Maria Sibylla Merian (1647–1717)

Harini Nagendra

Born 369 years ago, Maria Sibylla Merian was an exceptional woman for her times. A naturalist and artist par excellence, she studied the relatively ignored area of insect metamorphosis, drawing intensely detailed and accurate portraits of insects feeding on host plants at different stages of their life cycle. In 1699, she travelled from Holland to Surinam, spending two years there, and returned with material for a large volume on tropical insects and plants. In recent times, there has been a great resurgence of interest in Merian's work.

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Maria Sibylla Merian grew up in Frankfurt, surrounded by art and artists. Maria's father, Matthaeus Merian the Elder, was a well-known engraver and artist, who died when she was quite young. Her stepfather, Jacob Martell, a famed flower painter, and his students taught her painting as well as engraving – skills she was to develop considerably later. Her stepbrothers were artists as well, as was her husband, Johann Andreas Graff, another pupil of her stepfather.

Formidably talented, Merian had learnt how to engrave on copper by the age of 11 years. Soon, at the young age of 13, Merian embarked on what was to become a lifelong study of the metamorphosis of larvae. She began with silkworm larvae, feeding them with lettuce and mulberry leaves, documenting the transformations she observed. Later, finding that other caterpillar species produced butterflies and moths that were more beautiful, she began to collect varieties of caterpillar species, along with their host plants, and to rear them at home, making detailed drawings of the various stages of their transformation from wingless caterpillar to pupa to winged butterfly or moth.

Married at 18, and a mother of two girls by the age of 31, Merian continued practising art. She taught painting and embroidery to

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girls, publishing her first book in 1675 – a collection of flower paintings meant as samples for students to copy or embroider. By this time, Merian, Johann and their first daughter, Johanna Helena, had moved from Frankfurt to Nuremberg, where she continued her investigations of insect metamorphosis. Merian painted each developmental stage with its appropriate host plant in vellum (parchment), grouped them together in visually pleasing arrangements, and carefully engraved the entire set on a single copper plate: a unique arrangement that was quite different from the arrangements of insects used by other naturalists of her time. She used the engravings to create mirror images as prints on paper, hand colouring them with painstaking detail.

Her first caterpillar book, published in Nuremberg in 1679, was *Der Raupen Wunderbare Verwandelung und Sonderbare Blumennahrung* (*The Wondrous Transformation of Caterpillars and their Remarkable Diet of Flowers*). The book contained 50 engraved plates, each focused on a single species, representing its complete life cycle. Each plate was accompanied by text that described the habits and behaviour of the insect, and the associated host plant or plants for various life history stages. Although lacking names, the plants and insects were vividly drawn and clearly identifiable.

Merian later moved back to Frankfurt with her family, publishing a second book on caterpillars in 1683. Shortly thereafter in 1685, Merian moved with her mother and daughters to a religious commune of Labadists in Friesland, divorcing her husband soon afterwards. Through these repeated moves and domestic upheavals (including the death of her stepfather and stepbrother), Merian continued her focus on metamorphosis, describing the life cycle of change from frog eggs to tadpoles in 1686.

In 1690, Merian and her daughters left the commune and moved to Amsterdam. She and her daughters built on their reputation as artists, being well supplied with caterpillars by a small army of other naturalists who brought her their finds from adjacent heath and moorland habitats. Her older daughter met and married a

former Labadist, who was a trader with the Dutch plantation colony of Surinam. Given the extensive Dutch trade with Surinam, a number of travellers had brought back collections of colourful insects to Amsterdam, which, quite naturally, attracted Merian's attention.

At the age of 52, in 1699, Merian boarded a ship for Surinam with her younger daughter.

In Merian's own words, "In Holland, I saw with wonderment the beautiful creatures brought back from the East and West Indies, especially when I had the honour to be able to see the splendid collection belonging to the Most Honourable Gentleman Dr Nicolaas Witsen, Burgomaster of the city of Amsterdam and President of the East India Company, as also that of the Honourable Gentleman Mr Jonas Witsen, secretary of that city. In addition, I also saw the collection of Mr Frederick Ruysch, Medicinae Doctor, Anatomes et Botanices Professor, the one belonging to Livinus Vincent, and many others, in which I found these and countless other insects, but without their origins and subsequent development, in other words, how they develop from caterpillars into chrysalises and so on. All this stimulated me to undertake a long and costly journey to Surinam (a hot and humid land from where the above-mentioned gentlemen had obtained these insects) in order to pursue my investigations further." [1].

