The Science of the Studio

Not only did they create impressive works of art, they also took an interest in alchemy, mathematics and the natural sciences. At the **Max Planck Institute for the History of Science** in Berlin, researchers headed by **Sven Dupré** are studying how artists in the early modern era discovered, depicted and circulated new knowledge through their works.

TEXT BIRGIT FENZEL

here is no way that Karin Leonhard would be willing to taste some of the things her colleagues have cooked up on the kitchen stove. They stick strictly to the recipes of the old masters, albeit not those of the culinary arts, but of painting. As an art historian herself, Karin Leonhard knows the background to these peculiar kitchen experiments: "We are attempting to recreate, on the basis of old texts, the way paints were manufactured. Industrially produced paints in tubes were not available until the middle of the 19th century. Prior to that, anyone who needed paint had to make their own." Some of the raw materials were sourced from plants, while other ingredients came from the apothecary's poison cab-

inet. It was no accident that recipe book author Valentin Boltz of Rufach, writing in the year 1549 in his *Illuminierbuch*, a treatise on the manufacture and use of paints, urged the reader to exercise caution in using auripigment – arsenic trisulfide – to make the color yellow. "This is a woeful, yet beautiful paint. When you rub it, take care to bind your mouth and nostrils, lest you breathe in the vapor and the dust. And beware not to lick a brush of this color, for it is harmful." bourde avery me fupy

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THE RESEARCHERS USE A VARIETY OF APPROACHES IN THEIR WORK

Karin Leonhard, a native of Munich, is one of the team headed by Sven Dupré. Since October of last year, they have



Playing with colors: This page from the Cologne Pattern Book depicts the manifold mixtures and combinations used to illuminate books.

The 16th century saw the emergence of a new literary genre, the books of secrets or books of wonders.

been studying "Artistic Knowledge in Pre-Modern Europe" from a variety of perspectives. This interdisciplinary research group at the Max Planck Institute for the History of Science in Berlin draws on various methodological approaches, as well as the wealth of experience of its members - after all, the group is made up of historians of science and technology and experts in art and restoration.

HUNDREDS OF THE OLD **MASTERS' RECIPES**

In a sub-section of the project devoted to the written communication of knowledge, Karin Leonhard and her colleague Sylvie Neven, among others, are collecting the recipes of the old masters. "That's everything that relates to the manufacture and preparation of paints, such as how to make a naturalistic red to depict lips, or pigments for gilding, lacquering, and how to make ink, bronze casting and sculpture. There are even instructions on which paint to use for which elements of an artwork," adds Sylvie Neven. The recipes come not just from genres such as painting and illumination, but from the goldsmith's art, from glass and porcelain decoration, and from other areas of the applied arts.

Six months into the project, art historian Karin and Sylvie, an expert in the technology of art, have already assembled and digitized several hundred such recipes. Among them are transcriptions of the 15th-century Strasbourg Manuscript (destroyed by fire). For a long time, this recipe book was believed to be the oldest German-language source for the study of Northern European painting techniques. While Sylvie Neven concentrates on documents from the period between 1350 and 1500, Karin Leonhard collects examples from the 16th and 17th centuries.

"Part of what we are interested in is tracing the path that leads to the modern system of colors. After all, many of these documents are an attempt to develop an understanding of the order and structure of colors," says Karin, describing an aspect of her work that goes beyond a simple inventory of knowledge. The two researchers also want to discover the role these recipes played in training young artists in the workshop, and find out which of them were in circulation outside of the workshop setting.

In fact, contemporary interest in these treatises from the atelier wasn't restricted to members of the same craft. Alchemists and doctors of medicine also held the artists' expertise in high regard. "Word had gotten around that artists had a great deal of experimental knowledge at their fingertips," Karin explains. Scholars, art lovers and patrons were instrumental in transferring such knowledge from the workshops to the world. The rise of typographical reproduction techniques took it one step further.

"The handwritten records, notes and pattern books began to be published," Karin Leonhard continues. The 16th century saw the emergence of a new literary genre, the so-called books of secrets or books of wonders that were based on these artists' recipes. One famous example of a book of secrets was Giambattista della Porta's Magia naturalis of 1558. As is already becoming clear, the emphasis of many of these treatises lay on the manufacture of pigments and other raw materials and how to use them. In Sven Dupré's opinion, portraying the painter as an alchemist isn't as wide of the mark as many might suppose. "Contemporary art historians portraved them in just this way," the head of the research group concludes from his reading of historical sources. "As far back as the 16th century, Giorgio Vasari and Karel van Mander described the painter Jan van Eyck as an alchemist, ascribing to him the discovery of oil paint."

HOW TO TURN GUM RESIN INTO A BEAUTIFUL GOLDEN YELLOW

The latter claim doesn't quite accord with the facts – oil paint had already been described in an earlier text. Still, in the days of van Eyck, the art of making paints was without doubt a science in itself, in which artists used not just the same apparatus as the masters of alchemy and transmutation, but also the same raw materials. some of which were hazardous. The only difference was that they were less concerned with making gold than using water and alcohol to turn gum resin into a beautiful golden yellow. Or staining window glass shades





- 1 | Life in the undergrowth: Otto Marseus van Schrieck painted this *sottobosco* with snake, thistles and butterflies.
- 2 A dragon that isn't a dragon: This 18th-century fake was made from the stretched skin of a stingray. Similar preserved specimens can be found even in the 16th-century collections of curiosities.
- 3 Nature and art: Two of the dragonflies have real wings, the third set is painted. The picture originates from Joris Hoefnagel's Animalia Rationalia et Insecta, 1575–1580.



