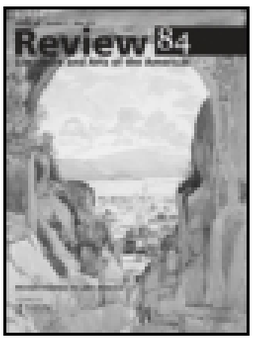

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Maria Sibylla Merian: The Dawn of Field Ecology in the Forests of Suriname, 1699–1701*

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In June 1699, pioneering German entomologist Maria Sibylla Merian traveled to Suriname with her twenty-one-year-old daughter Dorothea Maria with the seemingly implausible purpose of studying the process of metamorphosis among the insects of the embattled Dutch colony. The sojourn in Suriname—which lasted until June 1701 and produced the world's first long-term zoological field study, *Metamorphosis insectorum Surinamensium* (*Or, Transformations of Surinamese Insects,* 1705)—was chronicled in a series of watercolors, engravings, and commentary through which this traveling naturalist and artist captured the lifecycle of numerous exotic insects and reptiles, "all illustrated and described in America from life and in natural size" (Merian 84). The book—praised for its "unprecedented accuracy and detail"—would "establish a new standard in natural history" (Etheridge 2011, 15) and certify Merian as a pioneer botanical artist and the world's first field ecologist.

The unlikely voyage was the natural progression of her life-long fascination with the then little-understood process of metamorphosis. Born in Frankfurt am Main in 1647, the daughter of Mathias Merian the Elder, a well-known artist and publisher, and his second wife Johanna

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Sibylla Heim, Maria Sibylla learned the drawing, painting, and copperplate engraving skills that would give her work its distinctive aesthetic quality from her father, brothers, and stepfather Jacob Marrel, himself a well-known painter, engraver, and art dealer. From the age of thirteen she would use these skills in the service of recording and documenting her observations of the processes that turn a sinuous ungainly caterpillar into an unappealing pupa and on to a gaily colored and delicate butterfly or a somber-hued moth. As a self-trained scientist, Merian had inserted herself at a very young age into one of the most hotly-debated scientific issues of her time—that of establishing biogenesis (the belief that every living thing came from a pre-existing living thing) as the accepted understanding of the origin of life forms. Her own experiments with caterpillars, particularly as presented in her *Wonderful Transformations and Singular Flower-Food of Caterpillars . . . Painted from Life and Engraved in Copper* (which she published in two volumes in 1679 and 1683), were important interventions in the debate against abiogenesis (the belief in the spontaneous generation of certain forms of life, particularly insects, from non-living matter, especially from decaying organic substances) and heterogenesis (the belief that a form of life can derive from another one, such as bees generating from flowers).[1] By the time she felt the urge to travel to the colonies, she was already recognized as a noted entomologist and artist. Her *Blumenbuch*, a collection of copperplate engravings of flowers, had appeared in three parts between 1675 and 1680. Most important, perhaps, for the work she would accomplish in Suriname, was *Wonderful Transformations . . .* , which, like *Transformations of Surinamese Insects*, depicted insects from life in their various stages of metamorphosis organized around the plants on which they fed.

Merian's research destination, Suriname, flowed naturally from her scientific, artistic, and religious interests. Having moved with her two daughters in 1685 to Wieuwerd, Friesland, to join a Labadist community[2]—leaving her husband, the painter Johann Andreas Graff, whom she eventually divorced—she ultimately settled in Amsterdam, one of the busiest ports and most culturally active cities of seventeenth-century Europe. There, her keen interest in the variety and richness of the insect world was gratified by the many specimens brought by travelers to Dutch colonies worldwide and kept in tantalizing cabinets that attested to the territories' rich biodiversity, albeit, as Merian explained in *Transformations of Surinamese Insects*, "without their original and subsequent development" (Merian 85). Of the various Dutch colonies worldwide, Suriname was foremost in Merian's mind, as the Labadists had attempted to establish a settlement in the territory and still ran an ill-fated sugar estate, the Providence Plantation.[3] Avid to record these specimens in their natural habitat, and supported by the sale of many of her paintings and a grant from the city of

1. These principles had begun to be questioned only recently in the work of Sir Thomas Browne (*Pseudodoxia Epidemica*, 1646), Francesco Redi (*Experiments on the Generation of Insects*, 1668), and Jan Swammerdam (*Historia Insectorum Generalis*, 1669). On Swammerdam, see Ruestow 1985.

