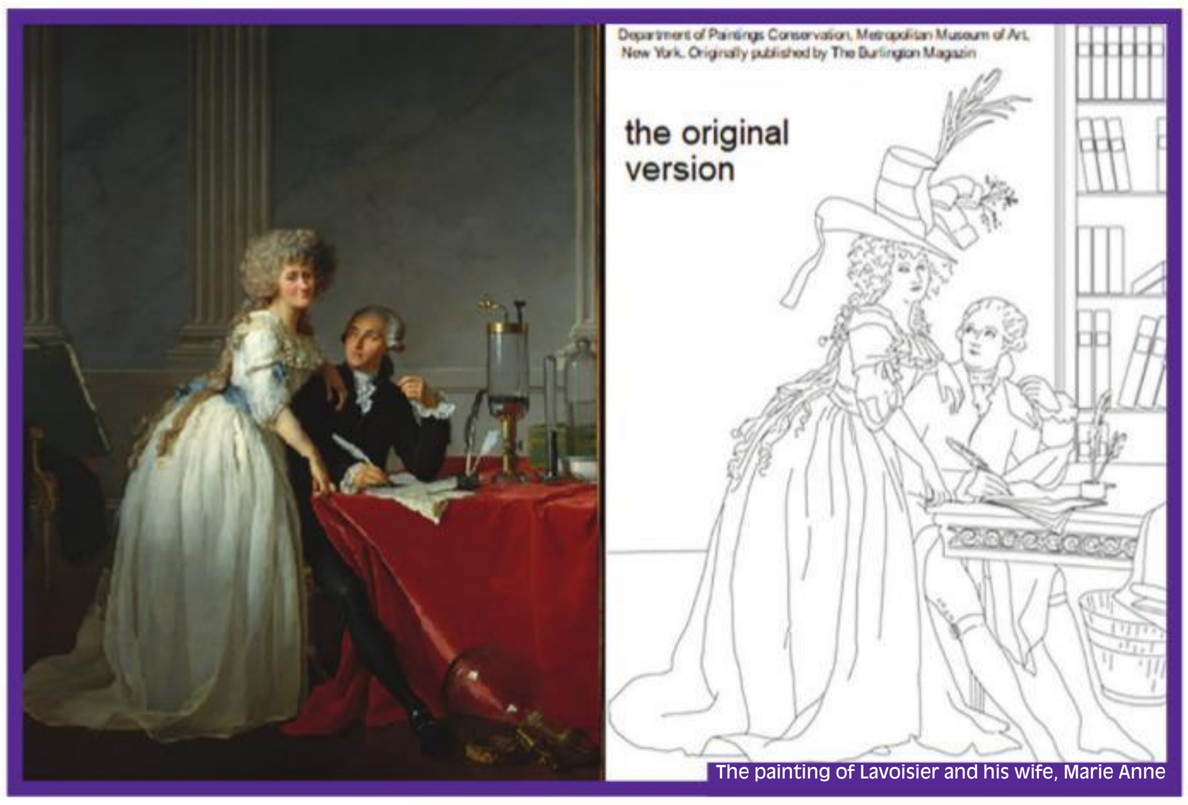
Cover-up in the French court

What was hidden away at the time of the Revolution?



The painting of Lavoisier and his wife, Marie Anne

S ANANTHANARAYANAN

Records of the colourful 18th century French court and nobility were hastily painted over to avoid scrutiny during the Revolution. And rightly so, it appears, from what analysis reveals.

The American Association for the Advancement of Science journal, *Science Advances*, carries a paper by Anne Michelin, Fabien Pottier and Christine Andraud, from the Centre of Conservation Research, Sorbonne, which describes how secret correspondence of Marie Antoinette, Queen of France, which was over-written, has been recovered.

And the journal, *Heritage Science* carries a paper by Silvia A Centeno, Dorothy Mahon, Federico Carò and David Pullins, from the Metropolitan Museum of Art, New York, which shows that a portrait of scientist Antoine Lavoisier, and his wife, Marie Anne, was altered to make it look more secular!


