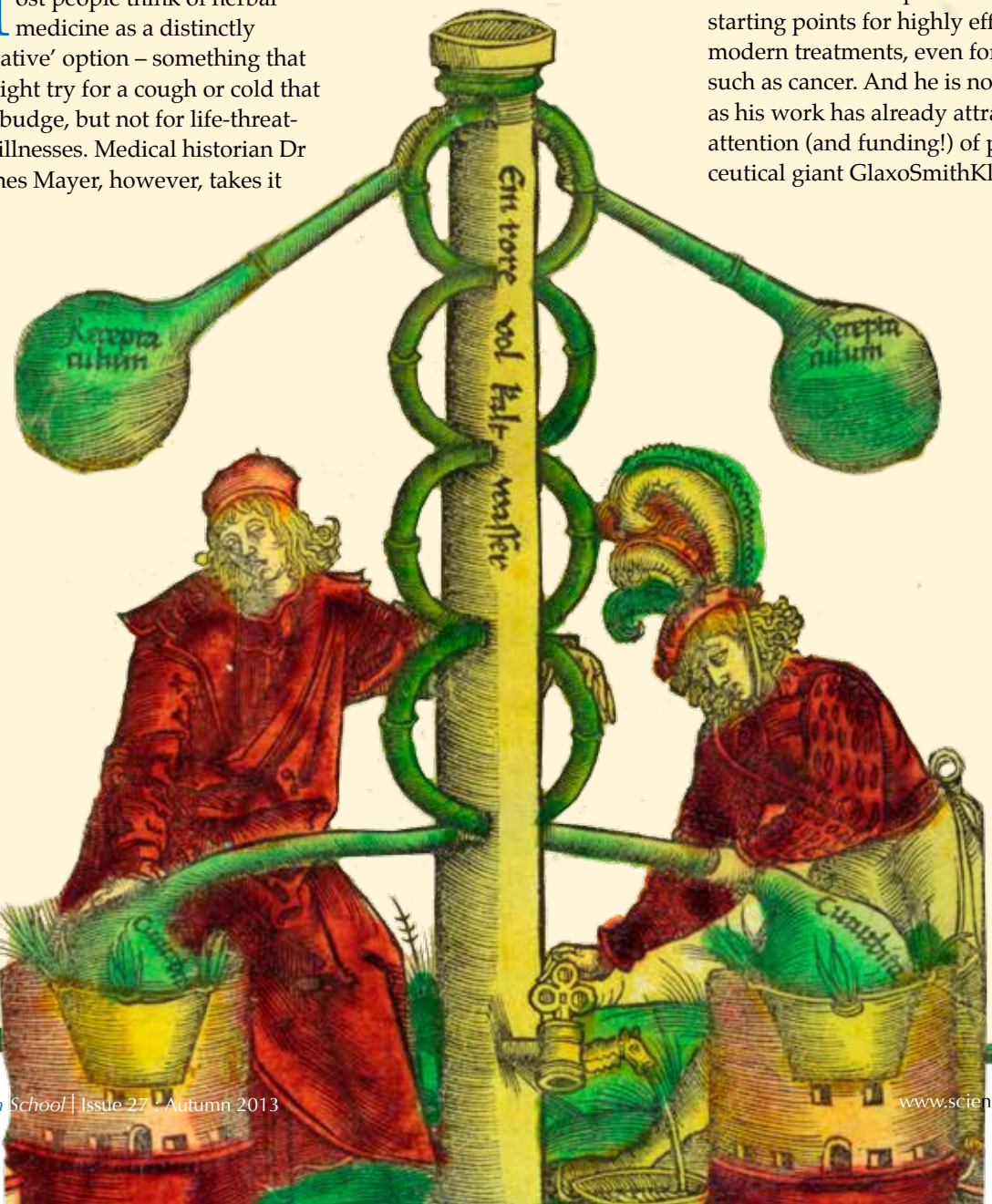
Monastic medicine: medieval herbalism meets modern science

A group of German researchers is bringing to light the medicinal wisdom of the Middle Ages.

By Susan Watt and Eleanor Hayes

Most people think of herbal medicine as a distinctly 'alternative' option – something that you might try for a cough or cold that won't budge, but not for life-threatening illnesses. Medical historian Dr Johannes Mayer, however, takes it all much more seriously: he believes that the herbal remedies described in medieval texts can provide excellent starting points for highly effective modern treatments, even for diseases such as cancer. And he is not alone, as his work has already attracted the attention (and funding!) of pharmaceutical giant GlaxoSmithKline.



