English Text

Double Helix: The Munich Way of Research in the History of Technology

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For almost a decade there has been a broad discussion, mainly led by social scientists, on the character of our present day society as a knowledge society, driven nearly on all levels by the production and use of science. "Re-Thinking Science", to quote the title of a most recently published book by Helga Nowotny, Peter Scott and Michael Gibbons, is on the agenda - rethinking science by studying the dramatic, and deeply interrelated changes, which have occurred in science and society in recent decades.
One explanatory model for the enormous importance that science and technology gave gained in modern societies, is the triple helix-model. This model is stressing the interrelatedness of university, industry and the state in modern societies, tightening academic, economical and political interests and functions close together. The triple helix means that modern society is no more working in a "Mode-1 science", designated to the production of reliable disciplinary knowledge from the autonomous sphere of science; it is rather producing "Mode 2-knowledge", resulting from more interdisciplinary work carried out in close connection to a context of application - and in market-driven societies this context of application is most often a technological and economical one.

Now, my model of a double helix, points to a similar effect of interrelating two knowledge-producing subsystems of society: the university and the museum. I use this model to describe the way, research in the history of science and technology is done in one of the local centers of this field of historical research, that is the place were I'm personally working: the Deutsches Museum in Munich.

My main argument here is: Linking research in a museum with universities provides a number of advantages for both sides of this symbiosis in scholarship: It allows the pooling of resources to gain a better visibility in the scholarly world; it enables museums to train young scholars better qualified for their future job in museums; and it accesses the richness of museum's collections for academic teaching and research. In the first part of my lecture, I will give an overview on the Munich way to organise the

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interlinking of research in academia and museum, followed by a description of the contents of this research. Here I will especially refer to artifact-related research, which is one the main scholarly activities in the Deutsches Museum. In my second part I will shortly introduce the museum itself, its structure, main collections and exhibitions as well as ongoing projects. Here I will take up the questions that Dr. Shimizu has asked me to answer: that is especially, how we collect, assess the collections and preserve the collected artifacts. Dr. Shimizu also asked me to tackle the question, how artifacts are exhibited, how they are contextualised. I will do this, by referring to one of our ongoing big projects, the "Deutsches Museum Verkehrszentrum", new branch museum for transport and mobility.

The Deutsches Museum is, compared to its sister-museum here in Tokyo, a rather old institution. It will have its 100 anniversary next year, which means that it was founded in 1903. The fact that the museum's life cycle spans a 100 years constitutes its corporate identity and it affects nearly every part of its activities. I will come back to the impact of this tradition more than once in my lecture.

The period of the museum's foundation, the turn of the century, was exactly the time, when engineers in Imperial Germany tried to emancipate from the predominance of scientists in society. German engineers worked hard to establish technology as an applied science and, more important, as a part of culture that drives history and progress. The technical universities (Technische Hochschulen), which had been founded in the second half of the 19th century, became the backbone of this movement. When the German Emperor Wilhelm II granted these technical universities the right to promote graduates with doctorate degrees, the engineering movement got their ultimate societal success.

But the public showcase of the engineering movement became the Deutsches Museum. The museum's task was to collect "masterpieces of science and technology", as the museum was subtitled up until recently, and to celebrate the progress of technology by looking back into history. The method of comparing history with the presence by reconstructing and exhibiting lines of technological development - and this is what the curators and their network of supporters in academia and industry did - paved the ground for the emergence of history of technology as an accepted field of scholarship.

As a recently appeared book on the historiography of the history of technology as a defined field of scholarship has shown, the Deutsches Museum, supported by its main ally, the Verein Deutscher Ingenieure - the German Engineering Society, which is still today the World's largest Engineering Society - was for many decades the seedbed to this discipline.4 Whenever efforts were made to establish the field, be it in the interwar period or in the years after the Second World War, they centred around the Deutsches Museum. The 1960s and 1970s then saw the breakthrough of the professionalisation of history of technology. The discipline found entrance in the academic curricula, respective chairs were founded, some in combination with history of science or history of economics. But the undisputed highpoint of this period of expansion was the foundation of three closely connected institutes for history of science and technology in Munich with the support of the German Volkswagen Foundation.

- The Institute for the History of Science of the University of Munich,
- The Institute for the History of Technology of the Technical University of Munich and
- The Institute for the History of Technology and Science of the Deutsches Museum.

No doubts that the logic places for this centre was the Deutsches Museum, which willingly provided the space to host this unique agglomeration of intellectual resources. For three decades the institutes flourished and delivered some excellent works, especially in the history of science. But, it's also fair to say that these institutes were not able to fully exploit their resources in these days. It was in the mid-1990s, when my colleague Ulrich Wengenroth, head of the Institute for the History of Technology of the Technical University, and I decided to go one step further in the pooling of resources. We aimed at amalgamating all relevant resources of the Munich scholarly landscape and to combine a long tradition of scientific co-operation with new, more effective tools and instruments in research and teaching. Within a lively public debate on the necessity to fundamentally reform the German system of higher education, the timing was perfect. The idea to pool resources of now three universities and the museum with six relevant institutes and thus realizing a centre of excellence got support from politics as well as from the presidents of these institutions.

Now, what is the Munich Centre for the History of Science and Technology and how is it related to the Deutsches Museum. It is a co-operation, based on a formal contract, in which the University of Munich, the Technical University, the University of the Armed Forces and the Deutsches Museum express their will to coordinate their activities in research and teaching and to run joint projects. Fig.1 includes also a list of formal partnerships: with the MIT in Boston, with the Georgia Institute of Technology and also with the Royal Technical University in Stockholm. Associated to the Munich Center are the respective archives of the universities and the Deutsches Museum.

Fig.2 shows the structure of research at the Deutsches Museum. On the right hand, you see the Museum, and on the left hand academia, the universities. There's a flow, if you like, of overlapping activities from the museum itself with its curators and collections, its archives, its library and its research institute to the Munich Center of the History of Science and Technology and finally to the universities.

What does the Deutsches Museum gain by following the double helix-model? We see at least four main advantages resulting from the integral cooperation with the academic landscape. Firstly, this cooperation enlarges the scholarly manpower and capabilities, and it thus also very much improves the museums visibility in the respective scientific communities. Secondly, it stimulates the intellectual life of the museum in many ways: by conferences, by seminars, by teaching, just by having students around. Thirdly, it allows the training and recruitment of young scientists with a better understanding of history of science and technology as well as of the specifics of curatorial work. Fourthly, it raises the awareness of academic scholarship for the importance of the specific resources that museums are offering: their artifacts, their collections, their archives etc.

Munich Center for the History of Technology

Founded in 1997

Staff: 50 (including Ph.D-candidates)

Member Institutes:

Deutsches Museum:
- Research Institute for the History of Technology and Science

Technical University of Munich:
- Central Institute for the History of Technology
- Institute for the History of Medicine

University of Munich:
- Institute for the History of Natural Sciences and Mathematics
- Chair for the History of Universities and Education
- Institute for the History of Medicine

University of the Armed Forces:
- Institute for the History of Science

Formal partnerships with:
- MIT, Boston
- Georgia Institute of Technology, Atlanta
- Royal Technical University, Stockholm

