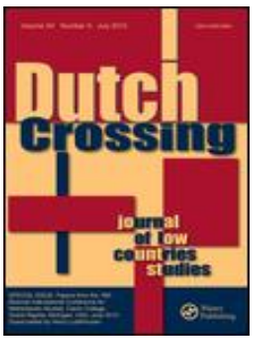

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Crossing Disciplines: The Fruitful Duality of Maria Sibylla Merian's Artistic and Naturalist Inheritances

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At the end of the seventeenth century Maria Sibylla Merian, then in her fifties, set out from Amsterdam bound for Surinam. Sketchbook and watercolours in hand, she was to spend two years travelling, sketching plants and animals, and following her passion: to unravel the mystery of metamorphosis. Historians have compared Merian unfavourably with early modern taxonomists, arguing that because she did not publish on scholarly matters we must conclude that she did not debate ideas about natural philosophy. However, Merian was firmly rooted in an artistic network that was enthusiastically amenable to the sharing of information and subjects. Ties with family, friends, and artistic mentors promoted her training in art, and encouraged her curiosity for *naturalia*. Her multi-generational *artistic* networks set her in good stead to participate in the community of *naturalists*, a group that she contributed to as well as learned from. These two networks provided different but related stimuli for Merian's lifelong projects, as knowledge and practices of science and art rapidly transitioned around her. Merian's dual inheritances, in art and taxonomy, rendered her watercolours a touchstone between artistic and proto-scientific communities; and her art replaced text in the natural philosophy that she championed.

KEYWORDS Maria Sibylla Merian, Naturalist, Surinam, botany, nature, Netherlandish, art history

Maria Sibylla Merian, a naturalist and a painter of flowers, plants, insects, and animals, lived in Frankfurt, Nuremberg, Amsterdam, and South America between 1647 and 1717. In a detail from the frontispiece to Merian's book on Surinam, re-published after her life, we see a woman surrounded by, and indeed defined by, the tools of her trade — or the intriguing detritus of a lifetime's passion (Figure 1). The image shows Merian holding a butterfly and a flower; it includes a pineapple plant and a copy of Merian's Surinam book; and cherubs investigate trays of *naturalia*, with verdant Surinam in the background.

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FIGURE 1 F. Ottens, artist. J. Oosterwijk, etching. *Maria Sibylla Merian: Suriname Insect Book*, Title Plate, detail. Amsterdam: J. Oosterwijk and G. Valck, 1719.
University of Groningen Library

Merian's artistic and scientific contributions were curiously marginalized in the nineteenth and twentieth centuries, and it is only recently, with the current groundswell of interest in environmental matters, that her important contributions are again being unearthed. Many of Merian's contemporaries understood the importance of her work: she established a studio and taught painting classes; left a rich *oeuvre* of watercolours, oil paintings, and etchings; and was highly praised by Joachim von Sandrart, who published a biography of German artists (Sandrart, 1675, I: 339; Reitsma, 2008: 23). But she was equally significant in the world of science. Naturalists collected and discussed her publications, later botanists and physicists used her images as evidence, and a poem written on the publication of her second book placed it in the same league as publications by leading European naturalists.[1]

At the end of the seventeenth century, Merian, a successful artist, engraver, author, naturalist, and teacher, set out from Amsterdam bound for Surinam, South America. But what brought her to this stepping-off point? What prepared her to make this decision? And what effect did this foray into another land and culture have on her life's work?

What *was* Merian's identity, and what *were* the communities that she inhabited? Was Merian a creature of *art* or *science*? Or is it more accurate to view her identity as 'contorted' between stages of transformation, like an organism going through transition as its environment, Europe and the European understanding of the world, transitions, an organism transforming to adapt to new environments and possibilities? Indeed, Merian was a *hybrid* creature carrying aspects of both proto-science and art; and concurrently inhabiting parallel communities. She applied the style of *flower painting* to the tradition of *entomological* study and to the activity of *scientific observation*, essentially crossing disciplinary boundaries in her own artistic and naturalist practices (Figure 2).

Merian sketched from nature and painted floral still lifes with a scientific eye; her scholarly knowledge informed her artistic subjects; into her art, she integrated the exotic subjects available in the marketplace, eventually following them to their source, to record them in their natural habitat. In her life and work we see again and again the convergence of art and science; the interweaving of her careful analytical methodology with her passion for direct experience of the natural world. When she wrote about her practical methods, she used the language of science. She noted observing tiny creatures from life, investigating outcomes, and inventing techniques for raising caterpillars and for developing vibrantly colourful paints. In the introduction to her caterpillar book, she explained that the she had categorized specimens by appearance, by seasonal behaviour, and by similar life-stage processes. At the age of thirteen, Marian had already witnessed silkworm metamorphosis, nearly a decade before anyone published a description of the process. Merian seems to have had an intuitive sense of the importance of her work. One type of caterpillar took twelve years of experimentation to raise to the moth stage. When it finally emerged, Merian made a note in her study book describing her eagerness to paint it, and to, in her words, 'make it something that would be on the page forever' (Todd, 2007: 72).