Axel Von Fersen and Marie Antoinette

Marie Antoinette, daughter of the Emperor of Austria, married the crown prince of France in 1770, when she was 14. Four years later, when her husband ascended as Louis XVI, she became Queen of France, and remained so till monarchy was abolished in 1792. Popular sentiment was already incensed by the excesses of French aristocracy, and Marie Antoinette made it positively worse. Her lavish lifestyle, reputation of affairs and immorality, opposition to social reforms, and suspicions of allegiance to the Austrian state, made her an obvious target of the Revolution. The plan of the royal couple to flee was aborted, they were imprisoned, and finally sentenced to the guillotine.

But during the troubled period, Marie Antoinette managed a secret correspondence with the Swedish diplomat, Count Axel Von Fersen, a close friend and believed to be a lover. The letters exchanged, which are now with the French National Archives, contain sections which look like they were over-written by a censor. What lies beneath the changes and why changes were made have puzzled historians for the last 150 years, the *Science Advances* paper says.

Recovering the obscured graphical content of historical documents is part of cultural historical research. Modern techniques, mostly using different kinds of radiation, which do not damage the fragile and limited historical samples, have often been successful. X-ray fluorescence, absorption or reflection of infra-red or longer wave radiation, and thermal imaging, are modern methods that can reveal concealed or degraded contents of documents. So far, the paper says, these methods have been used mainly to extract the text in rolled or folded, but brittle papyri or parchment, and documents, even, for instance Luigi Cherubini's 1797 musical score, in a sheet blacked out by the composer, the paper says.

The Antoinette-Fersen letters present a similar challenge, in the sense that the task is to entangle the visible text from something that is hidden. While the hidden text has not been erased, the paper says, the edited version is placed exactly over the older text and the ink used is dark and opaque. A range of methods was hence tried out, microscopy, spectroscopy, thermal imaging -- and X-ray fluorescence, which, the paper says, was found to work.

The inks used had left deposits of sulphur, potassium, manganese, iron, copper and zinc. And differences in the proportions of these components of the original writing and the over-writing should help tell them apart. When X-rays fall on some elements, atoms absorb X-rays of specific frequencies and re-emit light, again of specific colours. This property, of fluorescence, using different frequencies of X-rays, hence enables identification and estimation of elements.

While this could be straightforward if there were clear differences in the proportions, this was generally not the case with the Antoinette letters. Where an element in the original writing was also there in the overlay, but in greater quantity, the overlay could conceal the original. Data of several components of the samples, physical and chemical, was hence acquired and analysed statistically. This often became intractable and the number of components had to be kept down to what is known as "principle components". And with complex analysis, the originals of eight of the 15 altered letters have been made out.

Antoine Lavoisier

The paper in *Heritage Science* describes a similar exercise, carried out on a celebrated portrait, completed in 1788, just before the Revolution. The painting, by Jacques-Louis David, who may be the most important painter of the period, is of Antoine Lavoisier and his wife, Marie-Anne Paulze. Lavoisier was a renowned scientist, who identified oxygen, discovered the nature of combustion, and created methods of experimental science. And his partner and supporter in his work was his wife, Marie-Anne.

Lavoisier was also a nobleman, a landowner's son. And apart from his interest in science and public affairs, where he made important contributions, he was a part of the "Ancien Régime", the aristocracy that was overthrown in the French Revolution. He is known to have benefitted from "Ferme Générale", an organisation that undertook tax collection for the state, and kept a part of the collection as remuneration. This association marked him as an oppressor of common people, and his eminence in science or his public work could not save him from the guillotine.

In the portrait, however, the couple are depicted as progressive, rational people engaged in scientific pursuits, quite unlike the rich and privileged ruling class of the time. The simplicity of Marie-Anne's gown, the practical sash and sleeve, Lavoisier with a pen in hand, scientific apparatus on the table, the evident collaboration of the couple, "has come to epitomise a modern couple born of the Enlightenment," says the paper in *Heritage Science*.

