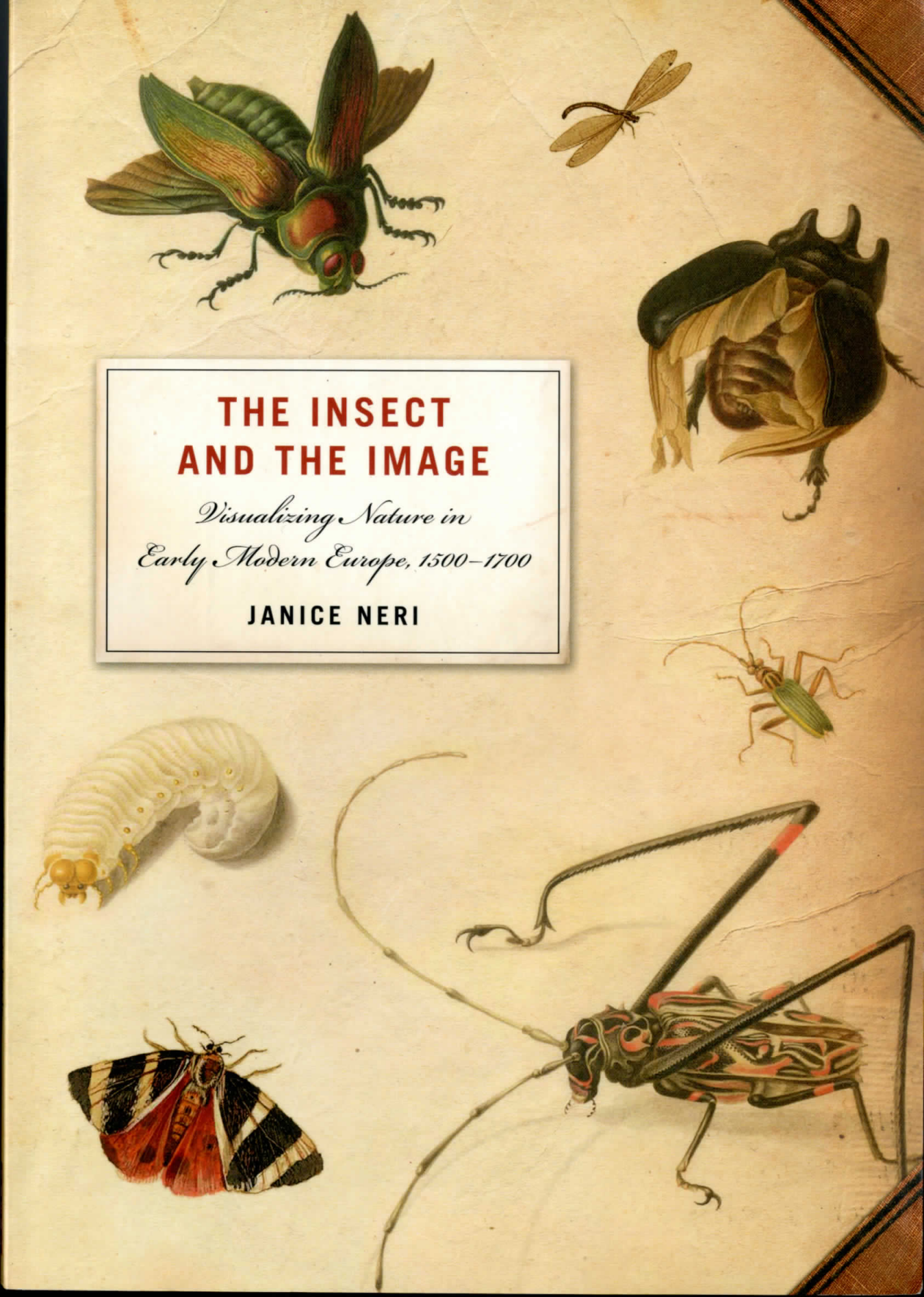

THE INSECT AND THE IMAGE

Visualizing Nature in Early Modern Europe, 1500–1700

JANICE NERI

FIVE

STITCHES, SPECIMENS, AND PICTURES

Maria Sibylla Merian and the Processing of the Natural World

By all accounts, including those written during her own lifetime, Maria Sibylla Merian was a remarkable woman who led an extraordinary life. Born in Frankfurt, Germany, in 1647 into the eminent artistic and publishing family of Matthäus Merian the Elder, Maria Sibylla demonstrated an early passion and talent for the subjects that would come to dominate her professional life. As a child she was fascinated by insects, and she raised silkworms in order to observe the stages of their development. She received artistic training in the workshop of her stepfather Jacob Marrel, where she became skilled in the depiction of flowers and other natural subjects, and like many young women of her social group she also learned embroidery and needlework from an early age. She was accomplished enough to offer lessons in these subjects to the daughters of several wealthy families in Nuremberg, where she and her husband Johan Andreas Graf settled in 1670. Merian referred to these students as her "company of maidens," and she worked with them on several projects that made use of the techniques she devised for colorfast painting on satin, linen, and silk—most notably a tent for an army general who "desired to have his field quarters designed to give him the illusion of living in a garden house full of birds and flowers."[1] It was for her company of maidens and others like them that Merian is believed to have published her *Neues Blumenbuch* in 1675, the first of a

three-volume series of floral designs for use as embroidery and needlework patterns, and the first of the artist's many illustrated publications. Merian was also actively engaged in the study of insects during this early period in Nuremberg, where she developed her unique approach to the visual representation of insect life cycles and collected and traded insect specimens, an activity that would come to serve as an important source of income for her later in life. Merian's *Raupenbuch* of 1680 presented innovative illustrations of butterflies, moths, and caterpillars that included picturing the stages of the insects' life cycles along with their food plants. The *Raupenbuch* represented the culmination of Merian's early research on insects and was the first of what would eventually form a three-volume series on European moths and butterflies. The study of insect life cycles, the art of painting and drawing, and the decorative concerns of embroidery and fabric design were the foundations upon which Merian would base her professional and commercial activities and would play an important role in her approach to the natural world over the course of her long and unusual career.