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REVIEW

- Biology
- Chemistry
- Medicine
- History
- Religious studies
- Ages 12+

It is widely known that herbs are useful in everyday life in a number of different ways; this article describes one such application – how medieval monastic herbs can be used as a source of modern medicines. Of great interest is the obvious link between history, religious studies and science disciplines such as plant biology, chemistry and pharmacy. Equally interesting is the complex procedure involved in extracting useful information from medieval monastic manuscripts. Overall, the article shows beautifully how knowledge can be transferred across time and different civilisations.

The article is an excellent source of information for interdisciplinary lessons. Relevant topics could include:

- Natural ingredients for modern medicines
- Using old wisdom for new discoveries
- How knowledge is transferred across time and different civilisations.

Suitable comprehension questions include:

1. Why is it difficult to gather useful information about herbs that could be used to treat illnesses?
2. The pharmaceutical industry normally relies on the combined work of biologists, chemists, pharmacists and doctors to develop a new drug. In the case of the monastic medicines described in this article, researchers from a wider spectrum of disciplines are needed. Explain why this is the case.
3. Once useful medicinal herbs have been identified, why can it be difficult to source large amounts of the specific herbs or their active ingredients?

Michalis Hadjimarou, Cyprus

The focus for Dr Mayer's research group at the University of Würzburg, Germany, is monastic medicine (*Klostermedizin* in German). For the past 30 years, group members have been sifting through monastic manuscripts dating from the 8th century onwards, translating and publishing details of plant remedies and the ailments that they are intended to treat.

Their work moved from the historical towards the more scientific some 14 years ago, when the group received a visit from a manager at GlaxoSmithKline. When the visitor asked "What is monastic medicine? Is it praying or something?", Dr Mayer explained that in fact it meant elucidating the herbal treatments documented by monasteries and investigating their physiological effects.

That visit led to a research group being established at the university, with sponsorship from GlaxoSmithKline, to look for effective modern remedies derived from medieval monastic knowledge. So far the collaboration has led to the development of some products to treat the common cold,