Archives:
- Archives of the Deutsches Museum
- Archives of the Technical University of Munich
- Archives of the University of Munich

fig.1

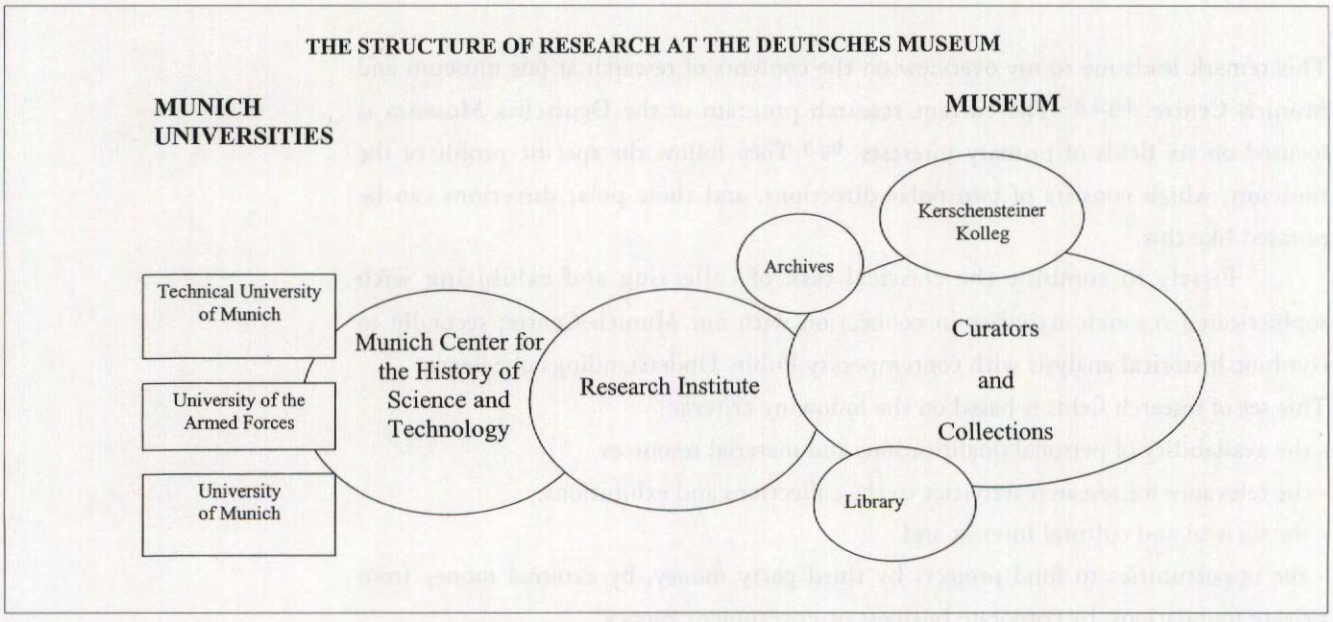

fig.2

But, it is fair to say that there are also problems related to the double helix-models, namely the following two: Firstly, this model absorbs a decent amount of intellectual resources and forces the museum's community to serve two different, sometimes even contradictory systems of research and scholarship. Secondly, whereas the academic world merits cutting-edge research and highly sophisticated publications, the museums world aims at producing more popular works addressing a general audience. To find a balance between these two systems of research is a sensitive task.

I will now show you, how this balance looks like in the Deutsches Museum by giving an overview on our current research programme. But, before I do so, let me make one more remark. The bonds between academically based researchers and the curator of museums can only yield their richest rewards, if the museum enables its curators to find time for the establishment of a community of ideas - in particular, time for scholarly curatorship has to be carved out of schedules that in national museums have tended to have become ever more dominated by the demands of management and public relations. If that time - the time for writing, the time for talking, and for reading - if that time is not found, it will be hard for curators to participate in the changes that are sweeping through the discipline of the history of science and technology, and even harder for them to reflect those changes in their museological work. The historiographical changes, to which I refer here, have drawn museums closer and closer to the heart of our discipline, the History of Science and Technology.

Historians today are more interested than ever before not just in theories and abstractions but in the practices of science and engineering. They are interested in the different forms knowledge, and that what is really done in science and technology, namely in objects and artifacts. Thus, the changes in historiography have played the museums in their hand.

This remark leads me to my overview on the contents of research at our museum and Munich Centre. fig.4,5 The current research program of the Deutsches Museum is focused on six fields of primary interests. fig.3 They follow the specific profile of the museum, which consists of two polar directions, and these polar directions can be phrased like this.

Firstly to combine the classical task of collecting and exhibiting with sophisticated research activities in connection with our Munich Centre; secondly to combine historical analysis with contemporary Public Understandings of Science.
This set of research fields is based on the following criteria:
- the availability of personal qualifications and material resources,
- the relevance for research activities to the collections and exhibitions,
- the societal and cultural interest and
- the opportunities to fund projects by third party money, by external money from private foundations, by corporate business or government agency.

I will quickly refer to the six fields of research by naming some major projects just to give you an idea how we understand these fields and what is topical in the history of science and technology in Germany or bit in Europe.

1. Research related to collections and artifacts is the backbone of the museum, and this relates to specific sets of artifacts and objects as well as to specific objects. For the Deutsches Museum, it is very important not only to study certain collections of artifacts, but also to bring together the curatorial community in the museum with the aim to perform larger projects.

One project which we currently working on, is called "Around 1900: Material culture at the turn of the century". 1900, the foundation period of the Deutsches Museum, was a time characterized on the one hand as a transition phase between traditional society and modern society; on the other hand, this period characterizes a specific openness in the technological and scientific development. And the set of artefacts, which we are studying, shows these paths of development, which were

Research Programme of the Deutsches Museum for the years 2000 – 2004

1. Research related to collections and artifacts
2. History of science in its disciplinary, cultural and societal context
3. Innovation cultures in international comparison
4. Studies in museology and museum pedagogics
5. Public understanding of science - theory and practise
6. Historical transport research

fig.3

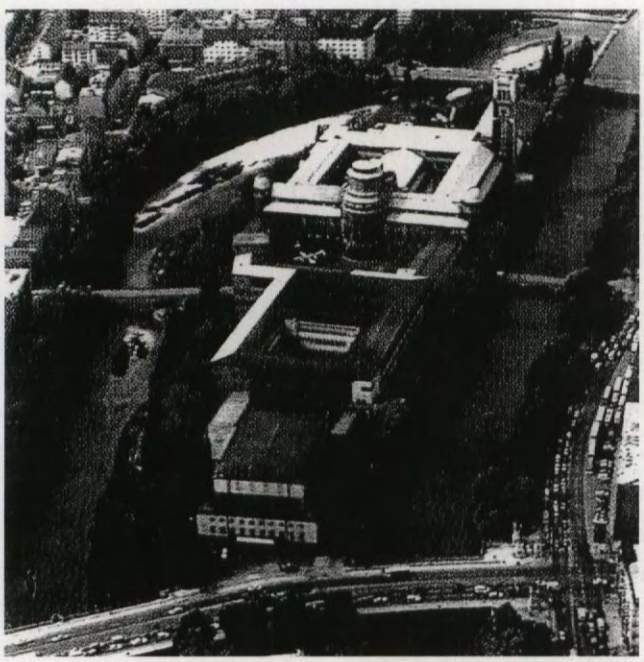

fig.4

The Deutsches Museum in Numbers

Founded: 1903

Visitors per year: 1,4 Mill.

Annual budget: 30 Mill. EURO

Staff: 350 permanent, 80 volunteers

Library: 865.000 volumes, 3.800 periodicals

Archives: 4.3 kilometers of archival material, sources and documents

Collections: 90.000 items, 25.000 on display

Exhibitions: 44 permanent

Museums:

Deutsches Museum, Museumsinsel (science and technology in general)	45.000 m^2
Deutsches Museum, Flugwerft Schleißheim (aviation and space)	7.500 m^2
Deutsches Museum, Bonn (science and technology in Germany after 1945)	1.200 m^2
Deutsches Museum, Verkehrszentrum	10.000 m^2

fig.5

opened at the turn of the century.

A second project, which I want to mention here, is a co-operation with the Smithsonian's National Museum of American History and the Science Museum in London. Again, this co-operation aims at again showing the importance of objects and artifacts to the scholarly world: firstly, by organizing annual meetings and conferences like the one here, streamline towards specific topics in the history of Science and Technology; secondly, by producing scholarly papers which then run into a series of publications called "Artefacts. Studies in the History of Science and Technology", published by Harwood Academic Press. The annual conferences serve also as a forum for discussing general problems of museums of science and technology. It is stunning to see, how related these problems are and how similar the challenges are within in the museum world. This is one of the reasons why I personally find these meetings, like the one here in Tokyo, very stimulating: to exchange ideas and to communicate within our national centres.

2. History of science in its disciplinary, cultural and societal context: I will not so much comment on this field aiming at trans-disciplinary studies on the history of science. As you know, it is important to see disciplines as channels for the development of scientific ideas. Thus, it is of special importance to study the interrelatedness of specific disciplines, their boundaries and their cognitive environment.