Soon after its completion, the painting was to be presented at a salon, in 1789. But it was withdrawn, and the reason was that it was thought politically not suitable to be shown, as it may have heightened the rising resentment for the aristocracy. And it remained under wraps for a century, till the "Exposition Universelle", in 1889. The painting was finally acquired by the Metropolitan Museum of Art, New York, in 1977, and has been seen as a showpiece of the art of its period.

In 2019, the painting was moved to the Museum's conservation lab for attention to a coat of varnish that protects the paint. And during this process, it was noticed that the paint seemed to cover another composition. The painting was hence examined by infra-red reflectography, and then with X-ray fluorescence, which revealed what the authors of the paper call, "an entirely unknown version."

The original version, which was perhaps what was to be shown in 1789, was of the couple in near regal splendour — the lady in a bright coloured hat with ribbons and a sprig of flowers. And the gentleman in breeches that were the height of fashion, a red cloak that came down to his knees, and no sign of scientific apparatus!

The composition was understandably seen as a projection of the decadence of the oppressor regime and was rightly withdrawn from display. And the painting may have been worked over by Jacques-Louis David, who later prospered under the French Republic.

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PLUS POINTS

Fertility hope

Researchers from the University of Sheffield in the United Kingdom and the New Zealand department of conservation's Kakapo Recovery Team have found that the high rate of hatching failure in the critically endangered kakapo is not primarily driven by male infertility, as previously assumed, but by a high rate of early embryo death across the population.

The Kakapo Recovery Team has also trialled artificial insemination and successfully produced chicks, demonstrating its potential as a conservation intervention for the species.

Nicola Hemmings, from the University of Sheffield, said, "The kakapo is one of the world's most critically endangered birds with only 201 individuals left, which are managed on predator-free islands off the coast of New Zealand.

"The population was at its lowest in 1995 when there were only 51 individuals left. Unfortunately, this rapid decline meant a lot of the genetic diversity of the population was lost and inbreeding became a problem.

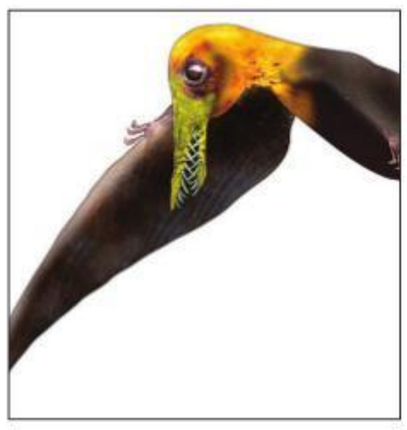
"In the last four decades, over 60 per cent of kakapo eggs have failed, which has been a major barrier to the recovery of the species. We found that this is primarily due to a high rate of early embryo deaths, which may be caused by the lack of genetic diversity in the Kakapo population."

Kakapo females who have mated multiple times hatch more eggs than those that only mate once, so the recovery team used artificial insemination to replicate a second mating and boost hatching rates. The present research confirms that artificial insemination increases the number of sperm that reach the egg. It can also help reduce inbreeding, which may cause early embryo deaths.

The kakapo population decline started when Polynesian settlers arrived in New Zealand around 750 years ago and was then accelerated by European colonists in the 1800s who further cleared habitats and introduced more predators to the islands.

Jodie Crane, from the Kakapo Recovery Team, said, "Kakapo are an iconic species across Aotearoa (Maori name for New Zealand), and a 'taonga' (treasured) species for Ngai Tahu. Our management has been successful in increasing the population, but collaborations on studies like these are crucial for solving the challenging conservation problems ahead."

Dragon in Chile



Scientists have found evidence a "flying dragon" — known to have roamed the skies of the northern hemisphere — also set foot in Chile. The dinosaur belonged to a group of early pterosaurs that roamed the Earth 160 million years ago. A fossil of this so-called flying dragon has been discovered in the Atacama Desert in the South American country.

