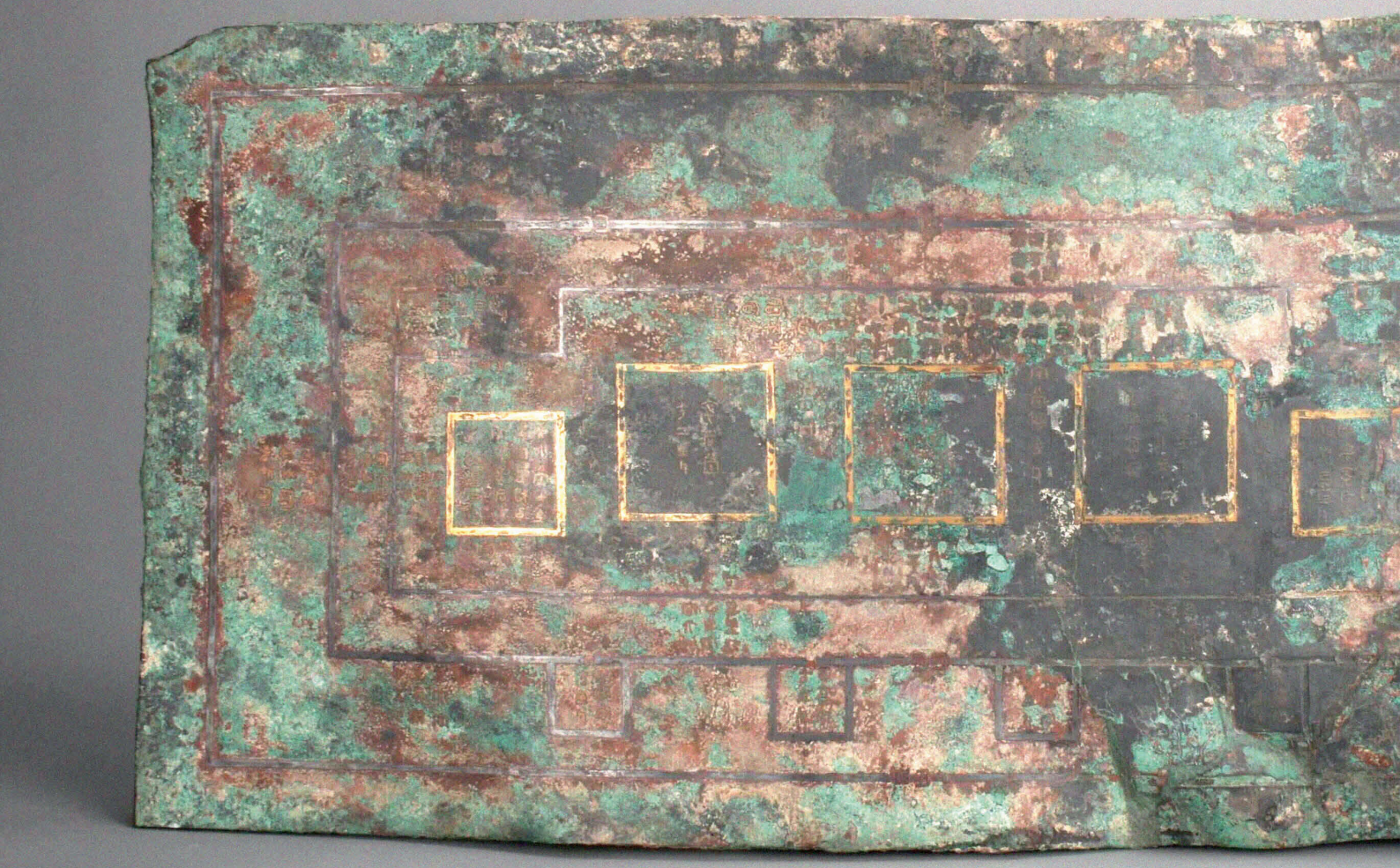


The Master Plans of the Mandarins

The ancient Chinese invented not only fireworks, porcelain and the wheelbarrow, but the precursor of post-its as well – those self-sticking, yellow pieces of paper used for writing down all sorts of notes. These are the kinds of sources that **Dagmar Schäfer** and her team at the **Max Planck Institute for the History of Science** in Berlin examine to learn more about planning histories and their impact on society, thereby also challenging the paradigms of their own discipline.