3. Innovation cultures in international comparison: During the last decade or so, the theoretical concept of "national innovation systems" has gained some prominence. This concept has been developed mainly by evolutionary economists with the idea to study kind the emergence of national systems of innovation: the institutional connections between science, industry and the state, in other words those actors that shaped innovations. This concept also aims at comparing the various national systems to better understand how these national economies perform in a globalise world. To our understanding, this concepts is to narrow. Cultural factors are usually neglected in the picture drawn by economists. It's more important to see how the soft factors in society have shaped our national societies. Our research projects focus on these soft factors in the long-term development. Just to give you one idea of our major findings concerning Germany. We are also comparing the West German society, the Federal Republic of Germany, with former East Germany, the German Democratic Republic.

Although these two Germanys were situated in very different political and social contexts, they followed the same path of innovation. In 1990, after 40 or so years of existence, both systems showed the same innovation profile: the same strong fields of science and technology and the same weaknesses in their economic development. East German society was strong in traditional mechanical engineering, electrical engineering and in chemistry, and like West Germany, it was weak in consumer technologies. Here, we can see the long lasting effects of culture and historical traditions.

Another project in this research field refers to Europe as a set of slowly amalgamating national innovation systems. This project tries to build up a network

of European scholars to study the emergence of a European innovation culture. The project understands technology as a driving force of the European unification. This is one of the most stimulating projects we are working with.

4. Studies in museology and museum pedagogic: I will not go into detail here. Studies in this field are permanently performed in order to ensure and optimise the quality of the exhibition projects.

5. Public understanding of science - theory and practice: You may have heard that just one week ago, the German National Parliament has passed a new law, a law which allow scientists to do experiments with embryonic stem cells. Never before, Germany has experienced such a long lasting and heated debate on scientific methods as on stem cell research. This debate ran for about two years and was intensively covered by all medias, engaging literally everybody in society. Like never before, the German decision-makers became aware of the importance of a public understanding of science. Politicians and scientists alike experienced the necessity of a truly balanced dialogue - and I emphasized the word dialogue here -, a dialogue between scientists and the public, between science and society. This debate has opened a new window of opportunity for museums of science and technology.

The Deutsches Museum has itself prepared for this opportunity and challenge. A few years ago, we started research programmes on the following question: How can museums contribute to public understanding of science in theory as well as to its practice by new programmes like public lectures by eminent scientist or by public dialogues on controversial issues. We have started a big project to establish the Deutsches Museum as a national platform for this dialogue, which we call "Centre for New Technologies". This Centre, which will become operational from 2003 onwards, aims at linking exhibitions on cutting-edge technologies like biotechnology, like nano-technology, like climate change, like software with accompanying activities in public understanding of science. The new Centre will engage the scientists, the national laboratories, the universities as well as industry, while the museum will serve as the moderator of their dialogue with the public.

6. Historical transport research: The question, where this new Centre is located, leads me to my last point, because the Centre will be realized by translocating our present galleries on land transportation in order to build up a new branch museum for transport and mobility and to gain space for exhibiting new technologies. The new transport branch museum helps me to exemplify the role of history and historical research within the Deutsches Museum.

Around 1995, the Museum was confronted with the idea of realizing a new branch museum on transportation. Next to first spatial plans, we began to build up a team of researchers in transport history in order to improve and enlarge our intellectual resources on this sector. In the meantime, about five dissertations and a number of post-doc projects have been finished and published. In addition, we have successfully built up a network of historical transport research in Europe funded by the European community, called "Lessons from History. Towards a European

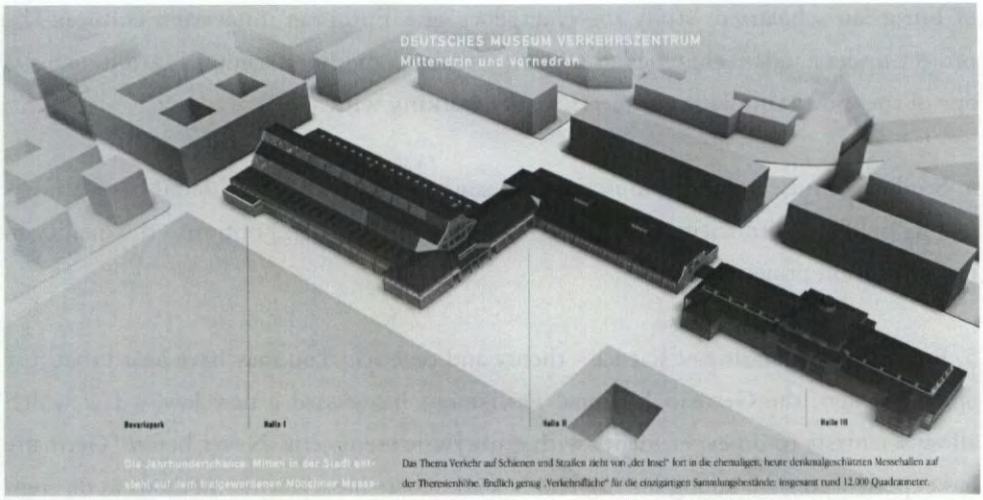

fig.6

fig.7

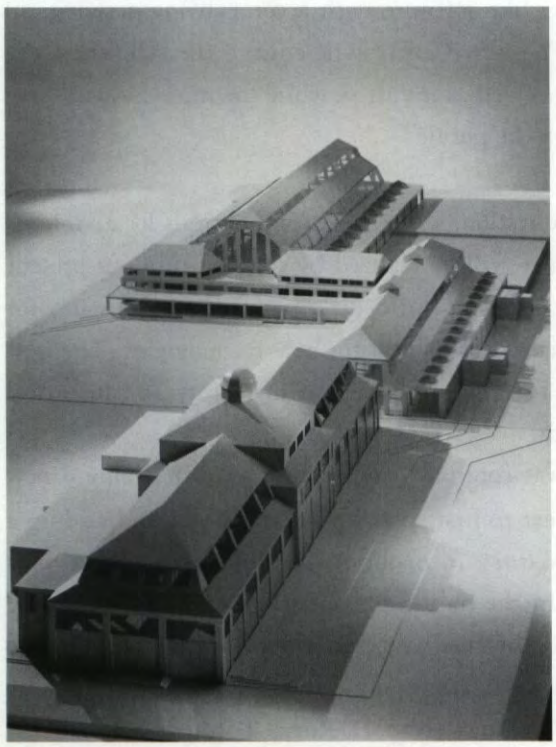

fig.8

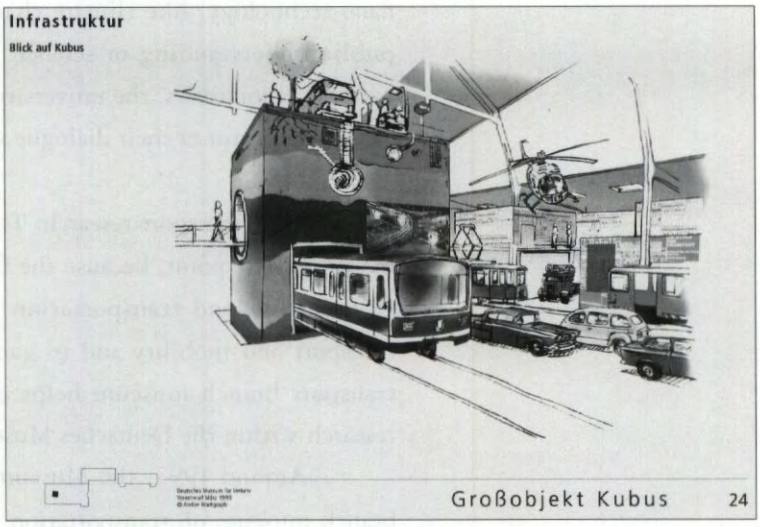

fig.9

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Intermodal Transport Network". We have also launched a series of publications on transport history with an external publisher. Finally, on the bases of its scholarly activities this group of researchers has developed first conceptions for the exhibitions in the new branch museum.