In 1685 Merian made a decision that profoundly affected both her personal and professional life. It was in this year that she left her husband and, along with her two daughters and her mother, joined the Labadist religious community at Waltha Castle near Wieuwerd in the Dutch province of Friesland. The Labadists maintained strict rules aimed at providing their members with complete separation from the outside world, and included among their precepts was the belief that marriages within their sect were valid only if both parties were Labadists. Merian never reconciled with her husband Graf, and he later filed for divorce and remarried. Merian and her daughters left the Labadists in 1691 and moved to Amsterdam, where Merian supported her family through the sale of drawings, insect specimens, and art supplies, and by offering lessons in painting and drawing. In 1699 Merian and her daughter Johanna Helena embarked on a journey to the Dutch colony of Surinam in order to observe, collect, and record the life cycles of South American insects. When they returned to Amsterdam in 1701 they brought with them a large number of specimens and drawings that served as the basis of Merian's most famous work, the *Metamorphosis insectorum Surinamensium*, published in Amsterdam in 1705. This illustrated volume of sixty copperplate engravings, accompanied by Merian's written accounts, was the high point of Merian's artistic career and established her reputation as a gifted artist and naturalist well into the eighteenth century.[2]

Although Maria Sibylla Merian has been the subject of extensive scholarly research, her far from ordinary life experiences have until recently posed a barrier to understanding the artist within her specific historical context. As Natalie Zemon Davis has shown, the topos of the remarkable woman has functioned as the lens through which Merian has been viewed from the earliest accounts of her life, and Merian herself was at times complicit in supporting such an interpretation. Davis's biography provides a richly detailed picture of the social

and cultural world Merian inhabited while also offering an important analysis of the relationship between Merian's gender identity and her focus on the organic interactions between plants and insects—or as Davis describes it, Merian's "ecological" approach.[3] More recently, Tomomi Kinukawa has explored Merian's place within the culture of early modern natural history, and has shown that Merian's many-faceted approach was shared by the local networks of burghers whose interest in the natural world stemmed from ideas related to religious reform, women's domestic roles, and a desire for knowledge of the individual things of the world through empirical observation. Merian's immense artistic talent has to some extent also been a barrier to understanding her visual imagery within its historical, cultural, and artistic contexts. While Merian is universally recognized as an extraordinary artistic talent, the meaning of her work beyond this extraordinary talent has been somewhat more difficult to pin down. Although Merian's illustrations of insect life cycles were innovative, she was not the first artist to depict the stages of insect development, nor was she the first artist to raise the portrayal of insects to "great art," nor was her research into insect development an important factor in resolving the heated debates among natural philosophers about the existence of spontaneous generation and the myriad associated philosophical and religious questions raised by this debate.[4] Analyses of Merian's imagery have often focused on distinguishing between the aspects of Merian's work that can be categorized as "art" and those that can be categorized as "science," with each of these understood as opposing forces engaged in a perpetual battle for dominance. Kurt Wettengl, for example, describes Merian's approach to illustration in *Metamorphosis* as "aesthetic" and "painterly" and sees other illustrations as exemplifying a "systematic, classifying methodological approach."[5] In this chapter I contend that there is little to suggest that Merian's approach in the *Metamorphosis* was not systematic or methodological, or that her approach in other visual work was not aesthetic.

In order to gain a better understanding of Merian's visual strategies and the significance of her illustrations it is necessary to look beyond questions of their artistic or scientific "value." Art and science were not separate concerns in Merian's work, nor is this the only axis by which Merian's imagery should be approached. I argue that the specific visual requirements of decorative arts practices such as embroidery and needlework played an essential role in the formation of Merian's approach to creating images of the natural world, and that Merian's involvement in the trade and exchange of natural history specimens within the community of collectors in Amsterdam during the 1690s was another important influence on her artistic development. It was in this milieu of preparing, circulating, and selling *naturalia* that Merian learned to see the natural world as composed of beautiful objects that could be bought and sold for profit. This chapter examines Merian's illustrations and drawings for publications she produced prior to *Metamorphosis* in order to show how these various

strands of her interests developed, and to show how they came together in the Surinam book. Merian's combination of skills in embroidery and needlework design, specimen preparation, and the observation of insect life cycles allowed her to create a book that offered European audiences an elegant and exotic vision of nature in the New World. In the illustrations for this work Merian used her wide-ranging talents to transform plants and insects into objects of exchange that could travel between continents and within cabinets; the techniques she developed for processing the natural world were the outcome of her immersion in the practices and culture of seventeenth-century natural history, but were also embedded within the practices of the global trade in commodities that came to serve as the foundation of the economic prosperity of early modern Europe.

Insects were a personal interest of Merian's, but they also suited her professional ambitions as an artist, author, and broker of natural history specimens. As discussed in part 1, by the later seventeenth century insects were well-established as subject matter for studying, collecting, and picturing in a variety of contexts. Although Merian's professional activities put her at risk of losing the respect of the international networks of collectors who preferred to obtain their specimens, books, and drawings through the exchange of gifts, the inherent interest and value of her subject matter was not at all in question. Rather, in order to garner interest in her insects, Merian needed to set herself apart. To do this, she not only cultivated the persona of the remarkable woman, but also ventured farther afield than Europe to find new insects that would satisfy the evolving tastes for the exotic among collectors and naturalists. In her culminating work, the *Metamorphosis,* Merian utilized all of the tools at her disposal to render nature newly exotic and collectable for this audience.