2. Raised a Lutheran, Merian gravitated to the Labadists and lived in their community in Holland for five years. The Labadists, founded by Jean de Labadie (1610–1674), a French pietist, were a seventeenth-century Protestant religious movement that lived in emulation of the early Christian Church as a community of holy persons that eschewed pride and attachments to possessions.

3. The plantation's best claim to fame was as the site from which "a large number of rebel slaves escaped to become one of the founding clans of the Saramaka Maroons" (Price 96). Merian visited the plantation in April 1701.

Amsterdam,[4] Merian set out in defiance of conventions to expand the reaches of her ecological methodology among the deep and verdant forests of Suriname. The voyage was the first "undertaken for pure entomological reasons" (Prete 126).

In Paramaribo, where she settled with her daughter, Merian occupied a liminal social space that marked her understanding of the world she negotiated (sometimes awkwardly) for two years. She lived literally between plantation and forest, openly critical of the planters' obsession with sugar yet facing the physical difficulties of penetrating the dense forests that contained many more species of insects and plants than she could readily comprehend. A white woman whose sensibilities were not attuned to planter society, she lived in constant conversation and plant exchanges with the slaves and indigenous dwellers familiar with the forests and its plants and creatures. A woman of acute powers of observation whose self-enforced mission was to chronicle accurately the specificities of the interactions among organisms in the liminal terrain between plantation and forests in Suriname, she was not interested in the depiction of the social world of the plantation, which impinges on her work only to the extent that it flaunts the natural processes she studies. Full of groundbreaking information to communicate to a world avid for scientific knowledge, she was not gifted with a facile pen for anything other than scientific fact. What she thought of the society of Suriname comes across through bits and pieces of commentary—mostly critical—of planters who cannot see beyond the cultivation of sugar and are, in the process, turning a blind eye to the richness of the threatened biodiversity surrounding them, with its promise of healing substances and potential food security. If her pen does not flow easily, however, her paintbrushes captured with vivid elegance the varied denizens of the forests, and reflected in the violence of nature an embattled plantation society where competition and stress were paramount.

The frontispiece to the 1771 French edition of her work, *Les insectes de Suriname*, introduces visually the liminal aspect of the terrain she occupied. In this charming rendition, the Surinamese landscape is encased in a window seen from within the abode of the Muse of Natural History, who—surrounded by quarreling putti wreaking havoc with specimen boxes and a copy of Merian's book open on the floor—sits by the window that frames the figure of Merian in equally quarrelsome surroundings: immersed in the landscape collecting insects, between Dutch landowners glancing on in disapproval and slaves in the distance carrying supplies. The space framed by the window is one that encapsulates (perhaps unwittingly) the tensions of colonial life in Suriname. The foreground shows the creeping vegetation of the bush encroaching on the cleared land of the plantation. The main plantation house and the slave dwellings face each other across the frame as conflicting spaces; the deforested mountains in the background speak of the toll plantation development

4. The City of Amsterdam's support made Merian "perhaps the first woman ever to receive a research travel grant!" (Russell 8–9).

placed on the forests of the colonized territory. In the very center of the space, Merian crouches to collect a specimen with her butterfly net—seemingly indifferent to the staring planters. The scene captures her solitary and unique endeavor, while the foreground image framing her connects that endeavor to a scientific pursuit that was not without its commercial and imperial value.