FIGURE 2 Maria Sibylla Merian, *Sweet Potato Plant with Parrot Flower*, 1701–05, watercolour and bodycolour on vellum.
The Royal Collection, Windsor Castle (RL 21198)

In trying to understand how Merian brought the practice of art to the study of natural philosophy, or proto-science, I am using the idea of the scholarly network to trace Merian's mixed artistic and scientific inheritances. I am interested not just in Merian's circle of scholarly associates, but in networks of knowledge and of ideas that stretch through many generations, surfacing in publications, in artistic traditions, and in connections of family, friends, or religious groups. I am curious about networks of beliefs, assumptions, and opinions. Merian learned from her peers in art and botany, and from the scholars who published before her, but equally from the painted and engraved models she saw from an early age. Her *home* was an important learning environment where her parents and step-parents mentored her in art and related trades.

Merian was born into a household ideal for someone interested in drawing and botany. Her father, Mathias Merian the Elder, owned a thriving Frankfurt printing house. He specialized in books of maps and pictures that he, his children and his sons-in-law illustrated. Most of Merian's step-siblings were young adults, and the whole family was engaged in the activities of printing around which the household revolved, setting type, etching illustrations, planning future publications, and meeting with clients (Wettengl, 1997: 205).

The capacity for printed material to spread ideas is well documented, but it is also important to recognize that the printing house itself was an important communication centre, where connections were made and ideas were debated. Writers visited the printing house directly to check on the progress of print jobs, and there they had lively debates with the community of clients that developed around the well-informed printers. An early modern French traveller described the hubbub he experienced when he went to purchase a book from a European printer: 'Here very often right in the shop you can hear them discussing philosophy no less seriously than once Socrates and Plato discussed it in the Lyceum' (Todd, 2007: 23).

Merian's fascination with images was particularly suited to the milieu of her father's business, which brought ideas and images from the outside world into her own home. Other publishers were releasing pamphlets on politics, prayer, or household tips, but Merian's father specialized in more expensive, carefully illustrated items. Even before Merian was old enough to read, she would have seen her father's engravings of city maps, illustrated religious books, illustrations of the medicinal use of plants, and images of dragons and mermaids in alchemical texts. One book seems particularly relevant to Merian's lifelong journey — one of the Merian family's most lucrative sellers was a series printed from plates inherited from Merian's step-great-grandfather, Johan Theodor de Bry. Titled *Grand Voyages*, the series chronicled the adventures of dozens of early explorers, and was richly illustrated with lush tropical countryside and fantastic animals and people (De Bry, 1591). Another important inherited set of engraving plates was *Florilegium Novum*, Johan de Bry's illustrated book of flowers, which the family republished again and again (De Bry, 1611). I believe that Merian learned from the presence of these images on a number

of levels, that they influenced her artistic style, her interest in natural subjects, and her confident approach to the business side of selling flower images.

At home, where one first forms ideas about life and behaviour, Merian's mother participated in the printing business; Merian and her sister drew flower embroidery designs to be printed and sold; and Merian developed her artistic practice, her interest in *naturalia*, and her business acumen. In many German cities, powerful guilds and journeymen's organizations prohibited women from becoming professionals, but in practice these rules were subverted, and wives, widows, and daughters often engaged in family businesses (Wettengl, 1997: 19).

Indeed, Merian's early life is a layering of training in different arts and practices. Each time circumstances forced her to move into a new household, she adapted to the new environment, benefiting from diverse teachers, and experiencing different conditions that fostered her artistic and scientific training. From her first step-siblings, with whom she had lifelong connections, Merian learned the techniques of engraving. Then, when Merian was still young, her artistic inheritance increased again. When her beloved father, the printer, passed away, her mother remarried the art dealer and painter Jacob Marrel, and Merian moved from a household that served as a print shop into a household that was an art shop and a studio. Her new home was frequented by art dealers, and again inhabited by apprentices, and step-siblings who assisted in the family business.

From her stepfather Jacob Marrel, Merian learned how to use art materials, parchment and brushes; to mix pigments; and she shifted from drawing to painting. Merian learned practical methods, but her style may also have a debt to her family and stepfamily, and to the artistic lineages that they brought to her life. If Merian's interest in clear, accurate renditions of the wonders of nature may relate to her *first* home, her artistic style may show a connection to her *second* family and home. Marrel shared with Merian his rich artistic heritage. He admired the work of Caravaggio, and had studied with Frankfurt's still life master, George Flegel. Marrel specialized in floral still lifes, and Merian participated by finding insect models and doing flower sketches and paintings (Wettengl, 1997: 57).

