

the Perfect Red, by Hubert von Onna, September 2009

Around the year 1606/7 Cornelis Jacobszoon Drebbel (1572 Alkmaar, The Netherlands – 1633 London, UK) developed a new dye, the 'perfect red'. A deep scarlet red dye, the most beautiful color red that existed. He manufactured the pigment by adding 'kings' water / 'aqua regia' and tin to a mixture of cochineal, an organic pigment, that is produced by processing large quantities of feminine coccus insects.



Alkmaar 1597, map, engraved by Drebbel

Was Drebbel's *trouvaille* a lucky coincidence or did he develop the 'perfect red', because of market demand?



Cornelis Drebbel, Selfportrait, 1623

Cornelis Drebbel was familiar with chemical substances and experiments. As an apprentice of the engraver and painter Hendrick Goltzius in Haarlem, he co-operated with him in experiments with saltpeter and tin salts. They must also have been familiar with the expensive cochineal as the pigment was used by painters. Perhaps were they searching for a method to make 'artificial gold', a popular activity in those days, with the use of cochineal.

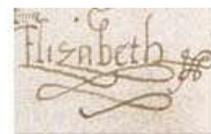
Or was it around 1600, during his stay in the city of Middelburg, that Drebbel became acquainted with the red dye 'Rubia tinctorum' that was produced in that region, Zeeland? The Archive of the Staten of Zeeland (Zeeland, one of the Seven United Provinces of the Republic of the Netherlands) owns a Register, a book, made of tanned sheep-skin, the cover of which is painted with cochineal.



Sir Francis Bacon Viscount St Alban, by John Vanderbank, 1731?, after a portrait by an unknown artist (circa 1618)

To a great extent, Drebbel's innovations and constructions were inspired by Francis Bacon (1561-1626), philosopher, innovative scientist and - some time later - leading Statesman, Drebbel knew well. Central theme of Bacon's philosophy was the improvement of the quality of life by study and research: applied science. With new understanding and pioneering ideas, one's life was at risk in major areas of Europe, if you came into conflict with the religious dogma and the story of the creation of the world: the world, as it then was, was ready and unchangeable, the earth was flat ...

Autumn 1603 Drebbel and family left the city of Alkmaar in the Province North Holland for England, where a nice position and fixed income were waiting. The family was accommodated at Eltham Palace. Francis Bacon was one of the quartermasters. Drebbel became a member of the court of King James VI of Scotland, who took the royal office in 1603 as King James I of England. James, a Stewart, succeeded Elizabeth, his aunt, the last of the Tudor dynasty. In the year 1586, he explicitly agreed with Elisabeth's death sentence over his mother, Mary Tudor, Queen of Scotland, niece and rival for the English throne.



James moved his court from Edinburgh to London and hired hundreds of new courtiers whose task it was to increase his status throughout Europe.

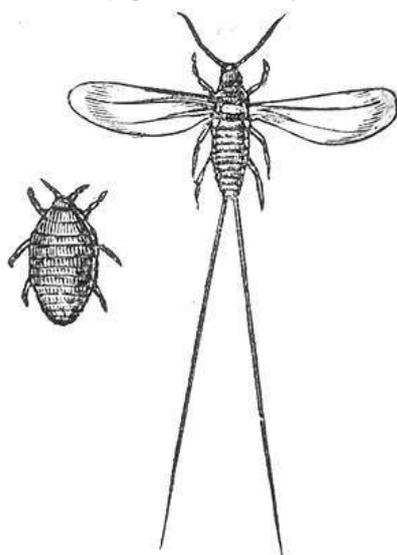
Cornelis was one of the Low Landers who received an invitation. Drebbel's booklet, 'the Miracle Discovery' dedicated to King James, in which he described a Perpetuum Mobile, was - most probably - useful in this respect. Drebbel's essay was only published in 1607 by Gerrit Pietersz.(Schagen), *Bookseller, living on the corner of the Meent / at the Weighing house / in Alckmaer*, with the title *'Miracle Discovery of the perpetual movement, by the Philosopher from Alckmaer, Cornelis Drebbel, by an eternally moving spirit, locked into a globe / dedicated to the high allmighty King Jacob of great Brittangen, openly displayed here. Printed at Alckmaer, by Jacob de Meester*

In order to restrict the imports and to stimulate the craftsmanship and local business, James I-VI stimulated the local manufacture¹ of silk, glass, tapestry, dyed cloth and other luxury goods. Skilled labor from the Low Countries, France and Italy were invited to come to England. In order to emphasize their wealth and good taste, the English dressed more and more fashionably and colorfully with all kinds of cloth, like silk and velvet. The masques, loved by the royal family, also needed extravagant cloth in fancy colors. Tobacco, coffee, chocolate and tea from Asia and Africa were available in England. And demand rose for clocks, lacquered furniture, tapestry, chimney decoration, crystal, paintings and jewellery. The first shopping centers emerged in London.