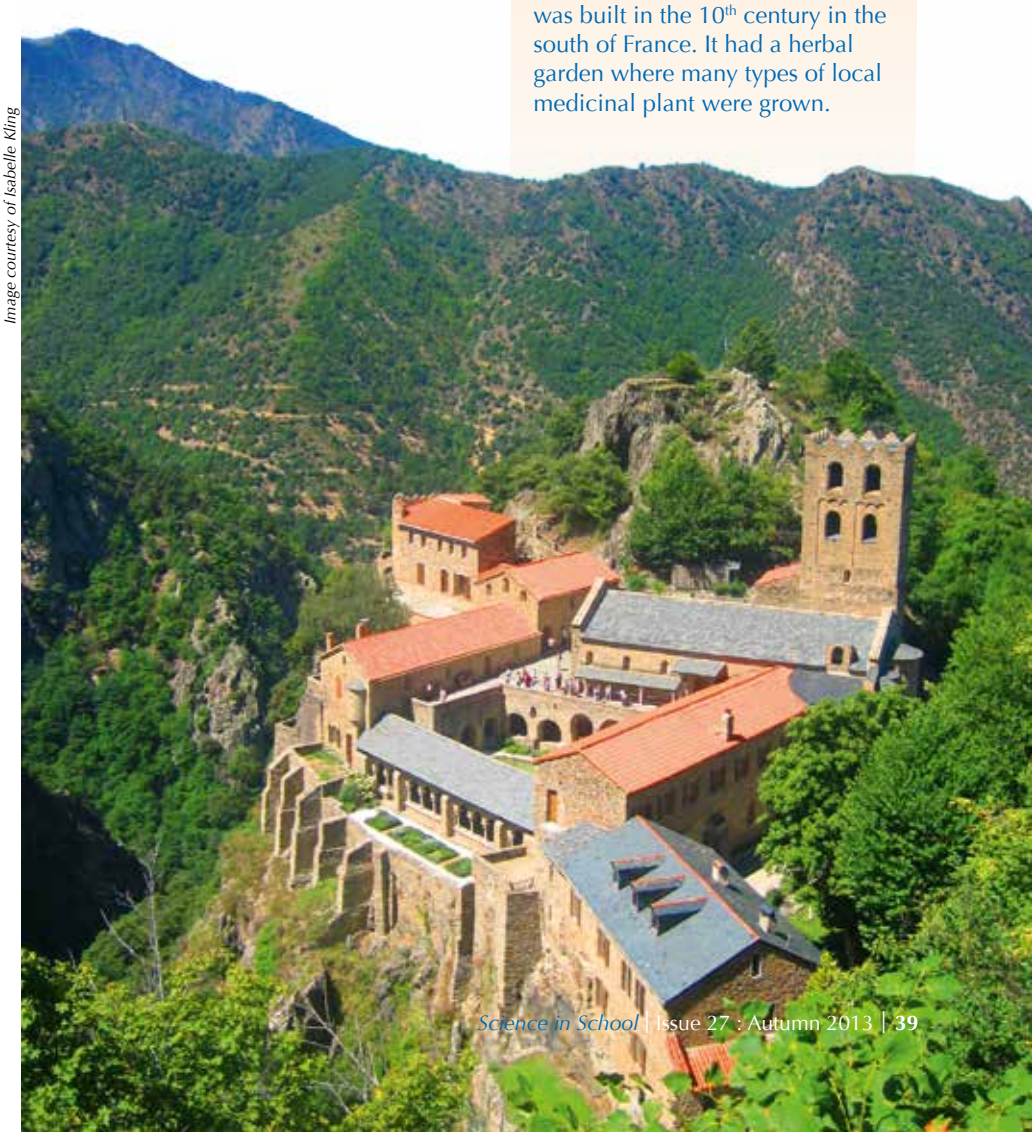

Image courtesy of Isabelle Kling

The abbey of St-Martin-du-Canigou was built in the 10th century in the south of France. It had a herbal garden where many types of local medicinal plant were grown.

Ten years ago, the Klostermedizin research group started a project together with Abtei to investigate the active ingredients and mechanisms by which hops *(Humulus lupulus)* and valerian *(Valeriana officinalis)* work as sedatives (see, for example, Schellenberg et al., 2004). They found that the lignans in hops function similarly to adenosine, an inhibitory neurotransmitter that promotes sleep. Hops work in a similar way to the hormone melatonin, which plays a role in the body clock.

Salvia officinalis, a type of sage, is mentioned in medieval manuscripts as being useful for improving memory. Recent research at the University of Newcastle, UK, has shown it to be effective in this role (it appears to help reduce the breakdown of the neurotransmitter acetylcholine), which makes it a candidate for the development of a treatment for dementia (Scholey et al., 2008). Drug development and clinical trials take time, however, so Dr Mayer expects it will be another ten years before a drug based on sage becomes available.

Images courtesy of Heike Will

Image courtesy of Heike Will

sold under the appropriately named brand Abtei (German for 'abbey'). The group now has other links with pharmaceutical companies, as well as with Würzburg University Hospital.

The initial source of such fruitful results is the huge range of historical texts. "First we tried to research the plants that were documented in monasteries used in the early and higher Middle Ages, between the 8th and 12th centuries," says Dr Mayer. "But now we are researching the whole history of medicinal plants in Europe up to the modern day, looking for indications of what might be useful."

The research involves several steps: translating the texts (often from medieval Latin), identifying precisely which plant was used for which treatment – no easy task given the inconsistent and varied common names used for many plants – and then finding the active ingredients.

Some of these ingredients are then tested in laboratories at Würzburg University Hospital or at their partner pharmaceutical companies. For example, scientists in the ear, nose and throat department at the hospital are currently testing the effect of water- and alcohol-based extracts of *Osmunda regalis* (old world royal fern) and

Reliable remedies

Although many plants have been used traditionally in medicine, few have been investigated scientifically to find out whether they are indeed safe and effective remedies for the conditions they are said to treat. In addition to laboratory studies, such as those carried out by Dr Mayer's group, the clinical efficacy of a treatment also needs to be tested.

Scientists agree that the best way to find out the effect of a treatment is via a high-quality clinical trial, or RCT (randomised controlled trial). These include several precautions to make sure the trial results are free from bias:

- The treatment being studied is compared to one or more alternative *control* treatments, including a placebo (one that has no direct pharmacological effect, such as a sugar pill).
- Participants in the trial are randomly assigned to the different treatments.
- Neither the patients themselves, nor the people giving them the treatment, know which treatment each has been given; this is called *double-blinding*.
- The trial needs to have enough people taking part so that the results could not easily have occurred by chance (the more data there is, the less likely this is to happen).