Photo: Hebei Provincial Museum at Shijiazhuang, Hebei Province, China

Weighty artifact: This approximately 2,300-year-old bronze plate, roughly 100 by 50 centimeters in size, reveals the significance of planning processes in ancient China – the representational value of the floor plan portraying the tomb of the king of Zhongshan is essentially equivalent to that of the mausoleum itself. The symmetrical contours of the building are depicted with gold and silver inlays, while engraved text fragments label the objects, state measurements and distances and refer to an official directive. As a result, this document shows that a highly developed administrative apparatus was already in place.

TEXT **BIRGIT FENZEL**

Writing things down on countless scraps of paper is not necessarily a sign of a chaotic state. In fact, it can, now and again, mean the exact opposite. This is the case with the yellow notes affixed to sketches, artifacts and memoranda on display at the Palace Museum in Beijing. They have become the object of study of one of the projects headed by science historian Dagmar Schäfer from the Max Planck Institute for the History of Science in Berlin, and their importance goes beyond bearing testimony to the administrative zeal of imperial court officials in bygone times. Together with her department "Artefacts, Action and Knowledge" at the Max Planck Institute for the History of Science, Schäfer uses these kinds of sources to reconstruct and analyze planning histories pertaining to a wide range of projects, eras and cultures. "Our goal is to find out how knowledge is generated by actions and preserved in artifacts," she explains.

Planning is defined as the process of thinking about future actions in order to prepare the decisions that must be made for advancing these actions. "The goal is always to make things work," is Schäfer's "translation" of the intention that lies behind any plan. In this regard, the Chinese precursors of modern post-it notes not only provide thorough insight into the project management methods practiced in a particular time period and culture, but also shed light on the role of management processes and organizational structures in the development of technology and knowledge in general. "For us, each individual project establishes a precedent that we study to reveal how popular certain strategies were, and how people handled them," says Schäfer in explanation of her approach, which always starts from the premise that science is also an ongoing and collective process.

"Most knowledge was not created single-handedly by some lone heroes, but is instead the result of a complex process and collective effort," says Schäfer, who discovered that the collection of artifacts and notes exhibited in the Palace Museum not only constitutes an unusually continuous documentation of the countless ways in which humans planned their actions, but also reveals alternative approaches to creating knowledge in all areas of life. "Planning was part of virtually every type of activity: from baking cakes to studying the night sky to performing experimental lab work." The remarkably broad spectrum of instructions and directions issued in ancient China also grant her insight into what people at that time perceived to be their ideal universal order and methodology. "The concept of planning consisted in understanding the importance of small details for the overall big picture," Schäfer says, describing the recurring approach to many planning histories. >

Due to its use as a decorative flower, food source and medicinal ingredient, lotus was cultivated extensively. The lotus money generated with this product is listed as a separate currency in the financial records archived in the administrative files.

One of the sources she mentions is the renowned philosopher Zhu Xi (1130–1200), who preached to his contemporaries that the key to successfully executing big plans was to bring order into the small, everyday things. "The way he saw it, the correct placement of the ancestral shrine in each individual household was the first step in the process of organizing society and state," Schäfer says, as she explains the beliefs of the famous teacher who served as adviser to the emperor during the Song dynasty, which lasted from 960 to 1279.

A COMPLEX WEB

According to the science historian, the planning histories also highlight the significant impact that the historical process of negotiating between the ideals and realities of political, social and material order had on the development of cultures of knowledge. "That's because the clash with reality also meant that the question of whether knowledge and methodologies could be generalized beyond the scope of specialist areas was put to the test time and again," Dagmar Schäfer determined. The popularity trend of the yellow notes ran parallel to the – at times futile – attempts of court officials to gather technical and artisanal expertise and production at the imperial court. She regards these notes as being elements of an increasingly complex web of codifications and models introduced by the Qing dynasty in response to problems that arose in the management of certain areas of production when putting the grand master plans of the Mandarins into practice.

After all, just like the Song emperors, the Qing emperors, who reigned from 1644 to 1912, also regarded the skilled crafts and trades to be the key to economic success, giving them top priority by declaring them a matter of the court. The emperors even held their officials personally accountable for the growth and prosperity of silk production, porcelain manufacturing and other money-making trades. "One of the notable elements that set the Manchurian Qing dynasty apart was the fact that it institutionalized a body of experts at the imperial court," Schäfer explains. The task of these technocrats, many of whom had little or no formal education, she says, was to oversee and assist in the technology-, material- and organization-related steps that led from an idea to actual production and application. This systematic integration of workshops into the state's bureaucracy apparatus was fueled by the desire to be a part of it all: The Manchurian rulers fought for access to and control over areas of knowledge characterized by Chinese tradition and expertise.