Cochineal: E120 = cochénille; cochineal-red; cocheneal-extract; CI Natural Red 4; Sun Red 1; Crimson. With electronic color-code the number 2. Carmine, a natural organic and animal pigment. Dye in food, like in smarties, yoghurt with strawberry taste, cosmetics, medicine, alcoholic beverages and oil paint and watercolor. One of my favorite artists, Bob Ross -the joy of painting- uses a lot of red -also named crimson- at his painting lectures.

In the sixteenth and seventeenth century, Spain had established a lucrative monopoly on the material cocheneal, the pigment for 'red', that was imported from Mexico. The Spaniards, enemies of England and the Low Countries, fully controlled the supply. The extraction of cocheneal was a State secret. Access to the regions where the pigment was produced –in particular Mexico- was forbidden for foreigners; the death penalty for those who betrayed the extraction and process. Only Spanish citizens were allowed to trade the pigment. Nevertheless many attempts were undertaken to unveil the secret. Cargos of cocheneal occasionally came abroad outside Spain through the hijacking of Spanish ships by the English and Dutch.

Carmine-pigment -the dye- is obtained from the secretion of the female coccus insect - *Dactylopius coccus* Costa. It is found in South America, in particular Mexico where the Spaniards got acquainted with it via the Inca around 1550. As a parasite, the insect lives on the leaves of the cactus Opuntia.



Cocheneal

The male coccus -with wings- lives short and dies after having performed its marital duty, the fertilization of the female. Large quantities of female lice are needed to earn sufficient carmine. The harvest of a plantation of one hectare is around 300-400 kilogram (kg) lice and app. 140.000 lice are needed to produce 1 kg of pigment. Soon, the Spaniards discovered that cocheneal pigment fetches a fortune in Europe. The locals were forced to produce cocheneal; with their exorbitant profits, the Spaniards financed the Armada – the fleet that conquered England- and the war against the Republic of the Seven United Provinces, the Dutch.

¹ Exposition Consuming Splendor, Folger Washington

Now-a-days, red is the color of love

Colors represented paradise, whether lost or not. The dull daily life was spiced by cheerful festive colors. Like purple, purple from Thyrene, a sign of wealth, power and good taste, the traditional colors of Phoenician, Greece and Roman nobility. For one pound of dye, around 30.000 purple snails were needed to produce 4 grams of concentrated color. A millennium before, the Minoan civilization on the island of Crete that might have descended from India, also used purple dye. In the Middle Ages, farmers in France spent an annual income or more for a scarlet red vest for their bride².

After 1606, Drebbels' dye was applied in the dye-works in Stratford-Bow on Lea. It conquered the world as "*Bow-dye*" and "*Drebbel's scarlet*"³. In 1606, Francis Bacon, 45 years old, married the fourteen year old Alice Barnham. Bacon was exuberantly dressed in scarlet cloth. Was it Drebbel that delivered the groom's fancy cloth?

Around 1630-35, Drebbel's two sons-in-law exploited a professional dye-work and renamed Drebbel's innovation in *color Kufflerianus*. Abraham Kuffler had married Anna Drebbel in the year 1622 and in 1627 Johan Sibertus Kuffler married the thirty year old Catharina Drebbel. Around the middle of the seventeenth century, the beautiful Drebbel's red conquered continental Europe⁴. With different acids all kind of variations were developed based on "*Drebbel's scarlet*": deep cherry-red, impassioned red, vermilion red, etc. Drebbel's red was applied for the dying of tapestries at Manufactures des Gobelins in France. In the year 1655, Drebbel's technology was introduced there by Nicolaes Clock or Kloeck, who used to cooperate with Drebbel. He was a relative of the cloth dyer Kloeck or Gluck from Amsterdam. The most fashionable outfits at court were red, Le Roi Soleil – Sun King - Louis IV adored them. Scarlet red blankets became a medium of exchange with the Indians in New Netherland, Manhattan and the Hudson Valley. The insurgents who would behead King Charles I, the successor of James, wore scarlet red cloaks. Catholic priests had red bonnets and robes, symbolizing their spirits and martyrs. Cardinal-red was the symbol for the willingness of the catholic cardinals to sacrifice their blood for the church. Officers of the Redcoats, an English army component, that fought in the American war of liberation, wore scarlet red coats. The uniforms of the Russian Imperial Guard and the kilts of the Scottish army were scarlet red. Not a good choice for camouflage....