Suriname—as Londa Schiebinger eloquently argues in *Plants and Empire: Colonial Bioprospecting in the Atlantic World*—was at the time of Merian's visit part of the West Indian biocontact zone scoured by European prospectors "for new plants and animals of scientific, commercial or medical value" (McCook 210). Merian—being neither young, medically trained, part of an official expedition, nor a person of ample means—may not have been typical of the scientific visitors busily surveying the region, but her own personal enterprise was closely linked to Dutch proto-imperial goals, whether or not she intended it to be so. As a result, she faced cultural and social obstacles in negotiating the complexities of Suriname's colonial hierarchy. The disapproval of the planter class runs as a subtext throughout her commentary in *Transformations of Surinamese Insects*.

In Suriname, Merian encountered a hybrid local society that included Dutch, Huguenots, Germans, English, Jews, Indians, and slaves. The colony had come firmly under Dutch control only in 1667 (the English had settled for a small trading post in North America, later known as New York), and was administered by the Society of Suriname, a private corporation founded in 1683 by the City of Amsterdam, the Van Aerssen van Sommelsdijck family, and the Dutch West India Company. A territory whose leaders were focused on making it a profitable enterprise, the planter class exercised significant control over political and economic matters. They relied on African slaves to cultivate coffee, cocoa, sugar cane, and cotton on plantations along the rivers, relegating the indigenous population to the dense tropical forests of the interior. The clearing of these forests had become a matter of concern, as the sugar industry that so obsessed Surinamese planters consumed prodigious amounts of wood, both through the cutting down of trees to open fields for cultivation and through the need to fuel the sugar boilers. As Richard Grove argues in *Green Imperialism*, the "full flowering of what one might term the Edenic island discourse during the mid-seventeenth century closely coincided with the realization that the economic demands of colonial rule over . . . island colonies threatened their imminent and comprehensive degradation" (5).

Aphra Behn, in her novel *Oroonoko* (1688), already pondered what the increasingly intense clearing of the Caribbean forests would mean for the indigenous peoples and animals relegated to the diminishing woods. Behn's sojourn in Suriname in 1653 coincided with "The Great Clearing," the period between 1650 and 1665, marked by devastating deforestation

throughout the British and French Caribbean that resulted in significant soil erosion and "the scarcity and high price of timber for construction and fuel wood, particularly for refining the sugar" (Williams 102–2). The geography of Behn's novel—which reflects the development of the plantation economy in British-held territories in the first half of the seventeenth century—is built on the social and economic separation between the cleared land of the sugar plantation to which the narrator and later Merian belonged as European women, and the dense woods that were the domain of the indigenous inhabitants on which Merian depended for a significant portion of her information and specimens. That division forced the planters—already dependent on food imports for their survival—to rely on the indigenous forest dwellers who "supply us with that 'tis impossible for us to get" (Behn 12). Behn's text alludes repeatedly to the increased pressure placed on the forest fauna by the demand to help feed the growing plantation population, recognizing the forests as endangered liminal terrain.

Merian's research into the life cycles of the fauna in that very same forest offers us a glimpse of the rich ecology of this emerging Dutch colony. Her two-year study marks Suriname and its forests as a crucial space in the development of the methods and procedures of field ecology (the study of plants and animals in their natural settings). As such, Merian's work highlights the tensions between the monocrop system emerging as the dominant form of agriculture in the colony and the varied agriculture that the terrain's biodiversity would have made possible. Her text showcases the earliest glimpses of environmentalism in the region—of the expressed interest in balancing the interactions between humans and their broader ecological milieu according to what Aldo Leopold later described as an "ethic dealing with man's relation to land and to the animals and plants which grow upon it" (Leopold 238). Merian's seminal displacement from her adopted Amsterdam to the Surinamese forest—and her insistence on the possibilities its biodiversity would offer to an otherwise sugar-obsessed emerging plantocracy—gives us an early understanding of the struggle waged between European exploitation of the cleared land and indigenous and African principles of environmental sustainability. In so frequently giving voice to the indigenous and African inhabitants of the colony while criticizing the planter elite, her text opens a space for contention about environmental and biodiversity issues absent from other scientific studies of the period.

