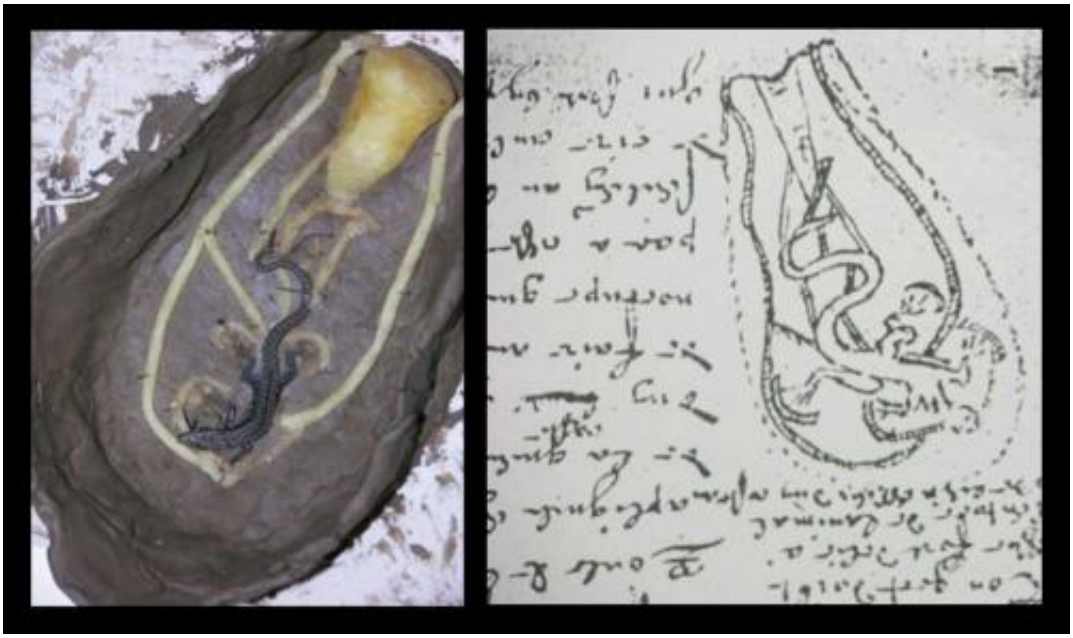
Mining the history of science

December 18 2013, by Bridget O'brian And Wilson Valentin



A reconstruction of a lizard lifecast.

History professor Pamela Smith started college thinking she would be a chemist. Then she took a course on the history and philosophy of science and "was just bowled over."

"I had never imagined that science had a history," said Smith, who helped create Columbia's new Center for Science and Society. On Dec. 2 she delivered the University Lecture, "Snakes, Lizards, and Manuscripts: Humanists in the Laboratory."

Next year Smith will teach a history course in a laboratory and work with students to translate the late 16th-century manuscript of a French-speaking craftsman—and even reconstruct some of its recipes. The manuscript includes techniques for everything from dye-making and counterfeit gem production to taxidermy and the then-popular method of "life-casting," or making metal sculptures from living plant and animal models. "I'm planning to produce a digital publication of this manuscript, in part by experimenting with crowd-sourcing the transcription and translation," said Smith, who devised a plan of study of "preindustrial materials science" at the Victoria and Albert Museum in London as a Mellon New Directions fellow. "The students—I hope drawn from the sciences as well as history—will do reconstruction and keep lab notes and we'll try to document everything on film. It will be an experiment in using the methods of history and of science in the lab."

Smith's current research focuses on attitudes toward nature during the scientific revolution—a period that, as she put it, "you could say began in the Middle Ages and stretched up to the beginning of public funding of science in World War II." She focuses on the origins of modern science in the 15th through 18th centuries, paying particular attention to craft knowledge.

Q. Is the history of science a new discipline, or has it always been part of the academy?

A. As an undergraduate writing a senior thesis in history of science, I began reading the Philosophical Transactions, one of the oldest scientific journals in Europe. First published in 1665 by members of the Royal Society in London, it was dedicated to the advancement of natural knowledge. It made fascinating reading because they were deeply interested in what would be considered pseudoscience today. It showed that natural science originated in areas such as alchemy and the study of

"monsters" as well as in literary philology, history and medical practice. The members of the early Royal Society tried to follow the ideas of [English statesman and scientist Sir] Francis Bacon, who advocated a "new active science." By "science" he meant certain knowledge and by "active," he meant hands-on activity, but how to combine those two things was not clear to members of the early Royal Society.

Q. Was the scientific method of that time anything like what we think of today?

A. In the mid-17th century, when the Philosophical Transactions began to be published, the method of this new natural knowledge was actively being formed. If you were a scholar like most members of the Royal Society, you would have been trained in the classics at university, much as Columbia College students are today—although the training was much more thorough in the 17th century. If they wished to know about nature, they went to Pliny, Aristotle and the books of the ancients. In their attempt to formulate a new method for their "new philosophy," they drew from models such as the medical case study, the collection of human experiences by historians and hands-on experimentation with natural materials from alchemical laboratories and craft workshops.

Q. Your work now focuses on the workshops of craftsmen. How did that type of knowledge dovetail with the classical learning of scholars?