Blumenbuch Series: The Foundations of Merian's Visual Style

Merian's *Blumenbuch* series has received comparatively little attention from scholars in favor of the better-known *Metamorphosis* volume and the *Raupenbuch* series, but the *Blumenbuch* illustrations are important for understanding the concerns that would shape Merian's approach to creating images of the natural world throughout her career. The *Blumenbuch* series was published in Nuremberg in three parts between 1675 and 1680; in 1680 Merian issued a second edition of the series that contained all three volumes together under the new title *Neues Blumenbuch.*[6] Each of the three volumes consists of twelve copperplate engravings featuring a single flower type, with the title pages composed of floral garlands. At this early stage in her career Merian relied heavily on existing pictorial works as models for her own illustrations, but she adapted these models to the unique pictorial demands of embroidery and needlework design. The pictorial requirements of the decorative arts would come to play an

important role in Merian's illustrations, in particular her approach to representing relationships between insects and plants.

As the name implies, the *Blumenbuch* series focused primarily on illustrations of flowers. Merian created clear, uncluttered compositions of flowers and insects with bold, crisply outlined forms. Color played an important role in these compositions, as it would in her later work. Merian used broad areas of deeply saturated hues to block out and define the compositions. She stated in the preface to the second edition that the illustrations were "to be of use and pleasure to people who know and love art as [models] for drawing and painting and to women for sewing."[7] An essential component of a respectable young woman's education and upbringing was the acquisition of skills in embroidery and other types of crafts, and pattern books such as Merian's provided an essential source of motifs for women engaged in these activities. The earliest European pattern books were published in Italy beginning in the fifteenth century and focused on patterns for lace. With the spread of printing, however, came an increase in the type and number of pattern books, and by the later seventeenth century needleworkers had many books to choose from when composing their designs. Pattern books were primarily intended for women whose involvement with embroidery and needlework were leisure-time pursuits rather than professional activities, but the work of such "amateurs" was often very sophisticated and exhibited high levels of skill.[8] In composing her own book of models Merian drew extensively on the work of others, and as Sam Segal has noted, "although the title pages state that the motifs were painted from nature, the claim cannot be taken literally."[9] Copying models was a regular component of an artist's training and, like other artists engaged in the production of images "from life," Merian learned to create lifelike illustrations through the twinned processes of observing nature and following established examples. Segal has identified many of the sources Merian used for the *Blumenbuch,* and primary among these was Nicolas Robert's *Variae ac multiformes florum species. . . .*[10]

An example of the ways in which Merian adapted her models for the purposes of needlework and other types of handwork is reflected in a succession of images of an iris. A bearded iris and swallowtail butterfly appear as plate 8 of the first volume of the *Blumenbuch* (Figure 5.1). Several scholars have noted that Merian based this composition on a plate from Nicolas Robert's *Variae ac multiformes florum species . . .* (Figure 5.2).[11] Merian's *Blumenbuch* copy is reversed, and she made two other changes to Robert's composition: the tulip was replaced with an iris bud, and a swallowtail butterfly was added to the lower-left corner.[12] A vestige of the original tulip remains in the form of the short, truncated leaf that appears in the lower-left corner, where Merian incorporated Robert's tulip leaf into the leaves of the iris. Merian retained the compositional balance provided by the tulip while at the same time simplifying the overall arrangement by eliminating the tulip's stem, which in Robert's composition ran diagonally

Figure 5.1. Maria Sibylla Merian, *Neues Blumenbuch* (Nuremberg, 1680), plate 8. Photograph copyright The Natural History Museum, London.

through the center of the image. In the *Blumenbuch* engraving, Merian further simplified the image by creating even more distance between the individual elements of the composition. The leaves have been separated from one another and the butterfly has been lowered in order to distinguish it from the petal upon which it rests, and the central structures of the flower are silhouetted against a small area of white space that has been carved out of the center of the bloom.

Commentators on Merian's early work have generally understood the deviations she made from her models as evidence of her burgeoning artistic talent. Segal has described the changes Merian made to Robert's composition as "improvements" that gave the composition "a more natural appearance," and

Thomas Bürger's opinion of the effect of these changes is that they "breathe artistic life into floral pictures."[13] While this emphasis on Merian's originality and artistic talent is certainly justified, Merian's modifications can also be understood as a translation of Robert's original design into the medium of embroidery, and thus devised in response to the specific needs of the genre in which she worked. One of the foremost pictorial requirements of such pattern book

Figure 5.2. Nicolas Robert, *Variæ ac multiformes florum species . . .* (Rome, 1665). Photograph courtesy of Brown University Library.

images was that they be easily copied; the more distinctly defined the individual elements of a given pattern, the better the chances that a needleworker would be successful at translating the printed image into the medium of fabric and thread. The elegant interplay between negative and positive space demonstrated in Merian's iris and swallowtail composition was an important feature of her embroidery and needlework patterns, and it would later play an important role in her illustrations of the insects of Surinam.