While this all may seem very complicated, without these precautions the results could easily be due to factors other than the treatment itself, so they would not be reliable. Even when a high-quality study has been done, the results need to be examined alongside those from other such trials to see what the total evidence suggests. (To learn more about clinical trials, see Garner & Thomas, 2010, and Brown, 2011.)

Herbal treatments that are supported by good-quality evidence include these:

- Artichoke *(Cynara scolymus)* can aid digestive problems as it increases the flow of bile, which helps to digest fats. See *The Handbook of Clinically Tested Herbal Remedies*[w1] for evidence.
- Cranberry *(Vaccinium macrocarpon)* may help prevent urinary tract infections: drinking cranberry juice is thought to make bacteria less able to adhere to walls of the urinary tract. (However, a recent evidence review concluded cranberry is less effective than previously thought.) See the Cochrane Collaboration website[w2] for evidence.
- St. John's wort *(Hypericum perforatum)* is as effective in treating depression as some pharmaceutical antidepressants, but like them it can also have side effects. See *The Handbook of Clinically Tested Herbal Remedies*[w1] for evidence.

Artichokes can aid digestive problems.

Image courtesy of Richardfabi / Wikimedia

Cranberries may help prevent urinary tract infections.

Image courtesy of Liz West / Wikimedia

St. John's wort has been proven in clinical trials to be effective at treating depression.

Image courtesy of Heike Will

BACKGROUND

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Folio from a manuscript of the *De Materia Medica* by Dioscorides (ca. 40-90 AD), showing a physician preparing an elixir. From Iraq or Northern Mesopotamia, perhaps Baghdad.

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Chelidonium majus (greater celandine) on cultures of ear cancer cells. Finally, a few promising leads have been passed on for development as potential new drugs, undergoing clinical trials and other testing to conform to legislative requirements. If the fern and celandine extracts prove effective, for example, the clinical trials will be carried out at the hospital.

This complex process is reflected in the multidisciplinary expertise of Dr Mayer's team, which comprises academics from a variety of backgrounds: historians of medicine and scholars of Latin and ancient Greek, plus chemists, biologists and pharmacists – all of whom are needed to fully understand the medieval recipes. There are also outside specialists that the group can call on – including a Cistercian monk who is a biologist.

Dr Mayer's own background is in history. "I first studied history, and then the history of medicine and that's how I found out that we didn't know what plants they really were using in the Middle Ages. So I started to make a database about historical plants used in Europe," he says.

Although most of the key texts are written in Latin, in many cases this is a translation from earlier texts written in Arabic, some of which also contain

Hildegard of Bingen (1098-1179) was an influential Benedictine abbess who wrote botanical and medicinal texts, as well as theological manuscripts and beautiful liturgical music. She is shown here, in a miniature from the *Rupertsberger Codex des Liber Scivias*, being inspired by God.

Folio from Hieronymus Brunschwig's *Liber de arte Distillandi de Compositis* (Strasbourg, 1512) showing two figures performing a distillation. Brunschwig's comprehensive book on distillation was one of the earliest texts devoted exclusively to chemical technology. This book expanded on his smaller, earlier work on distillation of herbal remedies to include a wide range of alchemical distillation techniques.

knowledge preserved from ancient Greek authors such as Aristotle. As Dr Mayer explains: "In the early Middle Ages there was not much literature here in Europe, and Pliny the Elder (23-79 AD) was the most important antique author for monastery medicine. Then in the 11th century, they started to translate Arabic texts into Latin, and so a lot of new plants came into European medicine." One example of this is *Alpinia officinarum*, a plant used to treat respiratory problems and also for relaxation. Although this plant is endemic to Europe, its medicinal use started only after the Arabic medicine texts arrived.

In time, the translation of Arabic texts came to overshadow the epoch of monastic medicine because it led to the foundation of many universities in the 13th century. So from this time onwards there were professional physicians, and monastic medicine became less important.

There was, however, a new period of monastic medicine in the 16th century, because many missionaries sent to the newly discovered lands in the Americas were monks. "The missionaries were interested in finding out what the native Americans did with the special plants in Central and South America. So they wrote books about the use of these plants, and sent the information back to Europe," says Dr Mayer.