The core concept here understands transport as a large technical system - as historians call it - a system shaped by technological and social factors. The system of transport in particular consists of different modes of transportation, but these modes (rail, road, air, bicycle etc.) are not separated but interlinked. The systems approach will prominently be expressed in the exhibitions of the new branch museum.

The new branch will consist of three buildings. fig.6~9 These buildings are under protection law. They were built by the same architect (Gabriel von Seidl) and at the same time as the Deutsches Museum was built, around the turn of the century. For almost eighty years, these buildings were used by the Munich Fair. When the Munich Fair moved out in 1995, we got them to build up a new branch museum for transportation. The whole site is an industrial site, if you like. It gives you immediately the impression that you are in an industrial area. Even more so, the main building on the left side looks like a station and thus fits perfectly with our plans.
Up to now, the Deutsches Museum has had galleries on each mode of transportation: on railways, automobiles, coaches, bicycles, ships and airplanes - galleries that followed the linear model of technological progress. These galleries followed the path of history from, for example, Stevenson's loco to the modern high-speed trains like Shinkansen, from the first German bicycles to the latest high tech bikes of Shimano.
This straightforward and reductionistic understanding of technological change has become obsolete and has to be thrown overboard. In the new museum, history will play a different role. History will provide the source, the context, and the background

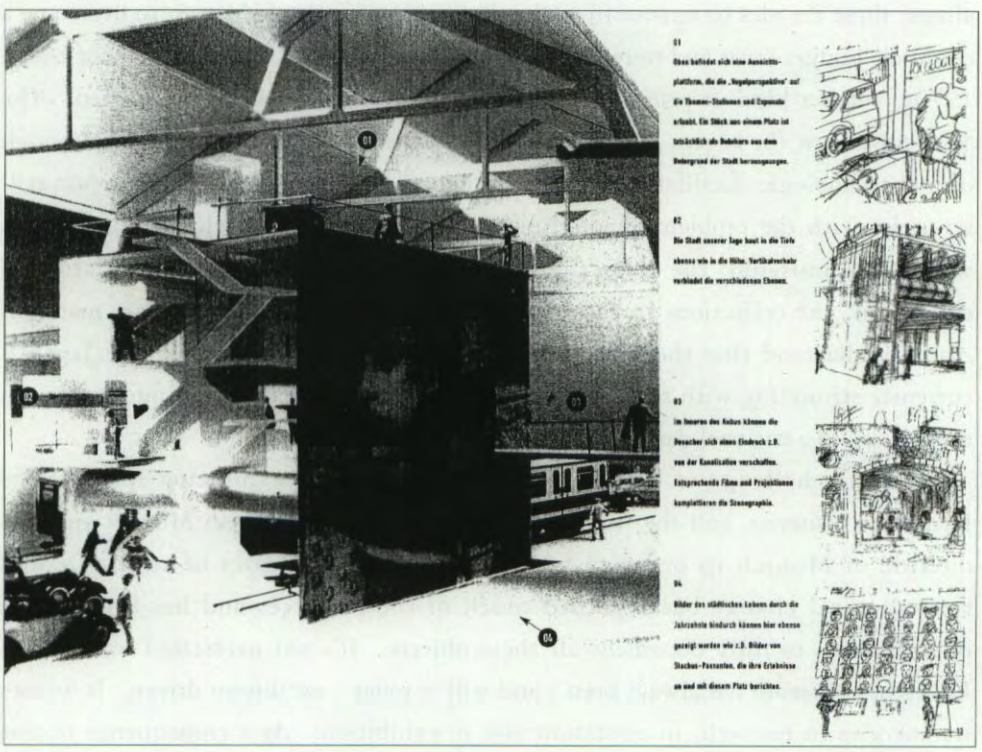

fig.10

for storytelling, stories on mobility as an anthropological factor in human history, stories on transport as a large technical system. These stories will link history with our present understanding of technological change, which perceives technological change as a winded and broken road to modernity including deviations.

To sum it up: History of technology plays a double role in the new Deutsches Museum of Transportation. As the field of sophisticated scholarship it shapes the basic conception of the museums exhibitions; as a source book of society, it enables the telling of exciting stories. Maybe, you will see the last picture just to give you an idea of one of these stories.

Fig.10 shows the name of Tokyo. This is my reference to the organisers of this conference. It stands for an exhibit on the city. The city is a major subject in transportation, as it is a major actor in transport as a large technical system. The city is the place, where various systems of transportation come together, and where flows of information, of goods, also of artifacts take place. The city as a connecting point and an ideal starting point for museum curators to tell the story of the problems, caused by massive transportation in modern societies.

Finally, let me come back to the question of Dr. Shimizu, how collection management is organized in the Deutsches Museum. As a background, the basic numbers of the Deutsches Museums are given in fig.5.

The Deutsches Museum on the Munich Museums island fig.4.

The collections and exhibitions at the Deutsches Museum suffered heavily from the Second World War, when about 80 percent of the museum's buildings and 20 percent of the objects were destroyed in allied air raids. It costs the Deutsches Museum almost three decades to recover from the devastating effects of the war, to overcome a chronicle budget crisis and to return to normalcy and routine. Thus, it was not before 1970s, when a kind of professionalization of collection management started. The 1980s then saw the advent of the computer in collection management. And although digital technologies facilitated the management of huge collections, the museum still struggles with the problem of interlinking different sources of relevant information within the museum: the collections of three-dimensional objects, the archival collections, the collections in the library and the internal documentation material. And I understand that the new Centre for the History of Technology in Japan is currently struggling with the problems of collecting and interlinking information in order to build a national database of historical industrial sources.

The challenge of constantly renewing the huge exhibition space of the Deutsches Museum, and the task to build up branch museums in Munich and also outside of Munich in order to keep up with the dynamics of scientific and technological change has absorbed much of the resources and has limited the opportunities to fully document all these objects. It's not overstated to say: The Deutsches Museum has always been - and still is today - exhibition driven. It focuses its energies in research, in education and in exhibition. As a consequence of this

setting of priorities, documentation has remained a critical issue in the Deutsches Museum and so has conservation and preservation. Personally, I am really looking forward to your new Centre of the History of Technology to see how you will handle this problem of dealing with huge collections of information.

Now, what about collecting? As I've already mentioned, collecting has often been perceived by curators of the Deutsches Museum as a sub function of preparing and realizing exhibitions. Some curators have a defined vision and try to actively enlarge their collections, either by filling gaps in the historical development of science and technology manifested in artifacts, or by hunting for material expressions of cutting-edge science and technology. Some curators collect in a more passive way, reacting to occasional offers by industry, science or the public.

To actively steer this process of collecting and to avoid the contingencies of acquisition, the Deutsches Museum has defined a clear management procedure, which has three steps. The first step consists of collection plans, which each curator has to develop for all fields, he bears responsibility. These plans serve as guidelines for the curators themselves as well as for the collection committee. This committee consists of about five or six curators and officials in the museum. With this committee start the second step: Each single acquisition has to be justified and finally approved by the collection committee. If the respective artifact will absorb more resources than usual, either by its size or price, step three comes into the play. In these cases, the Director General has to give his personal approval.

One concluding remark: The collection plans define corridors and priorities on a more general level. They are not understood as a Bed of Procrustes. Frankly speaking, the collection policy of the Deutsches Museum has always been led - and will be led in the future as well - by contingencies and occasional opportunities.

Industrial Artifacts and their Stories: New Challenges in Collecting, Researching and Displaying Industrial History at the Smithsonian Institution

Steven Lubar

Chair, Division of the History of Technology,
National Museum of American History, Smithsonian Institution

It is a pleasure to be speaking here today. I would like to thank Dr. Keiichi Shimizu and his colleagues for the invitation and for the wonderful hospitality I have received during my visit to Tokyo.

I salute all of the members of the group working to build the Japanese industrial history museum and information center. It is a bold and worthwhile undertaking. I am a true believer in industrial history museums. I believe in them because I believe that nothing is more important than preserving and interpreting our industrial history. That is because industrial history is, in important ways, the basis of all our modern history. It is the history of our economic life; it is history of our daily work; it is the history of the things that surround us at home; it is the history of the things that we buy and the things that we sell. Further, it is a chief part of our social and political history, the history of the nation.