Merian's vision of the colony was not political but ecological, centering on "interactions in nature and on transformative organic processes" (Davis 151). The keystone of her groundbreaking contribution as a scientist and artist is her painstaking observation and detailed representation "of insect behaviors and their ecological relationship with host plants" (Etheridge, forthcoming, 12). This reflects Merian's own goals as a field scientist. As she explains, "all these little creatures were placed on the

plants, flowers and fruit which they ate for nourishment ... sometimes accompanied by species of West Indian spiders, ants, snakes, lizards, rare toads and frogs, all of which I myself sketched and observed from life, with the exception of a few which I added on the testimony of the Indians" (86). In a letter to English collector James Petiver, she had underscored her methodological goals, explaining that she "was not looking for any more creatures, but only at the formation, propagation, and metamorphosis of creatures, how one emerges from the other, the nature of their diet ..." (qtd by Davis 181). Kay Etheridge, seeking to demonstrate Merian's claim to the title of history's "first ecologist," argues that

> Merian's contributions often have been treated by historians as an interesting side note to the main pathway of events of her time: the study of systematics and the taxonomic organization of organisms. A more accurate view of Merian's work would be to see it as a significant tributary feeding into a growing stream of knowledge, and one whose presence altered the course of the main stream by introducing ecological content. By illuminating interactions among organisms and painting communities, Maria Sibylla Merian demonstrated that nature is most interesting when viewed outside of confining little boxes of collections and categories (Etheridge, forthcoming, 17).[5]

5. For more on the nature of the scientific knowledge generated through Merian's work, see Hochstrasser 2010.

Merian's concerns with biological communities in their sustaining ecologies fuel her objections to the planters' disregard for the natural bounty surrounding them, with its offerings of fruits and vegetables, eggs, and edible fauna as sources of protein, and a variety of other useful plants that could be exploited for export and profit in a more sustainable agricultural system than that provided by sugar cultivation. Although this critique is never articulated systematically, the nature of her criticism of the planter class suggests that she extrapolated from the natural world some principles of proto-sustainability that would be applicable to planter society. The fact that these principles are derived from knowledge about the natural world partly drawn from her indigenous and African informants accentuates the cultural richness of the creolized space Merian occupies in Suriname as a self-taught female scientist with few ties to the hierarchies of power—in short, as a woman willing to learn from marginalized communities whose knowledge is rarely privileged by Europeans.

An analysis of Merian's extra-scientific commentary in *Transformations of Surinamese Insects* conveys the binary nature of her assessment regarding local communities and their environment. On the one hand, she credits the indigenous and African population with superior knowledge of the uses and properties of the local flora, underscoring their success at engaging with that environment in a sustainable way. Of the cotton tree, she writes that "the Indians lay the green leaves on fresh wounds to cool and cure them ... [its] cotton is spun by the Indians;

from it they make the hammocks in which they sleep" (94). The palisade tree, she reports, "is split to make the rafters from which . . . houses and huts in America are built" (95). The cashew, when roasted, "is good against diarrhea and also gets rid of worms" (98). The seeds of the peacock flower

> . . . are used by women who are in childbirth in order quickly to promote labour. Indians, who are not well treated when in service to the Dutch, use it to abort their children so that their children should not become slaves as they are. The black slaves from Guinea and Angola must be treated benignly, otherwise they produce no children in this their state of slavery; nor do they have any; indeed they even kill themselves on account of the usual harsh treatment meted out to them; for they consider that they will be born again with their friends in a free state in their own country, so they told me themselves (124–125).

The Dutch settlers, on the other hand, in their obsession with sugar-cane planting, eschew the knowledge that would allow them to engage more "naturally" with their environment and profit from it more sustainably. As Merian reports, American cherries "could probably be better cultivated if the country was inhabited by a more industrious and less selfish population" (93). "The *Granaat Boom* [pomegranate tree] with its fruit and blossom grows well in Suriname, yet it is cultivated very little by the inhabitants" (94). The American plum tree "grows wild and ungrafted, for the Europeans in this area grow nothing but sugar-cane" (96). Of the vanilla plant, she writes that "its use in chocolate is well known; it is a pity that no-one in this country is interested in cultivating such things as well as other plants which could doubtless be found in this large and fertile country" (108). Of an unknown variety of plant similar to tobacco she would write that "its name and properties are not known in Surinam; the people here have no desire to investigate anything like that; indeed they have mocked me for seeking anything other than sugar in this country; yet (in my opinion) one could find a great many other things in the forest" (Merian 117).