Such a decision of long distance travel was not to be taken lightly in the 17th century. The idea of a middle-aged woman undertaking a long and dangerous (because of tropical diseases, to which many travellers to Surinam succumbed in the 17th century) journey to Surinam to study and draw insects, seemed ludicrous to many. Unfazed, Merian financed the journey herself, prepared her will (just in case!), and boarded a ship for Surinam with her younger daughter in 1699, at the age of 52. She and her daughter travelled around the riverside city of Parabimbo, staying in a plantation near the surrounding riverside jungle. She closely observed the animal, insect and plant life in the jungles of Surinam, collecting and rearing caterpillars and their succeeding life cycle stages on local host plants with the help of her daughter, local natives, and African slaves. Dutch settlers ridiculed her

Merian's vividly coloured paintings depicted the spectacular variety of insect life in the tropical jungles of Surinam.

work, while for her part she thought them lazy and selfish, and deplored their brutal treatment of slaves and servants. Despite the tropical heat, which impacted her health, Merian carried on with determination, recording the perishable stages (caterpillars and pupae) on vellum, and preserving the butterflies and moths in alcohol to take back home. Eventually, exhausted by persistent illness, she was forced to leave for Amsterdam, having spent less than 2 years in Surinam.

On reaching Amsterdam, Merian created a series of lushly coloured paintings depicting the vivid, spectacular insect life teeming in the tropical jungles of Surinam. From 1701–1705, encouraged by a number of admirers – both naturalists and artists – she undertook the arduous and technically complex challenge of publishing a folio work, supervising engravers and collating 60 plates with lavish illustrations (*Figures* 1–3). Called *Metamorphosis Insectorum Surinamensium* (*The Metamorphosis of the Insects of Suriname*) and printed bilingually in Latin and Dutch, this collection made her famous the world over. In addition to depicting a number of insects new to science, she also illustrated a number of important economic plants, many of which (such as the sweet potato or pineapple) were relatively unknown in Europe at that point.

Merian planned to publish a second folio, on the theme of Surinam's reptiles and amphibians (following on her work on amphibian metamorphosis in the Labadist commune). She also planned to translate her work to German, but did not succeed in either of these projects, possibly due to the expense and effort involved. She did, however, continue her work on European caterpillars, producing a third volume of her 'caterpillar' series which her younger daughter published after Merian's death. Merian worked until the age of 68, stopping only when she had a stroke in 1715. After a lengthy illness, she died a registered pauper in 1717. Ironically, shortly after her death, the Russian Czar, Peter the Great purchased a set of her drawings for a large sum of money; unfortunately, she never saw or had a chance to benefit from this money.

Figure 1. In Merian's own words [1], "This plate shows the Cassava plant, *Manihota esculenta*. The caterpillar with black-yellow striped body and blood red head and hind parts, attacked a whole field of the *Cassava* during my stay in Surinam. In December 1700, it turned into a brown chrysalis and emerged as a white and black flecked moth with yellow-orange spots on its body (*Manduca rustica*). The snake (*Corallus enhydris*) I added to complete the decoration on the plate. It is naturally twisted and curiously speckled. Its fat belly shows that it was carrying eggs similar to those depicted on the *Cassava* root. The eggs have blue-speckled skin like the eggs of crocodiles or turtles and are oval in shape."

Figure 2. In Merian's own words [1], "This is a ripe *Ananas* (pineapple), which must be peeled to be eaten. This fruit tastes as though one had mixed grapes, apricots, red currants, apples, and pears and were able to taste all of them at once. Its smell is attractive and strong. The caterpillar which sits on this pineapple I found in the grass beside the pineapples in 1700 at the beginning of May. It was light green with red and white stripes along the whole body. On 10 May it changed into a chrysalis, and on 18 May, a very beautiful butterfly (*Philaetria dido*) emerged decorated with luminous green flecks, which is shown twice, resting and in flight. If the butterfly is observed through a magnifying glass, the 'dust' on the wings resembles fish scales with three branches on each scale, covered with long hairs. The scales are so symmetrical that they can be counted without any difficulty. The body is covered with feathers interwoven with hairs. On the crown of the pineapple, sits a small reddish worm which spins a thin web wherein lies a small chrysalis; this is the small worm which eats the cochineal insect. Above the web of that little worm lies a chrysalis whose skin I opened. I found therein a cochineal which is represented further up on the crown of the pineapples and is no other than the body of the two beetles depicted dormant and in flight, their red wings framed with a black border. I added this beetle (*Chilocorus cacti*) merely to decorate the plate."

Figure 3. Tree-dwelling spiders or pink-toed tarantulas (*Avicularia avicularia*) are shown eating ants, a hummingbird, and an insect on a guava tree (*Psidium guineense* Swartz). *Avicularia avicularia* are native to northern South America and are also known as bird-eating spiders. Included are leaf-cutter ants, army ants, huntsman spiders, and a ruby-topaz hummingbird [2].