When Merian's stepfather had to leave Frankfurt, Merian's mother took over running the art shop. For mother and daughter this was a time of greater responsibility in the household and business. But of course it would also have been a time of greater freedom, of increased self-management and self-expression. Merian's art reflects this shift in focus from communal projects to personal interests. This is when she began her serious studies of insect phases. The first image in Merian's sketchbook, or study book, depicts a subject that Merian called 'the most useful and noble of all worms' (Todd, 2007: 18). It was a silkworm.

We can see the beauty of Merian's art. But Merian's work is also of significance to the history of science. Merian meticulously observed and recorded the life stages of insects at a time before the empirical method was popularized, when the subject of insect transformation was more likely to be ascribed to magic or divine intervention than to natural processes. Merian's work was ahead of its time, both in terms of her

methods of observation and her interest in recording animal transformations and the environments that supported them. At the beginning of the seventeenth century, the doctrine of spontaneous generation prevailed. According to the theory of spontaneous generation, parent insects did not always give birth to young of their own kind. Instead matter itself produced creatures (Davis, 1995: 150).

According to early seventeenth-century belief, cabbages parented caterpillars that were born through holes in its leaves. Rainwater gave birth to frogs. Old wool was the mother of moths. Insects were conceived in mud, or by dung, trash, and old snow. On the authority of Pliny, it was understood that dew shrank into seeds that grew into maggots; and silk moths came from vapour on oak blossoms, usually during the rain, which was why they grew fur to keep warm (Pliny the Elder, 1847–48: II, ch. VIII, 41; Dampier, 1966: 114).

Of course, early modern observation of insect transformations complicated these ideas, but for some these metamorphoses appeared to *support* the theory of spontaneous generation. Was the change of a caterpillar into a butterfly really different from that of a cabbage into a caterpillar? Was the change into a butterfly a *development* or was it actually a *new birth*? People debated such questions as: how could an insect of one kind grow body parts of a different kind? How could matter re-form itself?

As people struggled with these notions, new observations were layered onto, but did not immediately displace, earlier theories. When discoveries were made in insect anatomy, earlier theories of spontaneous generation were retained, even by leading naturalists like Swammerdam and Redi, as possible exceptions to the newer consensuses. Even in the late seventeenth century, for example, the British Royal Society investigated whether spiders in Bermuda produced silk, whether frogs in Guiana could be created by throwing water onto the floor, and whether the Brazilian locust turned into a plant and another insect also found there changed into a bird.

Merian's lifetime saw a burgeoning of technological developments that led to new processes of botanical study. Scientists and philosophers had already begun to eschew the traditional reliance on either scripture or logic, asserting the value of direct observation. Technological breakthroughs in the telescope, microscope, and camera obscura encouraged new ways of seeing (Jardine, 1999: 97, 106, 117; Field and James, 1993: 52). Merian applied this new technology and her empirical methods not to recording microscopic details, but to pursuing the objects of her passion: the investigation into metamorphosis and the interdependence of plants and insects that she considered fundamental to their survival.

At the end of the seventeenth century, Amsterdam was a nexus of science and art, its port brimming with collections of curious natural objects and the marvellous foodstuffs, animals, plants, and shells being offloaded from Africa, Indonesia, and the Americas. Here Merian cultivated relationships with natural philosophers, publishers, and art patrons, and had access to gardens, book, and art fairs, and to collections that included specimens of plants, insects, and human and animal anatomy (Davis, 1995: 167; Wettengl, 1997: 145; Field and James, 1993: 56). Merian sketched from these collections, and searched for floral and insect specimens in city gardens and

in those of the aristocracy. But she did this not only for the joy of collecting. She always seems to have had her eye on matters of metamorphoses and interspecies interdependence. She collected insects and the food they ate, keeping them alive through generations of metamorphoses and sketching and re-sketching their phases. She raised a species repeatedly before feeling confident enough to make a final painting of its life cycle (Merian, 1683: 15).

Then, at the end of the seventeenth century, Merian, now just over fifty years old, wrote her will, sold 250 of her paintings, packed up her art materials, and, along with her youngest daughter, Dorothea, boarded a ship sailing to South America.

In the mosquito-infested heat of the small Dutch protectorate of Surinam, Merian's new environment called for revised methods in the pursuit of her artistic and naturalist interests. Her immediate community, her household, now consisted of two housemaids and a gardener. They, along with Merian's daughter, became important to her artistic process, accompanying her when she collected specimens and offering valuable information about materials. In these new conditions, Merian also developed different working methods.