It is the first time that evidence of the Jurassic-era reptile, which had a long tail, wings and sharp, outward pointing teeth, has been found in the southern hemisphere. The fossil in Chile was discovered by Osvaldo Rojas, the director of the Atacama Desert Museum of National History and Culture, in the town of Cerritos Bayos in 2009.

Analysis found the animal was part of the "Rhamphorhynchinae" sub-family, according to the University of Chile which investigated the remains. Jhonatan Alarcon, who led the study of the remains, said discoveries from this group usually come from Europe and the skeletal remains found in Chile show "the distribution of the animals in this group was wider than what was known up to now".

Details of the discovery have been published in the journal *Acta Palaeontologica Polonica*.

— The independent

UNDER THE MICROSCOPE

Here's a lowdown on the bacteria that causes meningitis

TAPAN KUMAR MAITRA

The meningococcus (*Neisseria meningitidis*) was isolated from the cerebrospinal fluid of patients with meningitis and studied in detail in 1887 by Anton Weichselbaum.

The meningococcus is a coccus 0.6-one mcm in diameter, resembling a coffee bean, and is found in pairs. The organism is gram negative. As distinct from pneumococci, meningococci are joined longitudinally by their concave edges while their external sides are convex. Spores, capsules and flagella are not formed. In pure cultures, meningococci occur as tetrads (in fours) and in pus they are usually found within and less frequently outside the leucocytes.

Meningococci produce toxic substances which possess properties of exo- and endotoxins. Disintegration of bacterial cells leads to the release of a highly toxic endotoxin. Meningococci readily undergo autolysis, which is accompanied by accumulation of toxins in the medium. The meningococcal toxin is obtained by treating the bacterial cells with distilled water, or 10 normality solution of soda, by heat autolysis, by exposure to ultraviolet rays.

Antigenic structure & resistance

Meningococci were found to contain three fractions — carbohydrate, which is common to all meningococci, protein which is found in gonococci and type III *S. pneumoniae*, and a third fraction with which the specificity of meningococci is associated. According to the International Classification, four groups of meningococci are distinguished, groups A, B, C, and D. Recently the number of types has increased to seven, but only the first two are dominant.

The meningococcus is a microbe of low stability, and is destroyed by drying in a few hours. By heating to a temperature of 60°C it is killed in 10 minutes, and to 80°C, in two minutes. When treated with one per cent phenol, the culture dies in one minute. The organism is very sensitive to low temperatures. Bearing this in mind, test material should be transported under conditions which protect the meningococcus against cooling.