If we understand our industrial history, we understand how the world we live in came to be. And as important, we can better understand the world to come.
As you can tell from this introduction, my definition of industrial history is very broad. Not just technology. Not just science Not just economics. I want to define industrial history - and the work of the industrial history museum - as the history of industrial society, not the history of industrial technology. Production, of course. Consumption. Work. Management. Business, entrepreneurship and economics. Politics. The lives of industrial workers on the job and off.

If we define industrial history so broadly, what does that suggest as the agenda for an industrial history museum? Industrial history museums are places that the public can visit to understand how industrial society came to be; get some perspective on the transitions we are undergoing as individuals, communities, as nations and as a global economy; and consider the future of work, technology, and society - not only their own future, but the future of people all over the world. An industrial history museum can make us better citizens of an industrial democracy.

Steven Lubar is the Chairman of the Division of the History of Technology at the Smithsonian Institution's National Museum of American History. A 1976 graduate of MIT in humanities and engineering, he received his Ph.D. in the history of science and technology from the University of Chicago in 1983. At the Smithsonian Institution since 1982, he has worked on many exhibitions, including Engines of Change, Information Age, Communities in a Changing Nation, and the forthcoming America on the Move. He is the author, co-author or editor of six books, and author of over 40 articles on the history of technology, material culture, and public history including, most recently, Legacies: Collecting America's History at the Smithsonian. Dr. Lubar has taught at the University of Maryland, the University of Pennsylvania, and George Washington University.

English Text

The job of the industrial history museum is to celebrate industry, to critically examine industry, and to make industry understandable to the public. The industrial history museum does this in a way that no other institution can: Through the use of artifacts, real things, collected by the museum and preserved for the future. The thing that makes museums unique - the quality that sets them off from other educational institutions. - is the central place of artifacts, physical things, in their work.

It is their collections of artifacts that allow museums to address history in a way that no other institution can. Artifacts define museums. The museum's collection of artifacts offers historical insight. They provide the backbone of its exhibitions. They are a key indication to the visitors of the verisimilitude of the museum's presentation.

In this talk, I want to consider the place of artifacts in industrial history museums. I will consider artifacts in three aspects of museum work: in collecting and preserving; in research; and in display.

In all of these aspects of museum work, I want to focus on a way that artifacts are combined with stories. Artifacts by themselves, I will argue, are not enough. It is artifacts, in conjunction with the stories that surround them, that makes the museum experience so valuable and educational. Indeed, I believe it is fair to say that a museum is a place where authentic artifacts and their authentic stories are collected, analyzed, and presented.

So, this talk will have three sections. Collecting artifacts and their stories, analyzing artifacts and their stories, and presenting artifacts and their stories.

I'll illustrate each of them with examples from the collections of artifacts at the Smithsonian Institution's National Museum of American History. Before I get into the body of this talk, let me say a few words about the National Museum of American History in Washington, where I work. fig.1 It is part of the Smithsonian Institution, which was founded in 1846, and which today consists of 14 separate museums located in downtown Washington, D.C. The American History Museum building was built

fig.1 : The National Museum of American History, part of the Smithsonian Institution

in 1964. Its collections include more than 3 million artifacts, including significant scientific, technological and industrial artifacts. We have about 350,000 square feet of exhibit space.

Part 1: Collecting Industrial Artifacts and their Stories

Back now to the main point, artifacts and their stories. Let's start with collecting artifacts and their stories. What should an industrial history museum collect - especially one that defines itself as broadly as I've indicated it should? What objects would a museum collect to document industrial work, management, economics, consumption, politics, industrial society? One answer would be: almost anything. Almost every aspect of the material world around us can help us tell the history of industrial society.

But a museum must take very little of what is available, very little of what we are offered. No museum has the room to store it, for one thing. And, it's expensive to acquire things. Each artifact you accept has significant lifetime costs associated with it. You have to move it, figure out what it is, do the paperwork to make it officially yours, and catalog, and store it.

Every time you say yes to an offer, even a donation, you are spending money. You have to perform a rough cost benefit analysis for each object you collect.
On one side of the balance sheet is the historical value of the artifact. On the other: the cost to acquire, understand, conserve, and store it.

But how to measure "value"? How do we decide what to take, what to go after? What's worth preserving? What's important? What's interesting? Why, and to whom? What might be useful for exhibition, now or sometime in the future? What artifacts, though perhaps not useful for exhibition, might prove useful to future historians? What artifacts... how do we balance the sometimes conflicting demands of exhibition and preservation, of increasing public understanding of the past, and preserving it for researchers? Since we can't save everything, what aspects of the past should we focus on?

When we collect something we are making a statement that it should be preserved, that it tells a story worth remembering. We're saying that it's valuable piece of evidence. More concretely, we're expressing our belief that researchers will study it, that curators will find it of use in exhibitions: that someone will learn something from it. There's no point in collecting something if it will simply sit in storage until it rusts away.

But there are many meanings of "valuable", many ways of judging an artifact's importance. We might judge it in strictly technological terms. We could do that by selecting devices that show great skill in design or manufacture, or that seemed important to engineers or inventors in their day, or by looking for the machines that seem to be precursors of what's important today. We might consider the amount of money a machine made for its inventor or manufacturer. We might focus on famous inventions.

Many donors to museums do think this way. An art museum collects only the "best" art, why, many people think, shouldn't an industrial museum collect only the

"best" technology? But "best" or even "most important", I think, are the wrong words; sometimes we collect an artifact because it's typical, that is because it's very common, or amusing, or peculiar; or even because it represents a path not taken, because it's not important to technological advance.

We collect it because it tells a good story about the industrial past, and, in our exhibits, it allows us to tell a good story to our visitors. To do this, we must look for artifacts with impact on the society or culture of their day, or ones that reflect key social or cultural changes, that is, we must move beyond technology to industry more generally. We could look for inventions that had the largest impact on daily life, or those that changed the nature of work, or the ways that people interacted with one another. Here, we're getting into historians' judgments, not engineers', or the market's.

We are considering technology in its broader context, returning to its original environment. People invented, designed, made and used the technology; it never existed on its own.

But, historical significance can mean different things. It is the invention that started a new industry? The machine that set a new style of work? A typical machine, one used in many factories, or a special machine that highlights a key aspect of society or technical change. Historical significance can be as hard to pin down as technological importance?

In recent years historians have suggested that three key issues are essential to understanding modern industrial history. Issues of work are foremost, with the "new labor history" focusing on life on the factory floor and workers as members of industrial society. Management and control of the workforce has been another line of study, with much attention to the rise of scientific management, deskilling of the workforce, and the redesign of machinery to enforce managerial demands. Finally, the relationship of the factory floor with the rest of the company, especially with sales, has been a key new context in understanding technology.

The history of workers and work is one of our main interests. We can't collect skills, or long hours, or heat and smoke and dust; instead, we must find artifacts that reflect those stories. Tools can help us tell this story. An individual tool tells us something about the skill of its user; a group of tools --a tool chest--tells us more.

fig.2 : Tool chest used by Walter Danow at R. Hoe and Co., early 20th century

Unlike tool collectors, who often want tools made by a particular company, or of a particular type, we're more interested in the collections of tools used by one individual. A tool chest complete with its full compliment of tools tells much about workers and workplaces. One with the personal story of the worker who used it tells us even more.

That's why we jumped at the offer of a tool chest that was owned by a fellow named Walter Danow, a machinist at the printing press manufacturer R. Hoe & Company, In New York City. fig.2 Danow was not an important man, he was a typical worker at the factory. He started at Hoe & Company in 1904, after a five-year apprenticeship that included a company-run night school where Danow studied English, arithmetic, and mechanical drawing. He worked there until the mid-1920s when he left during a major strike. Among the artifacts we acquired with the tool

chest from Danow's daughter were Danow's apprenticeship papers, photographs of the shop. The historian of the machine shop can read in these artifacts not just the story of skills, but also of management.

Danow's chest contains several check tags that help tell the story of 20th-century factory managers imposition of greater control on production by providing workers with company tools - and also with workplace relations: a lock on Danow's tool chest kept other workers from borrowing his tools. Walter Danow's tool chest reflects his work, his skills, and the changes in the life of a skilled machinist in the early years of the 20th-century. Over the years we've collected many tool chests, with their tools and stories, representing many kinds of work.