As she seems to have done her whole life, she began her work close to home and then expanded from there. She still had access to fields and kitchen gardens and the marvellous organisms they supported, and she continued to investigate the relationship between insects and agriculture. But, in several important ways, Merian's artistic output and proto-scientific interests were fuelled by the knowledge base of her new acquaintances. She became very interested in the medicinal value of plants, and was fascinated by plants and animals that changed colour over the course of their lifespan. She had always been interested in pigments, and now the Surinamese taught her about the pigments they used as body paints. Merian travelled along the Surinam River. Her research benefited greatly from gifts brought to her by the relatives of her housemaids: flowers, flowers, insects, moths, and butterflies from the rainforest and their villages. Another new development in Merian's research methodology was the integration of what we would now call community-based research: she integrated stories and local explanations into her knowledge and visual descriptions (Merian, 1705: 36, 49, 59). Some of the images of changing life-phases painted at this time rely on people's explanations, as well as on direct observation, and this may explain the added emotional poignancy of their artistic treatment.

The abundance of life in South America must have shocked Merian, with her finely attuned eye for colour and for interspecies interaction. One naturalist wrote that, while the total number of butterfly species in the UK was about sixty-five, and in all of Europe about 325, there were at least 700 species within an hour walk of his home near the Amazon.[2] The interdependence of species that Merian encountered entered the artistic treatment of her subjects. In her Surinam pieces, there is suddenly more going on. The images are busier. Plants grow on other plants, and several species of insects compete for a foothold in their host plant, making each tiny ecosystem alive with multiple interspecies relationships (Figure 3).

FIGURE 3 Maria Sibylla Merian, *Guava Tree, Leaf-Cutter Ants, Tarantulas, and Hummingbird*, 1701–05, watercolour and bodycolour on vellum.
The Royal Collection, Windsor Castle (RL 21172)

The scientific community's acceptance of species mimicry and the evolution it drove were many years in the future. But Merian had already witnessed first hand the complicated connections among organisms and their ecosystems. It is important to recognize the valuable input Merian had from local guides: it is due to both her commitment to direct observation and the valuable help from her local assistants that she documented insects and behaviours that were previously unknown in Europe.[3]

The vibrant South American environment suited Merian's style and her natural interests. Merian's images, rich in botanical information, differ from the period botanical images that favoured grid-like treatments emphasizing similarities among same species (Jardine et al., 1996: 101; Reitsma, 2008: 209). Instead, Merian was committed to investigating interspecies interconnections, and relationships among organisms and life phases. She once complained that she could not use some butterflies that had been sent to her because the man who had sent them had died without having told her about the process of their generation (Merian, 1980: 73). Merian's art is more scientifically accurate than most period still-life flower paintings, but also more *artistic* than most contemporary *botanical* sketches and paintings; and, as we have seen, some of the inter-species connections seen in Merian's art preceded European knowledge by a hundred years.

Upon returning to Europe from Surinam, Merian would go on to paint and publish her Surinamese book with sixty images; to raise and sketch more caterpillars, and publish books on them; to paint another series on garden plants; and to illustrate both a botanical garden catalogue and a publication on the famous collector Georgius Rumphius (Jardine, 1999: 236). Merian's legacy lived on in her many imitators, in her former art students, and in the lives of her daughters, one of whom returned to Surinam while the other was commissioned to design the exhibits of Peter the Great's *Kunstkamera* and to document the artefacts, which included art by Merian.

But I like to picture Merian as she appears in the frontispiece (Figure 1), recently returned from her voyage, piecing together field notes and sketches, remembering the stories of surprising Surinamese insects, with the scent of pineapple and jasmine still clinging to her clothing, painting in the late style of bright pigments that evidences Amerindian influence. Her impassioned comments about 'the generation and reproduction and transformation of the animals, and how one emerges from the other, and the properties of their food', could have been spoken moments ago (Merian, 1980: 73). The fortunate convergence of Merian's subjects and style with our twenty-first century environmental sensibilities gives us a feeling of affinity with Merian's focus on interspecies interdependence, and the notes excitedly penned in her study book now ring true.

Notes

[1] See Christopher Arnold's 'Introductory Poem', in Merian, 1679; James Petiver, John Ray, Michael Bernhard Valentini, Anton van Leeuwenhoek, and Czar Peter the Great, among others, respected Merian's researches. Her style influenced naturalists Mark Catesby and August J. R. von Rosenhof; French physicist Rene-Antoine Ferchault de Reaumur and Danish zoologist J.C. Fabricius used Merian's

published images as evidence for their theories; and in *Natural Systems*, eighteenth-century botanist Carl Linnaeus referenced Merian's work almost forty times (Davis, 1995: 313; French and Etheridge, 2007: 82).

[2] See Henry Walter Bates in Todd, 2007: 169.

[3] For example, Merian recorded the lifecycle of the Surinamese *Pipa pipa* toad that carries its fertilized eggs on its back, the first known example of an amphibian without a free-swimming larval stage (French and Etheridge, 2007: 79; Wettengl, 1997: 237; Davis, 1995: 187).

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