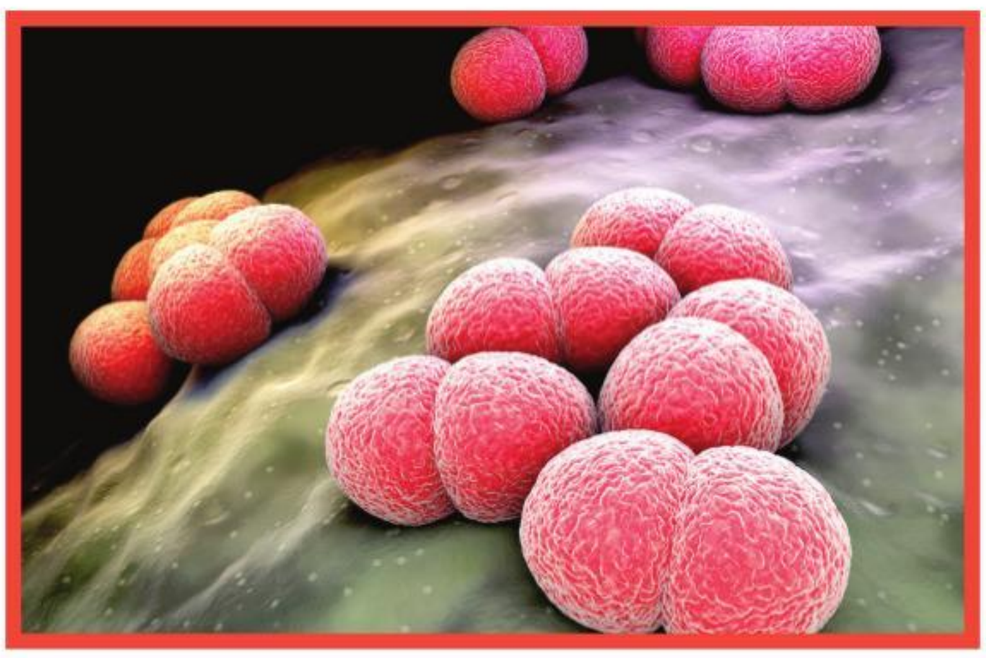
Pathogenesis & diseases in humans

People suffering from meningococcal infection and carriers are sources of diseases. The infection is transmitted by the air-droplet route as the causative agent is localised primarily in the nasopharynx. From there, it invades the lymph vessels and blood and causes the development of bacteraemia. Then as a result of metastasis the meningococci pass into the meninges and produce acute pyogenic inflammation in the membranes of the brain and spinal cord (nasopharyngitis, meningococcaemia, meningitis).

The disease usually arises suddenly with high temperature, vomiting, rigidity of the occipital muscles, severe headache, and increased skin sensitivity. Later, paresis of the cranial nerves develops due to an increase in the intracranial pressure. Dilatation of the pupils, disturbances of accommodation, as well as other symptoms appear. A large number of leucocytes are present in the cerebrospinal fluid, and the latter after puncture, escape with a spurt because of the high pressure.

In some cases, meningococcal sepsis develops. In such conditions the organisms are found in the blood, joints and lungs. The disease mainly attacks children from one to five years of age. Before the use of antibiotics and sulphonamides, the death rate was extremely high (30-60 per cent).

The population density plays an important part in the spread of meningitis. During epidemic outbreaks, there is a large number of carriers for every individual affected by the disease. In non-epidemic periods, however, the carrier rate increases in the spring and autumn. Body resistance and the amount and virulence of the causative agent are significant. Depending on these factors, the spread of infection is either sporadic or epidemic.



Meningitis can also be caused by other pathogenic microbes (streptococci, *E. coli*, staphylococci, bacteria of influenza, mycobacteria of tuberculosis, and certain viruses). These organisms, however, cause sporadic outbreaks of the disease, while meningococci may cause epidemic meningitis.

Immunity & laboratory diagnosis

There is a well-developed natural immunity in humans. Acquired immunity is obtained not only as a result of the disease but also as the result of natural immunity developed during the meningococcal carrier state. In the course of the disease agglutinins, precipitins, opsonins, and complement-fixing antibodies are produced. Recurring infections are rare.

Specimens of cerebrospinal fluid, nasopharyngeal discharge, blood, and organs obtained at autopsy are used for examination. The following methods of investigation are employed -- microscopic examination of cerebrospinal fluid precipitate; inoculation of this precipitate, blood or nasopharyngeal discharge into ascitic broth, blood agar, or ascitic agar; identification of the isolated cultures by their fermentative and serologic properties, differentiation of meningococci from the catarrhal micrococcus (Branhamella catarrhalis) and saprophytes normally present in the throat. The meningococcus ferments glucose and maltose, whereas Branhamella catarrhalis does not ferment carbohydrates, and Neisseria sicca ferments glucose, levulose, and maltose.

Treatment

Antibiotics (penicillin, oxytetracycline, etc.) and sulphonamides (streptocid, methylsulphazine) are prescribed. Prophylaxis is ensured by general sanitary procedures and epidemic-control measures (early diagnosis, transference of patients to hospital), appropriate sanitary measures in relation to carriers, quarantine in children's institutions. Observance of hygiene in factories, institutions, public premises, and lodgings, and prevention of crowded conditions are also obligatory.

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