It was only at the end of the 19th century, beginning of the 20-th that the Drebbelprocess was replaced by synthetic methods in Germany.



Often, Drebbel's innovative constructions had to do with measurement and control technology and optics: a Perpetuum Mobile, an incubator for eggs, which produced mid-winter chicken, to the amazement of the London citizens. Drebbel designed a solar energy system for the city of London (perpetual fire), demonstrated at the court how to regulate the temperature (air conditioning) – varying the temperature in a room from freezing cold to very hot within an hour – ordered lightning and rain 'on command', constructed a portable oven with an optimal combustion efficiency, able to burn at a constant temperature with help of a smart thermostat/regulator. As a forerunner of the Opera, he designed and constructed stage-props for the popular masques: automata, fireworks, fountains and virginals that played on solar energy. He developed an improved version of the telescope (*verre gesigt*) and the first microscope (*lunette de Dreubells*). He was involved in the plans to reclaim the moors around Cambridge. He built a camera obscura, a *laterna magica*, all kind of optical devices, forerunners of the barometer and thermometer, the "*Drebbeliaensch instrument*", developed a lens-grinding machine, devised a methodology to optimize the exploitation of the silver mines, asked permission to organize a lottery. In the year 1620 he built and navigated a submarine in the river Thames, producing oxygen for that experiment. He developed torpedoes and sea-mines and was involved in a plan to build a theater in London -the musician William Byrd was also involved. With Balthasar Gerbier, Drebbel served the Duke of Buckingham with the design and development of the gardens of York House, which the Duke acquired after Francis Bacon was appeased from his position as Lord Chancellor.

² Van Karmijn, Purper en Blauw, Herman Pleij, 2002 Prometheus

³ Prof. Dr. F. M. Jaeger, *Cornelis Drebbel en zijne tijdgenooten* (Groningen 1922).

In 1621 several reprints of Drebbel's essay: "*Grondige oplossing van de Natuer en Eyenschappen der Elementen*" - *Thorough Solution of the Nature and Characteristics of the Elements* – appeared, in which Drebbel described a methodology that gives the impression that he was able to produce oxygen: *'So the body of Saltpeter broken and resolved by the power of fire and so changes into the nature of air'. soo het lichaam des Salpeters gebroken en ontbonden wort, door de kracht des vuers, en alsoo verandert in de natuur des lochts'*.



Constantijn Huygens,
Michiel van Miereveld, 1641

In his diary the Dutch poet and state-official Constantijn Huygens (1596 -1687) wrote about Drebbel's microscope: *'Not only from his hand but also from his miraculous brain dates the what I call the 'standing binocular. Had Drebbel during his whole life done nothing else than construct this miracle tube, without doubt, his name would have become immortal (Niet alleen van zijn hand maar ook van zijn wonderbaarlijk brein stamt wat ik de 'staande kijker' noem. Al had Drebbel in zijn hele leven niets anders gepresteerd, dan nog had hij zich met dit wonderlijke buisje ongetwijfeld een onsterfelijke naam verworven'.*)

During his last years, *Drebbel* was involved in a plan to reclaim the moors around Cambridge and he exploited an Alehouse at the banks of the river Thames near the Tower bridge. November 8 1633 Cornelis passes away.

With his spectacular and innovative contributions, Drebbel was an important pioneer in the fields of optics, chemistry, measurement and control systems and mechatronics. Brilliant engineer, pragmatist and do-er. He was an Edison from Alkmaar, with his own lab for the development of innovations having market appeal. Cornelis Drebbel, a versatile and brilliant person, is famous throughout the world, except in Alkmaar.

Sources: www.drebbel.net,
A Perfect Red: Empire, Espionage, and the Quest for the Color of Desire by Amy Butler Greenfield

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