Merian's *Blumenbuch* illustrations are also indicative of the close connections among botanical illustration, natural history imagery, and needlework practices in the early modern period. For example, the *Blumenbuch* images could have been used as models for making slips, an embroidery technique similar to appliqué, in which designs are stitched onto linen canvas backing in colored thread and then cut out (Figure 5.3). The cut out design, or slip, would then be sewn onto another piece of fabric, usually a more expensive material such as satin or velvet (Figures 5.4 through 5.7). This technique was often employed in the early modern period to create designs with floral or botanical motifs, and the term "slip" derives from an early gardening term for a plant cutting.[14] Often lighter-colored slips were sewn onto black or dark blue backings, creating a sharp contrast and accentuating the bright colors of silk threads. This technique provided a convenient method for arranging and rearranging elements of a composition before permanently attaching the slips, and often resulted in compositions containing sharp juxtapositions of scale. Illustrations from botanical and natural history books were often used as sources for motifs since they too possessed the uncluttered outlines necessary for embroidery patterns.[15] Merian's *Blumenbuch* illustrations present elegant and unified compositions made up of distinct pictorial elements and would thus have been highly appropriate for use as embroidery patterns; they are also an early indicator of the ease with which Merian was able to traverse the overlapping contexts of the decorative arts and natural history and botanical illustration.

Embroidered slips were often incorporated into "scrolling stem" designs, in which a curving vine or trellis served as both a support and a framing device for flowers, insects, animals, and other pictorial elements. The stem draws attention to individual pictorial elements by isolating each into a separate "compartment." The scrolling stem patterns of the sixteenth century tended to be dense and tightly woven, but in later periods these designs became more open by incorporating larger areas of space.[16] Although later scrolling stem patterns were loosely constructed, plant stems continued to be used to separate and frame pictorial elements. Merian's illustrations in the *Blumenbuch* utilize some of the same visual strategies as those found in the tradition of scrolling stem embroidery design. In one illustration, the ribbonlike leaf of a hyacinth provides a perch for a damselfly (Figure 5.8); in another, a damselfly is encased within the intricate patterns formed by the overlapping stems and petals of a bouquet of

Figure 5.3. Embroidered slip depicting cornflowers (uncut), English, c. 1600. Photograph copyright Victoria and Albert Museum, London.

Figure 5.4. Jacket, linen, embroidered with silk and metal thread, England, c. 1600–1625. Photograph copyright Victoria and Albert Museum, London.

Figure 5.5. Detail of embroidered jacket. Photograph copyright Victoria and Albert Museum, London.

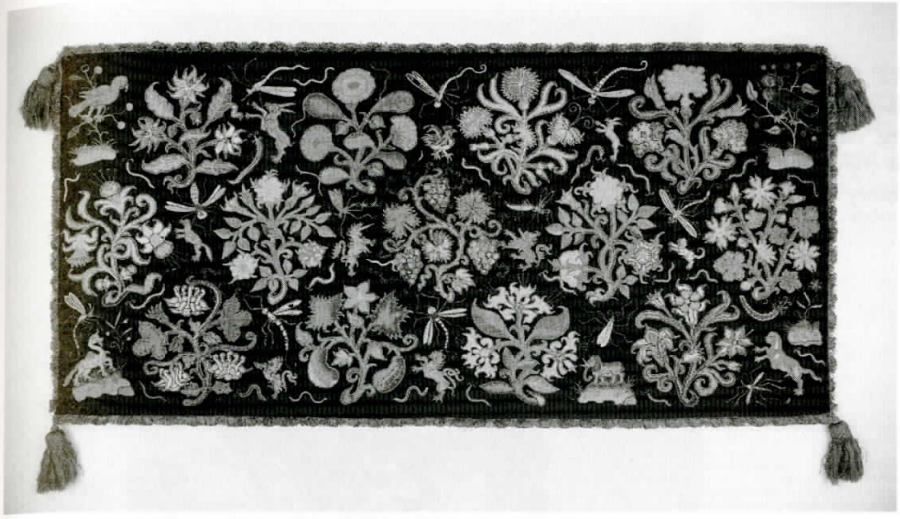

Figure 5.6. Cushion cover, silk velvet, with applied linen canvas embroidered with silk and metal thread in tent stitch and laid and couched work, England, c. 1600. Photograph copyright Victoria and Albert Museum, London.

Figure 5.7. Detail of cushion cover. Photograph copyright Victoria and Albert Museum, London.

Figure 5.8. Maria Sibylla Merian, *Neues Blumenbuch* (Nuremberg, 1680), plate 3. Photograph copyright The Natural History Museum, London.

pansies (Figure 5.9). In the iris and swallowtail illustration (Figure 5.1), Merian's placement of the insect within the greenery of the plant also recalls the compartments formed by scrolling stem embroidery designs. Merian based this swallowtail butterfly, as well as the damselfly pictured in Figure 5.9, on insects found in Hoefnagel's *Archetypa* engravings.[17] In Hoefnagel's composition, the swallowtail butterfly serves as the basis of an exploration and elaboration upon the theme of slender, elongated natural forms. For Merian, the interplay between the butterfly and the plant also serves as a motif around which to organize her composition. Merian frames the butterfly by placing it between the petal

Figure 5.9. Maria Sibylla Merian, *Neues Blumenbuch* (Nuremberg, 1680), plate 10. Photograph copyright The Natural History Museum, London.

and leaves of the iris, and the spaces created by the two leaves surrounding the insect visually extend the elongated form of the wing to the bottom of the page. In departing from Robert's original, Merian has fashioned the tip of the petal that the butterfly rests upon into a curved hook that echoes its own "tail." The theme of elongated hooked forms extends over the lower half of the composition, with the curving tips of each of the leaves forming a pattern that unifies the overall composition. Merian has further adjusted the leaf fragment in the lower-left corner to form a serrated edge that mimics the serrated edge and crescent patterning of the butterfly's wing.