Alchemy wasn't the only science that artists of the Renaissance studied in theory and in practice.

of yellow - a process described in a 16thcentury manuscript in terms that applied to the making of gold.

Nor was alchemy the only science the artists of the Renaissance studied in theory and in practice. Sven Dupré outlines the change of mood that took place in the workshops of artists who no longer regarded themselves as mere artisans: "By the early 17th century at the very latest, the interest taken by artists in alchemy went far beyond the methods of practical chemistry necessary to manufacture pigments."

ARTISTS REGARDED AS EXPERTS IN THE WORKINGS OF NATURE

"The intellectual life of the artist increasingly leaned toward the worlds of scholarship and science," says the Max Planck researcher, describing the new



spirit of the times. But artists had studied nature long before the 17th century. The new development began in the course of the late 15th and early 16th centuries, as artists came to be seen by others - both patrons and natural philosophers - as experts on matters of nature and the natural sciences. During this time, both painters and scholars became more and more concerned with the study of nature and the intellectual topics of contemporary interest.

Sven Dupré cites Lorenzo Ghiberti, a Florentine sculptor, jeweler and glass painter, as a prime example of what was going on in the early 15th century. He left behind extensive records that provide evidence of his familiarity with learned texts on the subject of lenses. The aspiration to be perceived as an intellectual is even more clearly expressed in the writings of the painter Peter Paul Rubens on alchemy. "The weight attached in these works to the spiritual and cabbalistic elements demonstrates the aspiration of the artist to be regarded as a pictor doctus," says Sven Dupré.

However, more interesting to the researcher than even the changes in how artists saw themselves is the role of the artist as a communicator of scholarly content. "We would like to find out not just how knowledge circulated among artists themselves, but also how it was used in the production of new works of

Tracing the knowledge of artists in the early modern era: Marlise Rijks, Karin Leonhard, Sven Dupré and Barbara Tramelli (from left).



Double geometry: Marie-Charlotte de La Trémouïlle, Duchess of Saxony-Jena, is depicted in this painting from around 1670 as an allegory of geometry. Beside it is a page from Alhazen's *Kitab al-Manazir*, taken from a previously unknown 14th-century copy.

art." A sub-project is thus investigating the role of the artist as a producer and recipient of scientific texts. In search of answers, researcher Barbara Tramelli is examining the artistic scene in 16thcentury Milan.

Her attention is focused on the painter Giovanni Paolo Lomazzo, whose writings provide valuable information about the knowledge that circulated among the likes of Bernardino Baldini, Guido Mazzenta, Girolamo Cardano and other protagonists of intellectual life, as well as about how they acquired and shared this knowledge. "Lomazzo is a prime example of the intellectualization of the artistic profession, a process in which the reading of and references to texts became important elements," says art historian Barbara Tramelli.

The artist as reader and recipient is also the subject of another sub-project

in which Sven Dupré is studying the circulation of the works of Arab mathematician Alhazen among artists from the 15th century onward. In his treatise De aspectibus written in the year 1021, Alhazen addressed aspects of optics and the refraction and reflection of light. "Some of the definitive artists of the Western world were familiar with the work of Alhazen," says Dupré. In absorbing his findings, artists acquired a valuable treasure trove of knowledge about light and color, enabling them to achieve their desire of creating the perfect illusion of three-dimensional space and to demonstrate a mastery of optics in the process.

Painters – above all the Dutch artists – were interested in both the colors and the effects of light when reflected or refracted by different textures, surfaces and substances. In the opinion of the researchers in Berlin, the way in which artists applied these optical discoveries is closely related with an understanding of materials, including their optical qualities.

BUTTERFLY WINGS – DIRECTLY ON THE CANVAS

"This knowledge was given visual form with the aid of various material objects in the artist's workshop," Dupré explains. Great artists were often also great collectors, hoarding not just pigments of every kind, but also feathers, plants, dried animals, sea shells and precious stones. The extent to which these curious collections may have contributed to their knowledge is another of the questions the Berlin-based project seeks to answer.

Artists also produced numerous exhibits for the collections of art and curiosities that enjoyed increasing popular-



- 1 Jan van Eyck optimized the mimetic potential of oil painting and developed a system of painting that was particularly well suited to reproducing light and color, especially the way light is reflected and refracted by different materials. The effect is seen here in the miter of St. Donatian.
- The processes used in glass making were similar to those employed by alchemists. "Distillation", Jan van der Straet (Stradanus): Nova reperta, 1584.



In igne fuccus omnium, arte, corporum Vigens fit vnda, lumpida et potifsima.

ity among the nobility and wealthy contemporaries of the Renaissance period. In her sub-section of the project, Sven Dupré's colleague Valentina Pugliano is analyzing the contribution made by craftsmen and artists specifically to the *objets d'art* inspired by nature.

In their efforts to achieve representations that were as true to nature as could be, some artists of the late Renaissance set aside their brushes, preferring to apply certain materials as a direct part of the picture. For example, when depicting butterflies, some artists pressed the wings directly into the wet paint on their canvas, says Karin Leonhard, describing a procedure that, in the opinion of some of his contemporaries, Dutchman Elias van den Broeck took to extremes.

TOADS AND BEETLES SCURRY OVER MOSSY GROUND

Such was his predilection for butterfly impressions that van den Broeck was expelled from the guild of painters in Antwerp and compelled to move to Amsterdam. A contemporary of his reported that "the velvet-trousered seigneurs of the first city accused him of having glued the butterflies rather than painting them, indeed so in a huff were they that they did not consider that the glued butterflies are more beautiful and more natural than their painted counterparts, since they not only retain their entire markings, but also last longer than the painted ones."