After her death, Merian's engravings, illustrations and specimens were in high demand amongst collectors across Europe. Yet, her work also received a surprising amount of criticism. Naturalists were quick to criticise the few errors that she made in the Surinam folio, connecting the larva or pupa of one species with the mature butterfly or moth of another. Yet such mistakes were perhaps inevitable given the difficult field conditions under which she worked in Surinam, and the relatively short duration of her visit. A later edition of the book, published two years after her death, added plates engraved by another naturalist which were full of errors, and for which she was (most unfairly) criticised. Contemporary reviewers criticised her for being a peculiar woman with strange interests, fearing that her travel to far off places like Surinam set a bad example for other women of her kind.The many racist, sexist, plain nasty (and ignorant) 19th century critiques of her work in Surinam only serve to highlight the remarkable and path-breaking nature of her work in the 17th century.

Widely known for the artistic quality of her images, the level of detail in Merian's illustrations is often insufficiently appreciated. The illustrations are remarkable, enabling many species of insects to be identified despite the centuries that have elapsed since the illustrations were prepared. Departing from the practice used by other naturalists of her time, she vividly depicted the association between host plant and insect, separating generalists (feeding on multiple plant species) from specialists (where each life stage of an insect species would feed only on a single species). She often recorded the life cycle of plant species as well, depicting buds, seeds and fruit with the same level of detail she accorded to insect life cycles.

Merian's illustrations are so spectacular that they tend to attract most of the attention, while the level of detail in her accompanying text is only recently beginning to receive the credit it deserves. She was one of the earliest scholars to observe and record the phenomenon of metamorphosis in frogs in 1686 (*Figure* 4), at least 13 years before Antonie van Leeuwenhoek[1] more famously documented this in a letter to the Royal Society. While working on the systematization of plant and animal species in his classic work, *Species Plantarum* and *Systema Naturae,* Carl Linnaeus[2], the Father of Taxonomy, used and cited some of her plant illustrations and many of her insect illustrations.

[1] *Resonance*, Vol.16, No.1, 2011.

[2] *Resonance*, Vol.5, No.6, 2000.

The richness of her drawings is rivalled only by the rich textual detail accompanying them, as can be seen in the text accompanying many of the illustrations reproduced in this article. For instance, she mentions that a species of caterpillar, when starved, fed on other caterpillars. She illustrated *Acacia* trees stripped entirely bare by leaf-cutter ants. In doing so, she was observing animal–plant interactions with the eye of an ecologist, not just of a taxonomist or an artist. She also recorded indigenous knowledge and local uses of the plants in Surinam by native residents in great detail. She trained her daughters as illustrators, and her work inspired a great deal of naturalist illustration in subsequent decades and centuries.

Figure 4. Frog metamorphosis as depicted by Merian. Pen and ink with watercolor and bodycolor on vellum, 23 by 32 cm.
Courtesy: The Trustees of the British Museum.

In recent times, there has been a great resurgence of interest in Merian's work, with a number of plant and insect species, as well as a species of spider and of a lizard named in her honour. A commemorative stamp was issued in her honour by the German Government in 1987, as part of the *Women in German History* definitive stamp series. An exhibition of the work by her and her daughters at the J Paul Getty Museum can be viewed online at http://www.getty.edu/art/exhibitions/merian/. Happy browsing!

Suggested Reading

[1] **M S Merian and S O'Brien-Twohig, *Metamorphosis Insectorum Surinamensium* (Or, Transformations of Surinamese Insects), *Review: Literature and Arts of the Americas*, Vol.45, No.1, pp.21–28, 2012.**

[2] **http://jcb.lunaimaging. com/luna/servlet/s/yu0j08**

[3] **K Etheridge, Maria Sibylla Merian: The first ecologist? In: V Molinari and D Andreolle, Editors, *Women and Science: Figures and Representations – 17th Century to Present,* Cambridge Scholars Publishing, Newcastle upon Tyne, pp.35–54, 2011.**

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[5] F F Pieters and D Winthagen, Maria Sibylla Merian, naturalist and artist (1647–1717): A commemoration on the occasion of the 350th anniversary of her birth, *Archives of Natural History*, Vol.26, No.1, pp.1–18, 1999.

[6] W T Stearn, Maria Sibylla Merian (1647–1717) as a botanical artist, *Taxon*, Aug 1, pp.529–34, 1982.

[7] S Valiant, Maria Sibylla Merian: Recovering an eighteenth-century legend, *Eighteenth Century Studies*, Apr 1, pp.467–79, 1993.

[8] http://www.theatlantic.com/science/archive/2016/01/the-woman-who-made-science-beautiful/424620/