Merian's use of broad tonal areas of color in the *Blumenbuch* illustrations was another visual strategy aimed at facilitating the use of the images as embroidery patterns, and this approach is also apparent in preliminary pen and ink drawings done after Robert's designs. Although talented needleworkers were by no means incapable of achieving very subtle tonal gradations, the embroiderer's palette was somewhat restricted due to the limitations of the medium. Unlike a painter, who can darken or lighten paint by adding black or white pigment, the embroiderer creates variations in tone by laying stitches side by side or on top of one another. For this reason, it is preferable that embroidery designs employ a smaller amount of tonal variation in order not to exhaust the number of different color threads available. A regular progression from light to dark, or vice versa, is also desirable since it allows the embroiderer to achieve the effect of tonal variation by increasing or decreasing the space between individual stitches. Merian's iris and swallowtail image reflects this concern with mapping out tonal areas according to the needs of an embroiderer. In Robert's engraving (Figure 5.2) there are many sharp contrasts between dark and light that would require many different colors of thread to embroider; the lack of regular transitions between light and dark areas would also make it difficult for the embroiderer to achieve the subtle variation in tone necessary for producing naturalistic effects. In contrast, Merian's compositions present clearly defined areas of light and dark and an even range of tones. The hand-colored editions of the *Blumenbuch* also show that Merian's use of color was similarly restrained by relying primarily on four deeply saturated hues—lavender, violet, tan, and dark green—to produce simple but vivid compositions that were also very practical in terms of the requirements of the needleworker.

Fabric and thread were not the only media in which patterns such as Merian's were used in the early modern period. Decorative arts techniques such as cut paper work, inlay, and marquetry also relied on designs that contained little or no overlap between pictorial elements and built compositions out of broad areas of color. In addition to depictions of individual blooms, Merian included a number of floral garlands in the *Blumenbuch* (Figure 5.10).[18] Merian's garlands were conceived in such a way as to offer complex and varied designs that could be easily translated into media such as stone, wood, and paper. An inlaid tabletop of engraved mother-of-pearl, stone, and ebony made by Dirck van Rijswijck provides an example of a type of object for which Merian's floral garlands could have served as patterns (Figure 5.11). The art of paper cutting was another medium in which designs such as Merian's would have been used. Johanna Koerten, the wife of a wealthy Amsterdam merchant who may have been an acquaintance of Merian's, was well known for her work in paper cutting. Koerten's compositions were remarkable for the artist's rendering of multiple tones and intricate forms solely through the juxtaposition of white paper against a dark background. Artisans such as Van Rijswijck and

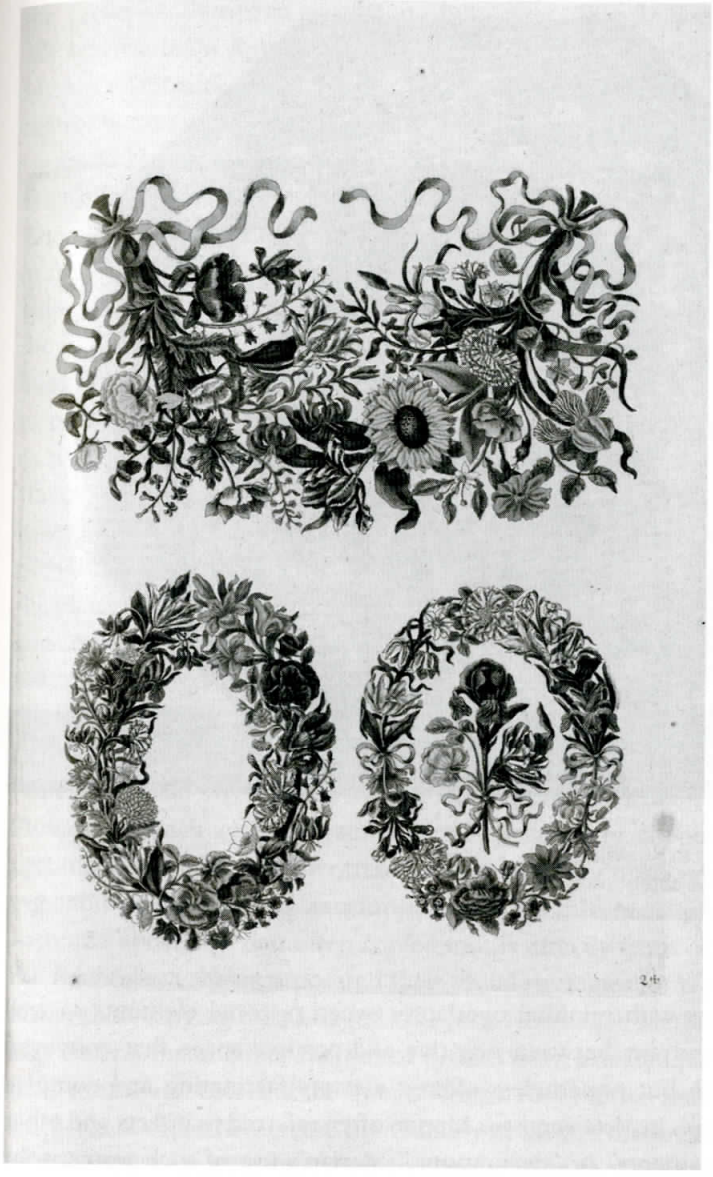

Figure 5.10. Maria Sibylla Merian, *Neues Blumenbuch* (Nuremberg, 1680), plate 24. Photograph copyright The Natural History Museum, London.

