon: drug dosages are adjusted to correct a decreasing liver function, antibiotics are geared towards a possible focus for infection seen on an X-ray, and tubes and monitor cables are put in place to monitor the cardio-vascular circulation. As above, in an ever tightening cycle, the patient's body becomes its representation. Information required by the record or written in the record leads to interventions on the patient's body as it is represented in the record. Again, the record does not simply describe a patient's body: it structures the way the patient's body is rewritten. The categorization of observations and substances is only a first step in a continuing sequence of events, in which the individual anatomical systems become the center for specific interventions by different specialists. Fluids and medication are given to correct urogenital problems, a chest is punctured to restore a deflated lung to its proper form, and postures have to be taken to shoot the X-ray right: in mapping the patient, the patient's body is reconfigured so that it matches its map.

The record is of course not the only element active in these rewriting processes. Only as a part of a interlocked series of elements does the record come to life; only when linked to nursing and laboratory routines, tubes, infusion bags and cables, the hospital information system and so forth does a network emerge which as a whole performs the transformations described. And the record's structure does not "determine" the nursing routines in any simple way: these routines and the record's current structure have emerged together, mirroring one another and interlocking in historically specific ways (Berg forthcoming). Yet the record is one turning point in the cycle of inscriptions that circulate through these interlinked entities. It is where the inscriptions end up, are matched and rearranged, and where new inscription-yielding activities begin.

### Multiplicity

The rewriting processes described above do not produce a single coherent and transparent patient's body, mapped into Euclidean space. Medical practice is not a unitary apparatus "disciplining" the patient's body into some free-floating, similarly unitary biomedical entity (Haraway 1991; Hirschauer and Mol 1995). Focusing again on the medical record, we could say that it constitutes multiple histories. It encompasses multiple layers: time flows faster in some sections than in others. The temperature curve exists in time measured in hours, while X-ray's exist in time measured in days. Some pages capture a time span of two months, while other pages cannot hold even a single day.

And these histories do not simply fold into one another. The flow chart links several histories by mapping them on a similar x-axis - yet even here the histories remain relatively self-contained. The fluid balance, for example, is produced as a closed system, with a rhythm and an internal logic which is transparent. Daily, a single number results which "represents" the fluid balance of this particular patient. And the temperature curve is similarly clear-cut: it is a graph mapping the evolution of the patient's body temperature over eight-hour periods. Yet the interrelation between these two histories is not self-evident. The only direct linkage (Mol forthcoming) produced by the record is a temporal co-occurrence. But how are the peaks related to the numbers? Are they? What is their joint history?

Such links are sometimes made in other parts of the record: especially in progress notes. A high temperature reading may be linked to a negative fluid balance record by the story that the former causes dehydration. Yet the progress notes only refer to a fraction of all the data listed in the record. More often than not, the X-ray reports, temperature curve, fluid balance, laboratory values and so forth remain unconnected, in their own time zones. And even if they are connected through the progress notes, another complication of the image of a fully integrated, unitary, Euclidean body arises. Where the flow chart