Artifacts representing individual workers, like Danow's tool chest, help tell the story of work; to capture the bigger picture of management requires more context. Management's ideas can be collected in--of course--paper. We have a fine collection of the "work incentive" posters that managers have liked to post in factories since at least the 1920s, and we're purchasing more. fig.3 We sometimes take contemporary posters, right off the bulletin boards at the companies that we visit. But it's harder to capture the actual work of management, and the interactions of managements and workers. We had a good opportunity to do just that, though, a few years ago, when a history-minded Lukens steel mill engineer called to see if the Smithsonian would like an entire steel mill. We mentioned that size is a critical factor in making our decision about acquiring objects for the collection, but that we would consider the offer if she would send some information.

fig.3 : "Ask your manager," a typical work incentive poster, 1940s

As we researched her offer of a mill designed for working stainless steel, we discovered a fascinating story of an immigrant inventor, a company willing to stake its future on unproven technology, consumer demand pulling technological change, and the critical role of skilled workers in perfecting new inventions. The mill itself was too big and heavy to realistically consider - but we had to consider something because the story was too good to pass up.

Here's the story. In 1939 Tadeusz Sendzimir, a Polish émigré, came to the United States to work at Armco Steel in Middletown, Ohio. There, Sendzimir invented a new kind of rolling mill, called the Z mill, which used a clustered nest of rolls to allow a very close control of the rolling process.

Tecumseh Fitch, an entrepreneur who had seen the Z mill Armco had sold in operation, was convinced that the new technology was perfect for producing the increasingly popular, and difficult to roll, stainless steel. In 1945, he raised the capital to open his own finishing mill. His new company, Washington Steel, was located just outside Pittsburgh, the heart of steel country, where the company could benefit from an experienced workforce. That was a key factor in its success, for a Z mill is very difficult to operate and depends completely on the skill of the maintenance staff and the operators.

What should we collect to display the interlinked stories of immigrant inventor, consumer demand for a new product, post-war start up, and skilled workforce? The mill stand itself was a "black box" that weighs 48,000 pounds. It was simply too big of things for us to collect. Instead, we collected the operator's pulpit,

a much smaller and lighter device that captured the essence of workers' skill. We also videotaped the mill in operation to record the technology and the skills of running it, interviewed the original rolling crew to show the contribution of worker skill to new inventions, and collected photographs and trade literature from the company to tell the story of entrepreneurship. We also collected pictures of Washington Steel company baseball team.

Factory machines reflect the relationships of managers and workers, but the ways in which technologies reflect the interests of the people who design, control and use them is at once the easiest and the most difficult to document in artifacts. Easiest, because it suggests that any object can tell us about its social context. But hardest, because, as historians have found, actually deducing the social aspects of artifacts from the artifact itself is very difficult. The artifact might suggest the story, but only through documentation can the story be proven.

Sometimes, if we're there when the decisions are made, we can capture the interactions of management and workers shaping machinery in a way that we could never do in documenting the past. One of the stories we captured on video at Washington Steel was a 1990s approach to engineering in action. Rather than buying a turn-key unit, the company engineer's teamed up with suppliers to cobble together a new control panel for their new Sendzimir mill. After extensive conversations and many sets of drawings had been completed, a plywood and cardboard mock up was built so that the mill operators could participate in critiquing the layout of the controls. We acquired the mockup for the collections, not for its technology, but rather for the way that it represents a solving of the technological problems in a new way, one that draws on the combined skills of engineers and workers.

Three interlinked revolutions characterize the last twenty years of manufacturing in the United States, the so-called, "Japanese" style management, robotics, and "quality". We've tried to document all of them. Faced with considerable foreign competition in the 1970s, American manufacturers realized that major organizational changes were needed to stay competitive. New management systems that emphasized quality control and flexible production were one of the reasons for Japan's success, and American firms began to copy them.

At the Smithsonian we wanted to document this critical moment in American industrial history. To do this, we decided to document the story of NUMMI, a joint Toyota-General Motors venture organized in 1982, the best-known American user of Japanese management techniques.

Originally, one of the worst factories in the GM system, the NUMMI factory became a benchmark for American manufacturers. To tell the NUMMI story, we collected artifacts representing the Japanese style management and the ways Americans adapted it and changed it.

The heart of the new management system was "just-in-time production". Just-in-time production calls for all parts to be made or delivered precisely when needed for use in final assembly. Large expensive stockpiles are eliminated and the lack of inventory points up the bottleneck areas in production, forces manufactures and suppliers to work more closely, demands better quality, and lets manufacturers be

more responsive to market changes. The kanban card, a simple inventory card used to indicate the need for more parts, is the key to this "pull system" of production. We got one for our collections, a small piece of paper that tells the story of a revolution in manufacturing management. The Japanese system's commitment to quality is reflected in major changes that the way assembly line speed is determined.

The Andon board, a large display board with a number corresponding to each worker, shows the status of production. fig.4 A worker can pull a cord to stop the line when he spots a problem - something previously unheard of in the American system. When he does, a light on the Andon board lights up.

In the American system, the production is always expected to be in the green that is problems don't become apparent. The Japanese style is to have the line flickering between yellow and red. If the assembly line never stops, the argument goes, then there must be excess capacity in the system. We collected an Andon board, and also several of the cords that workers used to pull to stop the line. New worker-management relationships are another key aspect of the Japanese system.

At NUMMI, the official relationship was detailed in the landmark union agreement, and we collected a copy. The new relationship showed up in the factory floor too, for example in worker uniforms, identical for production and management. We acquired typical examples. We also got a worker's hat with all of the pins he had collected, each celebrating a milestone in the factory's history, and another. worker's ID badge. fig.5 We've long collected labor history at the Museum, especially labor union materials. These pins told of a new chapter in that history.

As with any production system, artifacts alone are not enough to document the changing nature of management and work. To capture the nature of work and changing attitudes toward work, we undertook a video history of NUMMI and produced a film to put the artifacts in context.

One of the more unusual collecting adventures in recent years is the story of the El Monte sweatshop. About five years ago, American newspapers reported a particularly bad example of a sweatshop - immigrants forced to labor long hours in bad conditions in a clothing factory – in El Monte, California.

We visited the factory and collected examples of the machines used there, the clothing made, and even items from the company store. We did extensive video interviews with the workers, most of them illegal Thai immigrants. And we put it all on exhibit in one of the most powerful exhibits we've done in recent years, on sweatshops in American history. fig.6

The third category of interest mentioned above--the connections of production with sales and marketing, and with consumers, is also often best documented with paper artifacts. The Museum has always collected trade literature--catalogs and circular letters issued to buyers.

There are a superb source of pictures and descriptions of machineries. We've also discovered they tell us something about the buyers and users of machines. We've collected advertising, too, to tell how consumers fit into the picture. We've documented particular advertising campaigns, and collected the archives of some of America's largest advertising agencies.

fig.4 : Andon board from NUMMI automobile factory, 1980s

fig.5 : "Ask your manager," a typical work incentive poster, 1940s
: ID badge from NUMMI automobile factory, 1980s

English Text

Part 2: Using Industrial Artifacts and their Stories for Research

Part two of the talk considers how we use artifacts for research. So, we've collected good artifacts, carefully selecting them, and we've done our best to collect the stories that go along with them, collecting documents, producing video tapes, interviewing inventors, workers, and managers, thinking deeply about what aspects of industrial history these artifacts and their stories might tell.

Eventually, these artifacts might end up in exhibitions - that will be the third part of my talk - but most of them will not, and museums are more than just collections and exhibitions. Museums are places where research takes place. Because of their collections of artifacts, and the stories that go with them, industrial museums can provide a profound research of a sort that cannot be done in any other institutions.

Artifacts play a central role in technology. Technology, broadly defined, includes tools and machines of all sorts, the use of those artifacts, and the skills and knowledge of design, make and use them. Material culture, that is tools, machines, and other useful artifacts, thus must be central to an understanding of technology and its place in culture.