Koerten conveyed form and volume in their inlaid panels and paper cuts through incising the surface of the mother-of-pearl lamellae, or by varying the size of the cuts in the paper, but both relied on designs with clearly defined pictorial elements that could be worked in the rigid substances of paper, shell, and stone.[19]

Although the *Blumenbuch* was Merian's only publication that was explicitly intended for use in a craft or artisanal context, the concerns of the decorative arts would play an important role in the images she created for her other publications. In the *Raupenbuch* and *Metamorphosis* volumes, Merian would

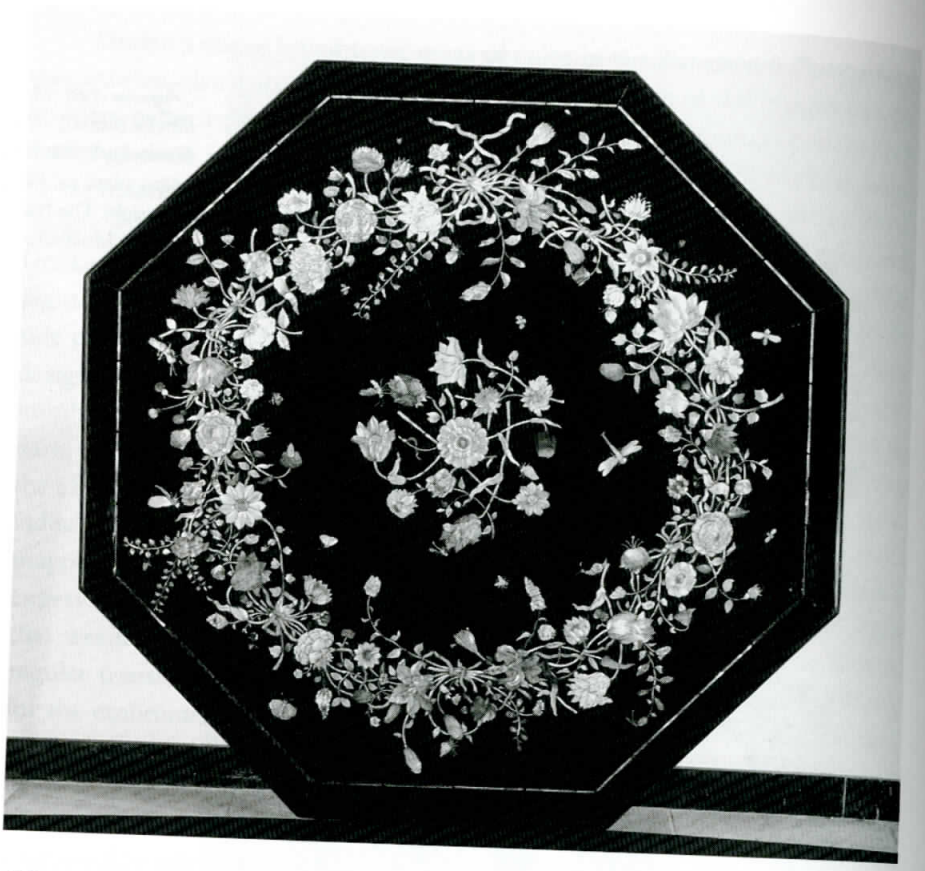

Figure 5.11. Dirck van Rijswijck, tabletop, 1655. Marble, ebony, mother-of-pearl. Rijksmuseum Amsterdam.

create illustrations with minimal overlap between pictorial elements as well as an intricate interplay between negative and positive space that conveyed little spatial depth but nonetheless offered viewers fascinating and complex spectacles of nature. In *Metamorphosis* Merian often referred to insects and other creatures as "ornaments" or "decorations." Merian's use of such terms is far from an indication that these elements played a secondary or inferior role in the images but rather is instead evidence both of a continuing concern with the visual logic of the decorative arts and of the centrality of ornament and decoration to Merian's approach to constructing relationships between otherwise disparate elements of the natural world.

Raupenbuch Series: Representing the Life Cycles of Insects

In 1679 Merian published the first volume of her second major project, the *Raupenbuch* series, in which she presented her illustrations and research on the

life cycles of European moths and butterflies. The *Raupenbuch,* more formally known as *Der Raupen wunderbare . . . ,* is considered by most scholars to be Merian's first serious work due to the more "scientific" approach and subject matter it contains, in comparison with the emphasis on "art" found in the *Blumenbuch.* However, Merian and her audience did not see these works as radically different from one another, particularly with respect to the illustrations. The popularity of the *Raupenbuch* seems to have generated renewed interest in the *Blumenbuch,* and this prompted Merian to issue the second edition of the *Blumenbuch* in 1680.[20] Merian's preface to the 1680 *Blumenbuch* indicates that the illustrations in the *Raupenbuch* were being used in the manner of a pattern book. She writes that the new edition was intended "to be of use and pleasure to people who know and love art as [models] for drawing and painting and to women for sewing," and then goes on to thank these same people for the "favour with which they have clearly been pleased to receive the recently published little *Raupenbuch.*"[21] In the *Raupenbuch* Merian developed and established the visual forms for which she would gain renown in natural history circles, but the pictorial requirements and design imperatives of the decorative arts, as well as a continuing interest in the material, decorative, and aesthetic qualities of the natural world, remained a strong influence in her imagery.

In the *Raupenbuch* illustrations Merian paired insects and the stages of their development with their food plants, which she describes in the title as "The Caterpillar's Wondrous Metamorphosis and Particular Nourishment from Flowers."[22] Each of the three volumes contain fifty copperplate engravings accompanied by Merian's written descriptions of her observations of the breeding habits, behavior, and transformation of the insects pictured in the plates.[23] As noted above, Merian often copied motifs directly from other artists, but in the *Raupenbuch* she incorporated their visual strategies for representing insects rather than copying their images. Like Joris Hoefnagel, Merian depicted butterflies and moths in either the flat or profile view, a technique that highlighted the patterns and colors of the insects' wings. And Merian also manipulated size and scale in order to increase the visibility of surface features and the markings of the minute creatures pictured. In plate 35 from the first *Raupenbuch* volume, the caterpillar is nearly twice the size of the adult moth of the same species pictured in the upper-left corner (Figure 5.12). The positioning of the caterpillar is reminiscent of the paradoxical configurations of two- and three-dimensional space often found in Hoefnagel's compositions; Merian's caterpillar rests upon the surface of one leaf, which is contiguous with the surface of the page, while simultaneously receding into the depth of the picture plane as it traverses the edge of another leaf. Another technique Merian often employed in her illustrations of insects was the placement of a flat or open-winged moth or butterfly in one of the upper corners of the composition, as seen in Figure 5.12. According to Segal, Merian took this idea from Robert, and it remained one of her