Yet the craftsmen were not necessarily willing to make themselves or their trade secrets – many of which had been in their families for generations – fully available to the emperor. One example that Schäfer came across in her research consists of countless written records by imperial court officials who countered the state's official account by documenting how difficult it was for the court to entice the best craftsmen from cities such as Hangzhou, Nanjing and Suzhou to leave the rich South and settle in the northern capital of Beijing. "Attempts at persuading jade carvers to relocate to the court failed on a regular basis," she reports. The same applied to silk spinners and weavers: Due to the arid climate and lacking proximity to their traditional markets and production areas, the court robes and tribute silks they produced in Beijing would have been of an inferior quality, which is why they steadfastly refused to move to the imperial court. "Experts who were resettled against their will tried every trick in the book to be granted early release from service." The imperial workshops at court gradually turned into "design studios," while the actual production activities remained in Jiangnan, Schäfer explains. Consequently,

Photo: Harvard University

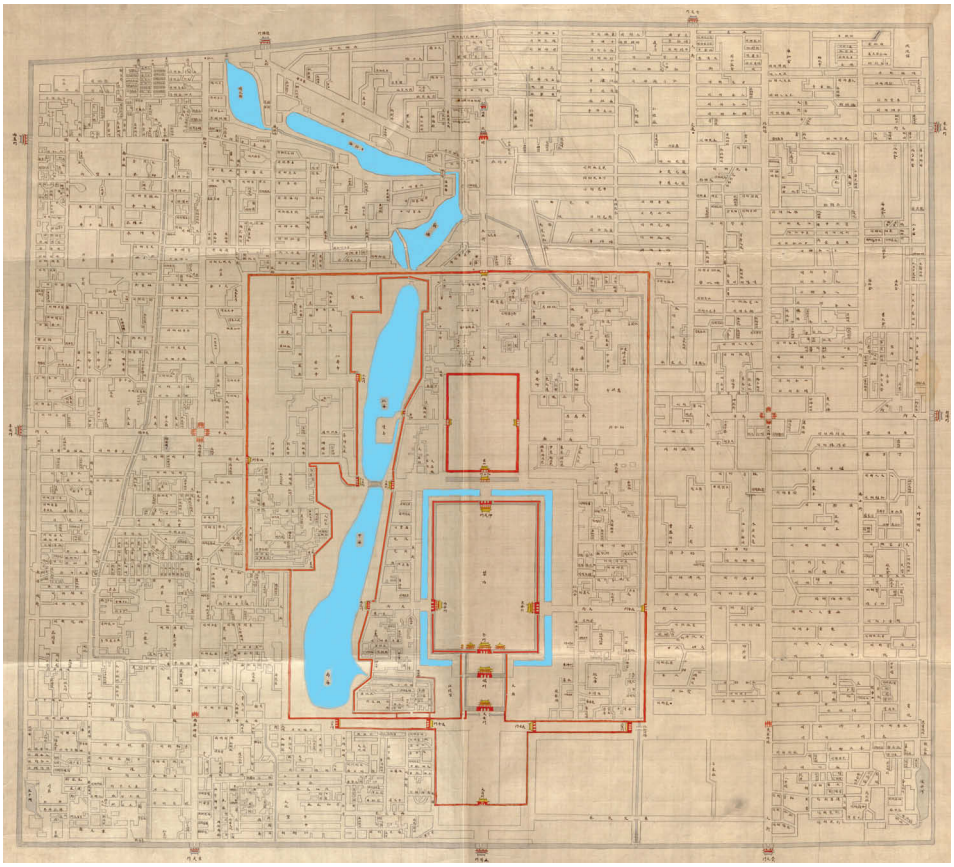
» Most knowledge was not created single-handedly by some lone heroes.

the researcher learned by comparing order specifications and surviving artifacts, even the meticulously elaborated production plans could not prevent a certain amount of frictional loss – a problem that is all too prevalent in our modern day and age as well, especially in the top-down approach that is commonly applied in project structure planning. Even back in ancient China, the devil – as is so often the case – was in the details.

LUCRATIVE LOTUS MANAGEMENT

Another example illustrating the utmost precision with which the Qing dynasty organized its administrative structure was the cultivation of lotus, which is the object of study of Schäfer's colleague Martina Siebert, who summarizes her project in a charming manner: "This plant was part of the imperial household, which was essentially a kind of palace machine that 'produced' money, matter and identity for the Manchurian imperial court." Between the 17th and 19th centuries, the cultivation of this aquatic plant, which is highly prevalent across China, was developed into a complex system. "The regulations sometimes also stipulated the minutest steps," says Siebert. The court even issued instructions regarding the yellow hue and textile quality of the pieces of cloth in which the roots were to be wrapped and handed over to the palace kitchen. (The roots came from a shallow, 47-hectare body of water in the West Park, where lotus plants were cultivated on a grand scale right next to the Forbidden City in Beijing.) Or rules that dictated how to turn worn-out boat punt poles into the scythes that were used to cut off withered lotus leaves or trim the vegetation growing on the rooftops of the buildings.