Merian's representation of the cassava plant (Fig. 1), from whose roots "is baked the bread usually eaten by Indians and Europeans in America" (Merian 91), demonstrates both her method of artistic illustration and the way in which her explanatory notes navigate the space between natural and social worlds, privileging indigenous knowledge. Here she represents one of the most useful plants found in the West Indies, adopted by both indigenous and European populations as a locally abundant source of flour. It is shown as the habitat and food for the *Anartia jatrophae*, the white- and brown-flecked butterfly Merian depicts in three stages: as a hairy brown caterpillar, a reddish pupa, and two views of the chrysalis. She has observed the metamorphosis "in Mr van Vreedenburg's cassava plantation," describing both the plant's adoption into and her own navigation of the plantation. To the illustration she has added a young

Fig. 1. Maria Sibylla Merian, *Manioc* (1705). Plate 4 from *Metamorphosis insectorum Surinamensium* (*Or, Transformations of Surinamese Insects*), vol. 2 (1980–82). Images supplied by Royal Collection Trust / © HM Queen Elizabeth II 2012.

Sauvegard (which grows as large as a crocodile), whose eggs are eaten by the Indians. She is thus able to reflect her growing interest in the reptiles she has encountered in Suriname while pointing to the business dimension of her pursuits since "another whole book could follow about such creatures, if I see that this work is appreciated by amateur naturalists and sells well" (90).

The multi-layered nature of Merian's commentary, as seen with the cassava plant, underscores her assessment of the colony as a beleaguered space, in which the symbiosis between insects and the plants they feed upon—extended to the relationship between indigenous and African populations and nature—is ruptured by the plantation's unsustainable approach to the environment. Merian's binary depiction of the stress between the "natural" symbiotic relationships between insects and plants and the planters' refusal to engage sustainably with the landscape mirrors the racial and class tensions intrinsic to the plantation system. The violent struggle for survival in nature—as in her dramatic image of a spider eating a hummingbird (see Fig. 2)—she finds echoed in the mistreatment of slaves and Indians that she repeatedly condemns in her commentary. The projected book on reptiles to which she refers would have been a space where this battle for survival could have found its full artistic range, as in her illustration of the "Common or spectacled caiman and South American false coral snake" (Fig. 3), a remarkably beautiful rendering of conflict and stress in the natural world.

Maria Sibylla Merian's voyage to Suriname unleashed a series of epiphanies that changed forever the way we look at the natural world.

Fig. 2. Maria Sibylla Merian, *Spiders and Hummingbird* (1705). Plate 18 from *Metamorphosis insectorum Surinamensium* (*Or, Transformations of Surinamese Insects*), vol. 2 (1980–82). Images supplied by Royal Collection Trust / © HM Queen Elizabeth II 2012.

Her paintings provided some of the most beautiful early depictions of tropical fauna and flora while offering groundbreaking observations of the nature of metamorphosis. As Kay Etheridge has argued, her voyage easily earned her the title of the world's first ecologist, as her images were the first "to emphasize interactions among the species portrayed—the very foundation of the study of ecology" (Etheridge, forthcoming, 1).

Fig. 3. Maria Sibylla Merian, *Common or Spectacled Caiman and South American False Coral Snake* (c. 1705–10). Images supplied by Royal Collection Trust / © HM Queen Elizabeth II 2012.

Her commentary, on the other hand, by extrapolating from her observations of the natural world principles of sustainability that were at odds with the spread of the sugar plantation, anticipated the crucial ways in which plantation development would in time become associated with unsustainable exploitation of the landscape. With that she may have earned the title of first environmentalist.

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