Figure 5.12. Maria Sibylla Merian, *Der Raupen wunderbare . . . [Raupenbuch]* (Nuremberg, 1679), plate 35. Heidelberg University Library.

most frequently used pictorial devices in both the *Raupenbuch* and *Metamorphosis* illustrations.[24] Heidrun Ludwig has argued that in the *Raupenbuch* Merian merged the tradition of flower painting with that of the insect piece by reversing "the conventional roles of central motif and secondary elements, so that the plants that now occupied central positions in the composition were employed primarily in support of what had formerly been subordinate to them."[25] Merian's practice of placing flattened butterflies and moths in the corners of her compositions can be understood as evidence of the role reversal Ludwig describes, but it is also indicative of her interest in the symbiotic relationships between insects and plants. By giving each element in the composition equal weight and attention, Merian both highlighted the importance of the insect as subject matter and used it as a framing device for the overall composition.

Merian's depiction of insect metamorphosis was strongly influenced by another artist, Johannes Goedaert, and his illustrated book on insects, *Metamorphosis Naturalis,* which was published in three volumes between 1662 and 1669.[26] Goedaert studied and collected insects for over thirty years and recorded his observations in illustrations that presented insect metamorphosis as a series of distinct stages arranged in vertical format, in which the caterpillar appears in the upper area of the page, followed by the pupa in the center and the adult below. Merian followed Goedaert's format closely in several of her preparatory drawings and watercolors for the *Raupenbuch,* and in the published illustrations she also presented several compositions using this vertical arrangement.[27] However, in most of her illustrations in the *Raupenbuch* (and later in *Metamorphosis*) Merian utilized Goedaert's method but did away with the vertical arrangement, opting instead to present the stages of development among the leaves and petals of the insects' food plants. This technique placed more emphasis on the material qualities and characteristics of the insects' forms, and it was best suited to depicting the life cycles of insects that experience dramatic changes in their physical form during their development. Both Goedaert and Merian focused on the phases of the insect life cycle that are most visibly distinct from one another, and as such they preferred to illustrate butterflies and moths because they exhibit dramatically different visual appearances as they proceed through their development cycles. Butterflies and moths undergo "complete" metamorphosis in which the successive stages of development are very different from one another, but for insects that undergo "incomplete" metamorphosis the changes in form appear more gradually. Typically, the immature, or nymph, forms of insects that experience incomplete metamorphosis resemble the adult form but lack wings and reproductive organs. The different stages of development in these insects are more difficult to distinguish from one another than in insects that experience complete metamorphosis, and thus they are not well suited to the techniques for representing insect life cycles developed by Goedaert. Insects that experience incomplete metamorphosis are not necessarily lacking in visual interest, however, and Merian included a number of dragonflies and damselflies in the *Blumenbuch.* But in the *Raupenbuch* she abandoned dragonflies and damselflies in favor of moths and butterflies. This shift in subject matter was the result of Merian turning her attention to insect metamorphosis and of her decision to concentrate on species that were best suited to the method of visually representing insect development as a series of distinct stages. Merian usually depicted only one larval stage in her illustrations, and she generally chose the stage where the insect displayed the most vibrant colors or intricate patterns, even though butterflies and moths experience between four and nine changes during the larval phase.[28] During her stay in Surinam, Merian would become interested in the life cycles of beetles, another insect that experiences complete metamorphosis.

Merian's major innovation in the *Raupenbuch* was the pairing of insects with their food plants, and this has been the primary reason why she has been described as taking an "ecological" approach to observing, interpreting, and representing the natural world. Merian was not the only early modern European artist whose work can be described as having an interest in ecological relationships—loosely defined as a concern with depicting the habits of living organisms, their mode of existence, and their relations to their surroundings. The Dutch still life painter Otto Marseus van Schrieck, for example, specialized in subject matter similar to Merian's, although he did not depict insect metamorphosis. Van Schrieck's approach to representing the natural world can also be described as "ecological" in that his primary focus was on interactions between living organisms, but his compositions differ dramatically from Merian's in their tone and character. Merian's clear, uncluttered presentations of plants and insects bear little visual resemblance to Van Schrieck's dark and mysterious paintings, a difference that stems in part to Merian's visual roots in the pattern book and decorative arts traditions.

Although it is often noted that Merian produced the first volume of the *Raupenbuch* during the same period she was working on the *Blumenbuch* series, in emphasizing the innovative aspects of Merian's work in the *Raupenbuch* scholars have tended to overlook some of the continuities between the two works. Merian employed almost identical visual styles in both works, with the difference between the two lying mainly in their subject matter. As noted above, the images in the *Raupenbuch* were used by some readers as patterns for painting, drawing, and sewing. And like the *Blumenbuch,* the *Raupenbuch* illustrations present insects as isolated elements framed by the elegantly curving stems and branches of plants, thereby forming complex patterns of negative and positive space. There is no doubt that the *Raupenbuch* signaled a major shift in Merian's career that coincided with her increased involvement in raising and observing insects. But in devising methods for representing the life cycles of insects, Merian did not abandon the design principles of the decorative arts in favor of a "scientific" approach based on empirical observation. Instead, these concerns emerged as inseparable components of Merian's understanding and approach to the natural world. Her interest in exploring the similarities and connections between visual forms and patterns found in nature would play an important role in her illustrations of insect life cycles in the Surinam book, as well as in another area of Merian's interest—the collection and trade of insect specimens.