Artifacts, writes historian George Basalla, are "both the means and the ends of technology.". Technological artifacts, like other material culture, are cultural artifacts, and while they may be, because of their practical uses, more strongly shaped by natural law and economics than some artifacts, much of what makes them interesting is shaped by culture.

Technologies, historian Eric Schatzberg "is the reifications of human purposes." Looking closely at artifacts can tell us things that no other sources can. Industrial artifacts can tell us about industrial society: work, hierarchy, economics, change.

Historians interested in industrial work have undertaken some of the most interesting

fig.6: Section of exhibit on sweatshops in American history, on display late 1998

analysis material culture in technology, examining tools and machines closely for wear marks and other indications of use to reconstruct the lives and skills of the men and women who operated them. Historians have investigated wear patterns on the floor at textile mills to determine the ways that looms were used. They have examined the design of machines to gain a better understanding of managerial oversight and labor relations. They have examined machines to understand the choices made by their designers, and to understand technological skills and knowledge, a key theme in the history of technology.

Some of the big questions in the history of American Technology have been addressed by the use of material culture evidence. Close examination of muskets made by Eli Whitney have debunked the widely held belief that he was producing muskets using interchangeable parts, as he claimed. William Kelly's claim, accepted for more than 150 years, that he had invented steel converter before Bessemer was proved false by close examination of his surviving apparatus.

In a few cases, historical artifacts or copies of them have been operated to determine something of the knowledge and skills of their creators and users. Replicating historical artifacts and using them is a longstanding tradition in archeology, where it has fostered a better understanding of everything from flint-knapping to mastodon hunting. Applied to more recent technologies, it helped explain the changes made in the 1831 locomotive named John Bull to adapt it from British to American railroading style. A recreation of the Wright Brothers' flyer 1903 airplane highlighted the skills that its designers brought from their bicycle business.

Historians have run historic lathes, looms and other machines to determine levels of skill and attentiveness they demanded of the men and women who operated them, making more complex notions of "deskilling" based on other kinds of evidence. Many of the significant theoretical issues in technology studies have a material culture aspect. Issues of politics, style, and the social construction of technology have placed artifacts on center stage. Recent work in technology and gender, especially what's been called, the "consumption junction" of design, marketing and use, has suggested some of the way that technology has shaped people's lives, and the people's lives shaped technology.

Langdon Winner's seminal article, "Do Artifacts Have Politics?" raised a central question for the material culture of technology. To what extent, he asked, are political choices embedded in the design of technological artifacts? His example of the way that the bridges on the Long Island Expressway were designed to keep busses from Long Island parks have led to many studies of the political design of landscapes and architecture, especially vernacular and factory architecture.

More generally, his question has been applied to studies of the ways politics shape artifacts, and the ways in which those artifacts in turn intentionally or unintentionally shape society. Others have looked at the ways in which machines modulate, influence, and intermediate the interactions of groups. Recent work on the automobile, for example, has focused on the ways the design of that artifact reflects the politics or gender. Railroads, other scholars have shown, reflect the politics of race.

Technological style is another issue that has attracted considerable attention.

Physical laws and economics alone, students of technological style argue, do not determine the shape of technological artifacts. Rather, they argue, these artifacts reflect styles in the same way that decorative arts do. Students of locomotive design, for example, have noted distinct differences in national styles, based in part on resource economics, in part on different styles engineering education, in part on use and historical precedent.
Eric Schatzberg's analysis of the shift from wood to metal airplanes makes material choice a key element of technological style.

In recent years, the "social construction of technology" approach, first outlined by Trevor Pinch and Wiebe Bijker, has been central to the historiography of technology. Followers of this approach have focused on, what they call, the "interpretive flexibility" of technological artifacts. Artifact design, they argue, is "contingent," not determined, and thus interest groups of all type shape technological artifacts. Technological artifacts, according to this school of thought, mean different things to different groups; they have no intrinsic meaning, though, over time, as society comes to a consensus on a technology, interpretive flexibility decreases, and the artifact - its meaning and its use - become more stable.

Ruth Schwartz Cowan has developed this approach further, using the notion of the "consumption junction." The consumption junction, she says, is the point in a technological network where a technological artifact, its producer and its consumer all interact. Both designer and consumer are enmeshed in a web of social relations that shape their interactions.

Cowan puts the consumer, and his or her choices at the center, and urges that the meaning and value of technological artifacts be understood as issues of use, not merely as design or production.

Scholars have followed Cowan's arguments in studies of refrigerators, glassware, and other domestic technologies. Many of these studies have emphasized issues of gender and technology, discovering new complexities in the interactions of designers, marketers and consumers.

Cowan's work, and those who followed her, have helped to bring the study of technological artifacts into the mainstream of twentieth-century historiography. The examination of artifacts standing at the nexus of gender, race, and class suggests an interaction between historians of technology and other historians interested in social and cultural history more generally.

Part 3: Displaying Industrial Artifacts and their Stories

The third part of my talk is artifacts and stories on display.
Scholars use artifacts to learn new things about industrial history. Visitors to the industrial museum, too, should learn new things. A central role for the modern industrial history museum is to help its visitors make sense of industrial society, to help them understand the worlds of work and consumption and the economic and business structures bind them together.
To do this, the museum must address the whole range of issues that shape modern

society. Technology is essential, of course, but no more so than work, community, business and management, government, distribution and consumption. An industrial history museum must tell many stories.

Our exhibits, then, must be more than just machines on display. We should reunite the machines and their stories. We should put the machines back into context, and display with it the people, the environment, even the economic setting that it once was part of. Artifacts, I believe, do not speak for themselves; they need to be situated in a context of environmental settings, the places and things and images and words that once surrounded them, either at one point in their history, or representing change through time. The physical environment is the easiest part of this complex display problem.

At the museum of American History, we have occasionally collected entire buildings - workshops, rooms of factories - along with our machines. For example, we reconstructed an entire machine shop from 1850 inside the museum.

We've collected entire examples of worker's housing. More often, we have used photographs to recreate the settings within which our machines once lived, sometimes with mannequins to remind our visitors that the machines did not run themselves. Sometimes, we've simply put mannequins with machines, to show the human side of the story.

From factory settings to video and virtual reality, industrial history museums have to use all of the presentation techniques that they have or they can imagine, or that they can draw from television, from theme parks, from entertainment settings, to bring their machines to life. Machines, by themselves, seem to be the center of the story - they are big, they are complex, they always seem important.

We've got to put them back in their place. If artifacts represent the challenge of being perhaps too prominent, too overwhelming, the task of showing the hidden structures of industrial society represents the opposite problem. There are few artifacts that represent the substructure of industrial society: economics, politics, race and ethnicity, class structure, and so on. Undeniably important for us to understanding the context of industrialization and de-industrialization, these concepts remain a challenge to museums.

Business stories are harder to tell in exhibits, but we have tried to tell them with documents, drawings, and paper. On the wall next to our display of an this 1840s Blanchard lathe we reproduced the management rules that controlled the men who used it, enlarged to about the same size as the machine. fig.7 A pin-making machine from 1840 was surrounded by documents about the creation of the business and the government policies that shaped it. We have drawn maps of capital and product flow, as in our recent exhibit on sweatshops and the global trade in clothing. fig.8

Both machines and social structures hide perhaps the most difficult concept for museums : contingency. How can an exhibit show that it might have been otherwise? How can it show the choices that shaped artifacts, structures, and society , to show that history was not pre-ordained, but rather the result of human choices among alternatives? These are essential historical questions, ones that are difficult to portray in a museum whose collections after all, rarely represent the path not taken.

How can a museum show the contingency on which such substantial artifacts rest? Can we show contingencies, and the reasons - political, social, economic as well as technical - that choices were made?

Conclusion

Today's industrial history museum, then, has a complex task. It's not enough to collect machines, or even to collect machines and display them. The modern industrial history museum must collect machines and other artifacts, and the stories that give these artifacts meaning, it must do research to understand the meanings of the industrial artifacts in its collections; and it must present them to the public in a way that brings their history to life.