Distillierbuch (Book on Distillation), 1500

A. As European cities grew and trade expanded, craftspeople became more visible in society. Because they were manufacturing trade goods—such as metal items in Nuremburg and textiles in Italian cities—they came to have real power in urban governments. And, as they began to produce weapons and fortifications, as well as artworks used to represent power, their expertise became an important part of the power of territorial rulers. As their influence grew, craftspeople had ambitions to be seen as practitioners of the liberal arts—the arts of a free man. At the time, all university learning was conducted in Latin, so some tried to learn Latin to improve their social and intellectual status. Leonardo da

Vinci, for example, laboriously taught himself Latin so that he could read the books of the learned.

Q. How did that affect how craftspeople were viewed?

A. As urban craftspeople became more powerful and visible to the elite, scholars and nobles became interested in visiting their workshops. There are interesting examples of 16th century scholars wondering how to talk about what artisans do. And, they began with the words craftspeople used in their work. The scholars who went into the workshops were quite text-centric—like we are today—but even more so because ancient texts were the source of authoritative knowledge for them. This was a clash of cultures of sorts because many craft skills simply can't be written down. A book is not a good way to convey craft techniques. Yet we find craftspeople writing down what they did from about 1400. It was in part a response to elite and scholarly interest in their techniques, but it was also a claim to the authority of authorship. A claim about what they knew and how certain their knowledge was.

Q. Can you give us an example?

A. The 16th-century French manuscript is an example of such a craftsperson writing down techniques. The author-practitioner clearly finds it difficult to convey techniques in writing, but he may have started writing because of interest on the part of the powerful French noble in whose collection this manuscript ended up. Another example comes from the late 1520s, when Georgius Agricola, a scholar and trained medical doctor, went back to his home region, a mining boomtown in Saxony, to become the city's physician. Once there, he invested in mines, and published several books about metals and mining. One of these, De Re Metallica, became foundational in the science of geology. It contains beautiful woodcut illustrations of mining and smelting techniques, and is

Agricola's attempt to explain and legitimate mining to his fellow shareholders. But how does he, a physician, set about writing this book? He interviews miners and begins by compiling vocabulary lists of the words they use. Then he goes on to formulate theories that are based on miners' ideas about how nature operates and how minerals form in the earth. We can see how the science of geology began in the labor of craftspeople.

Q. What impact did the printing press, which was invented around 1440, have on the development of these new ideas?

A. Huge. It had similar effects to the information revolution we see today in terms of access to information and speed of dissemination. Printed books were quite expensive at first, but they became cheaper very quickly. Printers, who started as metalsmiths, were entrepreneurs; they wanted books that would sell. At first printers mainly produced Latin texts for the university market, humanist scholars and lawyers. Between 1550 and 1570 you begin to see much more printing in the vernacular languages: French, German and to a lesser extent English. Many of these vernacular books were actually craft manuals—how-to texts. They became very profitable for the printers. Through the printing of these texts, the ideals of craft knowledge and inventiveness—observation and hands-on experimentation—elements of what we think of now as the scientific method, were disseminated. These new methods for investigating nature emerged partly out of the craft workshop, and its ideals were disseminated by printers trying to make a living from these how-to texts.

Q. Did the rise of craftspeople threaten the status of scholars?

Wenzel Jamnitzer, Tablepiece, 1549, Rijksmuseum, Amsterdam

A. Scholars, such as those who were members of the Royal Society, in many ways appropriated the methods of the workshop and began to call it a new experimental science. But the very pervasive social and intellectual divide between people who work with their minds and people who work with their hands has remained in place. A fascinating exception today are surgeons, people who work with their hands, who now sit at the top of the medical hierarchy. In the 15th and 16th centuries they were lowly craftspeople.

Q. You once said that historians should step outside themselves. What do you mean by that?

A. History is in part about inhabiting someone else's shoes and

approaching the past as another culture, which I think is an important skill. More than this, I think the power of history, and the humanities more generally, is that they study human complexity. History considers the complex causes of events and explores unfamiliar worldviews. Good historians are self-conscious about how delicate and subtle a process it is to formulate multicausal explanations. Thus, history fosters an appreciation for and an ability to think through complexity.

Q. How did you arrive at your hands-on approach to studying the history and development of crafts?

A. In my last book, The Body of the Artisan, I argued that craftspeople made philosophical claims about their knowledge in their works of art, especially when those artworks depicted nature. But, when I finished that book I realized I didn't really know anything about how craftspeople understood the workings of nature–what were their theories about how nature operated? Did they even have theories? I realized I had to learn more about how craftspeople actually made things in the past. I came across the 16th-century French manuscript with all its descriptions of techniques, but I could not understand a thing! I wondered, how do we even know that these are real processes? So I began collaborating with a trained silversmith and conservator to reconstruct the technical recipes. We first examined museum objects, then began working with the manuscript, reconstructing the techniques. Through this we discovered it's clearly an authentic record of practice, but it's impossible just to read it because it's so nonlinear and so much tacit skill is involved. One really has to try to do the processes set out in its recipes to understand it. For a historian, working on the manuscript in the lab, it is like seeing inside a craft workshop of the 16th century. In my research now, I am working to publish a digital edition of this manuscript and I plan to involve both history and science students, working in the laboratory, who will help to reconstruct the techniques.

Q. What is the mission of the new Center for Science and Society that you will head?

A. Since the 19th century and increasingly from the Second World War, science has become an incredibly powerful cultural force in our society. Scientific research today is one of the most intensively publicly funded enterprises of knowledge-making in world history. It's a central part of culture; it pervades the way people think, the methods used for obtaining all kinds of knowledge, and the kind of knowledge that is produced. Such a cultural phenomenon deserves to be studied in all its many effects and in all its complexity. That will be the work of the center.

Provided by Columbia University