And then there were other tasks that the court let the gardening department organize and carry out on its own. The only requirement was for the department to disclose all financial expenditures to the central office of the imperial household in the form of monthly or annual reports. This autonomy was partly based on the income generated by leasing a total of 212 hectares of water gardens suitable for growing lotus in the "Inner City" and northwest and south of Beijing, as well as by selling excess lotus cultivated in the West Park. By examining the meticu-



The meticulous documentation of even the smallest steps of lotus management also comprised a precise definition of the cultivation areas (shown here in blue) in the Imperial City (red outline) and beyond the palace grounds.

Photo: Library of Congress, Geography and Map Division

» The key to successfully executing big plans is to bring order into the small, everyday things.

lously archived financial records, Siebert found out how lucrative lotus management really was. In 1814 the gardening department generated a revenue of around 57 kilograms of silver, which was listed in the administrative files and regulations as "lotus money" and virtually treated as a currency in its own right.

PROJECT PLANNERS THOUGHT OUTSIDE THE BOX

Yet lotus had more than just a monetary value, Martina Siebert recounts. The plant was an ingredient used in cooking and medicine, a decorative garden flower and an agricultural product – and required a whole lot of work. "Due to the fact that the flowering lotus was an important visual element of the West Park's landscape and surely served as the inspiration for the occasional poem, vast amounts of withered leaves had to be cut off and carted away in the fall. In order to harvest the lotus roots, helpers had to wade through the muddy, shallow lakes, loosening the soil through treading and pulling out the horizontally growing root chains." Martina Siebert summarizes this organizational effort by pointing out that all of these activities needed to be coordinated with the schedule of court receptions of foreign delegates, ritual ceremonies and imperial festivities.

Planning histories such as these provide the Berlin-based science historians insight into how and when knowledge was systematized, what was put down in writing, what was considered expertise, and which areas and processes were taken for granted or deliberately ignored. The researchers also discovered that new knowledge was continuously gained that was in fact not restricted to the respective project or product, but instead developed only after variations had been introduced into the ongoing process.

"Historically speaking, knowledge was often created as the result of people trying to solve specific problems," says Schäfer. Yet a large number of her examples indicate that, despite their strong focus on practical application, many Chinese project planners also thought outside the box. While researching an episode from the history of livestock farming, Schäfer came across a prime example of lateral planning. When the Song state lost political control of the north in the 10th century, this development entailed the loss of oxen and horses, which were traditionally bred in that very region and were vital for transport and military efforts. As a countermeasure, the imperial officials not only set up their own stud farms and breeding establishments, but also founded a separate area of expertise called "Methods for Compensating for Diseases and Disorders." In addition to rules regulating the care and treatment of humans and animals, this field encompassed ideas on water engineering, seed selection and moral education, as well as on the teaching of knowledge related to language, literature and philosophy.

"In China, the sciences were promoted very differently than in Europe," says Schäfer. For an extensive period of time, the Western world believed that the key to enlightenment was theoretical knowledge. "Yet if we look at Chinese planning histories, we see that practical implementation was highly influential in the development of scientific thinking and activity." This provides her with more than one piece of evidence showing that the boundaries between the history of science and the history of technology can't be as clearly drawn as some like to believe. "Our findings certainly add another dimension to the extensive debate about the role played by the history of technology," she says with conviction. But perhaps even more important for her is the realization that continuing to scrutinize the traditional paradigms of the history of science is the right thing to do. "I believe that my work in China shows where it's worth taking a closer look in all regions of the world." ◂

TO THE POINT

- **The plans forged by officials of the imperial court in China can still be retraced centuries later. Sketches, invoices, plans, notes – in short: all kinds of artifacts – help science historians reconstruct planning histories.**
- **Planning histories can shed light on the defining elements of individual cultures of knowledge: Which processes and structures shaped actions, and how did the ideals and realities of political, social and material order flow into these actions?**
- **The cultivation of lotus at the imperial court during the Qing dynasty provides two key insights: first, that this plant played a comprehensively regulated double role as a decorative flower during the blooming season and as a food source during the root harvest; and second, that – symbolically speaking – the cultivation of lotus was a small cog in the wheel of the palace machine, which was supervised by the imperial household and generated money, matter and identity.**