Let me conclude by turning to the one thing in the work of the museums that is more important than, and more complex than how the artifacts work. That is the visitor. Perhaps the most important challenge facing the museum is this: how to make all of these undeniably important, but - let's admit, - not always very exciting -

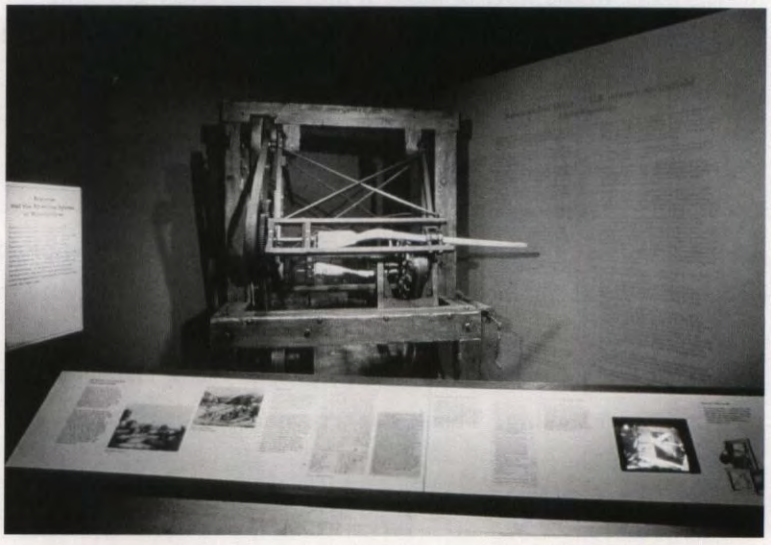

fig.7 : Blanchard lathe on display with management rules and video

fig.8 : 1840 pin-making machine, on exhibit with video

stories fun, meaningful, and stimulating to the visitor. Museums may be educational institutions, but they are voluntary education, and while education is one reason that visitors attend museums, entertainment is high on their list, too. Museums must keep the visitors happy and visitors must feel that they are getting their money's worth.

Not too long ago, museum professionals tended to think of visitors as receivers of knowledge, as empty vehicles to be filled with information by a visit to the exhibit. But we are more likely to succeed if we welcome visitors as active participants in the work of interpretation. Visitors' personal experiences - the memories they bring with them to the exhibition, the family stories that they have told, their lives as workers and consumers and community members. These all shape their response to museum exhibitions. And, it is as much of the experience as anything they might see on display. The museum is a place where memories interact with new experiences. The interplay of history, and contemporary experience gives the museum its special power.

Industrial history has many narratives that connect with visitors, from the drama of machines to the diverse lives of workers to the daily life in the surrounding communities to the business decisions and economic structures of industrial management to the story of modern industrial society generally. An industrial history museum can focus on any of these, or it can try to cover them all; but to be effective, the museum must make a connection between its visitors and its historical artifacts and stories. We must use artifacts and stories to deliver both a memorable experience and an enhanced understanding of our industrial past. To do less would be to abandon a segment of our history that has shaped our modern world.

To do it well is to provide a broad new audience with a new, profound, and essential understanding of the modern world and how it came to be. And that, as I said at the beginning of this talk, is vitally important work.

Again, I commend you for your bold vision and I wish you the best in this important undertaking. Thank you very much.

開催概要

国立科学博物館では、平成9年度から「産業技術史資料の評価・保存・公開等に関する調査研究」を実施してきました。この最終年度に当たり、本プロジェクトの企画推進委員会では、これまでのまとめを行うとともに、これまでの成果を基盤にした「産業技術の歴史を未来に役立てる情報拠点」としての『産業技術史資料情報ナショナルセンター』構想の中間報告をまとめました。

この構想では、産業技術の歴史についての「新たな学術分野の形成」、青少年に産業技術の夢と可能性を教育できるような「情報公開」、後世に伝えるべき資料の収集を可能にする「資料情報の管理」などを行うとともに、全国の産業技術系博物館とのネットワーク化や「拠点博物館」などと連携することが提案されています。

20世紀の産業遺産に込められた我が国の独創性を再認識し、次世代に継承することは、現在、極めて重要な課題となっています。このため、海外の「産業技術の歴史」博物館の調査研究や展示公開活動の紹介を行い、新たな学術分野としての「技術革新学」の考え方、産業技術系博物館のネットワークのあり方など、「ナショナルセンター」で行われるべき活動を検討するシンポジウムを開催します。

[会期] 平成14年2月7日(木) 10:00~18:00
[会場] 国際連合大学 ウ・タント国際会議場
[主催] 独立行政法人国立科学博物館「産業技術史資料の評価・保存・公開等に関する調査研究」企画推進委員会
[後援] 独立行政法人産業技術総合研究所
[協力] 社団法人研究産業協会、全国科学博物館協議会
[言語] 英語/日本語(同時通訳付)

Date: February 7, 2002,
Venue: U Tant International Conference Hall, 3F, UNU Center
Sponsored by: National Science Museum, Tokyo
In Cooperation with: Japan Research Industries Association, Japan Council of Science Museum

［プログラム］

司会：佐々木勝浩（国立科学博物館 理工学研究部長）

第1部｜産業文化のネットワーク化について

10:00————開会挨拶 佐々木正峰（国立科学博物館 館長）

10:15————基調講演「ミュンヘンにおける産業技術史研究の特徴」
ヘルムート・トリシュラー（ドイツ博物館 研究部門長、ミュンヘン科学技術史センター センター長）

11:00————基調報告「産業技術史資料情報ナショナルセンターの目的」
清水慶一（国立科学博物館理工学研究部室長）

11:30————基調講演「スミソニアンの新たな挑戦とその展望」
スティーブン・ルーバー（スミソニアン協会 アメリカンヒストリー 技術史部門長）

12:15————昼食

第2部｜産業技術史資料情報ナショナルセンターにおける学術研究について

13:15————基調報告「拠点博物館構想に期待するもの」
宮田清蔵（東京農工大学 学長）

13:45————特別講演「ナショナルセンターで取り組む技術革新研究」
吉川弘之（国立科学博物館産業技術史調査会会長、産業技術総合研究所理事長）

14:30————コーヒーブレイク

15:00————パネルディスカッション
「ナショナルセンターに求められる社会的役割について」
コーディネーター：
鈴木基之（「産業技術史資料の評価・保存・公開等に関する調査研究」企画推進委員会委員長 国際連合大学副学長）
パネリスト：
スティーブン・ルーバー（スミソニアン協会 アメリカンヒストリー 技術史部門長）
ヘルムート・トリシュラー（ドイツ博物館 研究部門長、ミュンヘン科学技術史センター センター長）
宮田清蔵（東京農工大学 学長）
小泉成史（フリージャーナリスト、元読売新聞記者）

17:00————交流懇談会

［Program］

10:00————Opening Remarks
Masamine Sasaki (Director, The National Science Museum)

10:15————Keynote Remarks "Munich Way of Research in the History of Technology"
Helmuth Trischler (Deutsches Museum, Director of Research of the Deutsches Museum, Munich/Head of the Munich Center for the History of Science and Technology)

11:00————Keynote Report "The Aim of the National Center for History of Industrial Technology"
Keiichi Shimizu (Chief Curator, The National Science Museum)

11:30————Keynote Remarks "Smithsonian's New Challenge and Its Prospect"
Steven Lubar (Chair, Division of the History of Technology, National Museum of American History, Smithsonian Institution)

12:15————Lunch

13:15————Keynote Report "What is Expected from the Conception of Affiliate Museums"
Seizo Miyata (President, Tokyo University of Agriculture and Technology)

13:45————Special Remarks
"Technological Innovation to Study at the National Center"
Hiroyuki Yoshikawa (Board of Trustees, National Institute of Advanced Industrial Science and Technology)

14:30————Coffee Break

15:00————Panel Discussion
"The Social Role of the National Center"
Coordinator: Motoyuki Suzuki (Vice Rector, The United Nations University)
Panelist: Steven Lubar (Smithsonian National Museum of American History)
Helmuth Trischler (Deutsches Museum)
Seizo Miyata (President, Tokyo University of Agriculture and Technology)
Seishi Koizumi (Journalist),

17:00————Reception

「産業技術史資料の評価・保存・公開等に関する調査研究」企画推進委員会委員名簿

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