Today, Dr Mayer's group collaborates not only with industry but also with working monasteries, advising on special plants to grow in the monastery gardens and on their uses in tea-style infusions and in lotions. They even run courses for the public at the local monastery in Oberzell – which brings in some useful additional funding for the group.

Dr Mayer has found that cultivating plants is not always the best way to obtain them, either because it's hard to get them to grow or because the ingredients obtained from wild plants are better than those from cultivated plants. "You must go out in the woods to find these plants, like *Arnica montana*; it's very difficult to cultivate the plants and to get enough flowers," he says. "But in the wild it grows well." Which is perhaps a fitting reminder of the fabulous complexity of nature, as evident today as it was to the people of the Middle Ages.

Class activity

Students can carry out their own research into herbal medicines that have been shown to be effective – or not. Perhaps ask them to investigate some commonly used herbal remedies (e.g. echinacea, evening primrose, gingko, ginseng, valerian) and to explain what the available information suggests and how reliable they think this is.

One of the best resources to find out about the efficacy of medicines of all kinds is the Cochrane Collaboration website[w2]. The Cochrane Collaboration produces reviews of clinical trials data to establish whether there is good evidence that a treatment is effective. The reviews can be accessed via the Cochrane website.

Another resource is *The Handbook of Clinically Tested Herbal Remedies*[w1] by Marilyn Barrett (2004), which can also be accessed online. The author has compiled evidence from trials of more than 30 commonly used herbal remedies, together with reviews of each trial and a rating of the quality of the evidence that each provides (graded I, II or III).

References

Brown A (2011) Just the placebo effect? *Science in School* **21**: 52-56. www.scienceinschool.org/2011/issue21/placebo

Garner S, Thomas R (2010) Evaluating a medical treatment. *Science in School* **16**: 54-59. www.scienceinschool.org/2010/issue16/clinical

Schellenberg R et al. (2004) The fixed combination of valerian and hops (Ze91019) acts via a central adenosine mechanism. *Planta Medica* **70(7)**: 594–597

Scholey AB et al. (2008) An extract of *Salvia* (sage) with anticholinesterase properties improves memory and attention in healthy older volunteers. *Psychopharmacology* **198**:127–139. doi: 10.1007/s00213-008-1101-3

Web references

w1 – A good compilation of evaluative information about herbal treatments is: Barratt M (2004) *The Handbook of Clinically Tested Herbal Remedies Volume 2*. USA: Haworth Press, Inc. ISBN: 0-7890-2724-0. This is available online, for example at: http://www.pharmacognosy.com/book.pdf

Images courtesy of WeiterWinkel / Flickr

Monasteries such as the Cistercian abbey of Maulbronn, in southern Germany, preserved and transmitted important knowledge about herbal medicine in the Middle Ages.

w2 – The Cochrane Collaboration produces reviews of clinical trials data, including trials of herbal medicines, which can be accessed via the Cochrane website. www.cochrane.org/cochrane-reviews

The most recent review of evidence for the effectiveness of cranberries in the prevention of urinary tract infections showed no significant benefit. http://summaries.cochrane.org/CD001321

Resources

The Science and Plants for Schools website offers a teaching resource about medicines and drugs from plants. Using a card-game format, the activity is suitable for teaching students aged 16+ about plant-derived pharmaceuticals, or it could be used to introduce younger students to poisons. See www.saps.org.uk or use the direct link: http://tinyurl.com/cnc4zw8

To learn more about Arabic science and medicine between the 7th and 17th centuries, see:

Khan Y (2006) 1000 years of missing science. *Science in School* **3**: 67-70. www.scienceinschool.org/2006/issue3/missing

To learn more about the work of Dr Mayer's research group, visit the Forschergruppe Klostermedizin website (in German): www.klostermedizin.de

If you found this article interesting, why not browse the other science topics in *Science in School*: www.scienceinschool.org/sciencetopics

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Dr Eleanor Hayes is the editor-in-chief of *Science in School*. She studied zoology at the University of Oxford, UK, and completed a PhD in insect ecology. She then spent some time working in university administration before moving to Germany and into science publishing in 2001. In 2005, she moved to the European Molecular Biology Laboratory to launch *Science in School*.

To learn how to use this code, see page 53.