Collecting, Preparing, and Trading Specimens

It was while preparing the first volume of the *Raupenbuch* in Nuremberg during the late 1670s that Merian began collecting and observing insect specimens systematically. Merian searched for caterpillars within the city, in gardens, and

outside the city walls in the surrounding meadows and woodland areas. Merian's techniques for collecting, raising, and observing caterpillars have been summarized by Wettengl as follows: "Merian ordinarily collected the insects herself, determined through close observation which plants provided them nourishment, procured their food, bred the small creatures in little boxes, observed their successive developmental phases, and described the place in which they had been found—their natural living environment—as well as their appearance and behaviour."[29] Merian recorded her observations in a journal now known as the *Studienbuch,* in which she collected written and visual records of her observations of insect metamorphosis over the course of thirty years.[30] The entries in the *Studienbuch* reveal the extent to which concerns with the decorative and material aspects of the natural world informed Merian's approach. In one entry, Merian describes an encounter with "a great web upon which all of 70 caterpillars, which were yet very small, lay in a round circle very close together; but they looked just like a round, black, velvet patch."[31] Merian's description of the caterpillars recalls the black velvet fabric upon which embroidery slips were often sewn; glistening upon a spider's web in the morning dew, the patch of caterpillars must have produced a similarly dazzling effect.

Merian used the same basic methods for collecting and preparing specimens throughout her career. Her particular interest in insect life cycles necessitated that she obtain for her research living specimens rather than dead ones. Merian sometimes received caterpillar specimens through the mail as gifts from friends, but these proved difficult for her to raise to maturity if the correspondent did not provide sufficient information about the insect's diet and behavior. In addition, specimens sent through the mail were also subject to uncontrolled conditions that sometimes resulted in the insect dying in transit.[32] When James Petiver sent her a gift of insect specimens in 1705, Merian refused them because they were not appropriate for her research. Merian explained to Petiver that she could not use specimens that were not alive, especially if he did not provide her with information about the insects' behavior, habitat, and diet:

> I have . . . received animals [insects] from the gentleman [Petiver] on two occasions. The first time they were brought by Doctor Reuss, but because I was not in need of such creatures I gave them back and thanked him, requesting that he write to the gentleman, telling him that I have no use for such animals and did not know what to do with them. For the kind of animals I am looking for are quite different. I was in search of no other animals, but only [wished to study] the generation and reproduction and transformation of the animals, and how one emerges from the other, and the properties of their food, as the gentleman can see in my book [the *Raupenbuch*]. Therefore, I would ask the gentleman not to send me any more animals, for I have no use for them.[33]

While Merian's repeated refusals of Petiver's insect specimens would have done little to endear her to him, her insistence upon studying the life cycles of insects through observation of living specimens demonstrates her commitment to the methods and techniques established early in her career.

Merian's introduction to the culture of collecting and exchanging exotic specimens may well have occurred during her stay at the Labadist community at Waltha Castle. The property was owned by Anna, Maria, and Lucia van Aerssen van Sommelsdijk, three sisters who were followers of the sect's leader, Jean de Labadie, and Pierre Yvon, Labadie's successor. The women's brother, Cornelis van Aerssen van Sommelsdijk, served as governor of Surinam from 1683 until his death in 1688. He was interested in natural history, gardening, and collecting exotic specimens, and he maintained ties with botanical gardens in Holland by sending specimens of plants and seeds from Surinam.[34] He also sent exotic specimens as gifts to his sisters, who seem to have displayed them at Waltha Castle for the members of the Labadist community and their visitors. The historian Trevor Saxby notes that the display of specimens included "a 23-foot aboma (tree-snake), stuffed by indians and shipped as a memento by the governor to his sister." In addition to the tree snake, the display contained "a collection of large and brilliantly colored butterflies sent . . . by governor van Sommelsdijk."[35] It is believed by most scholars that Merian's encounter with these butterflies eventually inspired her to travel to Surinam herself to collect and study insects. Another important factor in Merian's decision to travel to Surinam was her experience viewing and studying specimens in collections in Amsterdam.

The exotic flora and fauna of Surinam may have been unknown to the majority of the population of Europe during the early modern period, but in the late seventeenth century many Dutch naturalists and collectors were not only familiar with such items but owned and displayed them in their cabinets and museums. By the time Merian had left the Labadist community and settled in Amsterdam with her daughters in 1691, Surinam had been under Dutch control for almost twenty-five years.[36] Many collectors maintained contacts with and received regular shipments from travelers to Dutch colonies in the East and West Indies. Nicolaas Witsen, Frederick Ruysch, and Levinus Vincent were some of the figures whose collections were among those Merian visited in Amsterdam. In the preface to *Metamorphosis* Merian states that she visited the collections of Witsen, Ruysch, and Vincent before her journey to Surinam, and she describes how she "saw with wonderment the beautiful creatures brought back from the East and West Indies."[37]

These collections not only inspired Merian to travel to Surinam to study insects but also provided her with practical information about the preparation and preservation of specimens. Elizabeth Rücker notes that Merian "was well versed in the technique of preserving specimens in alcohol, either in sugar jars or bottles. Merian had presumably become acquainted with this process in

the course of visits to the many and diverse exhibits of curiosities that Amsterdam had to offer, acquiring the necessary skills in order to prepare herself for research in the South American tropics."[38] Merian's specimens would presumably have been prepared using a technique similar to the one Merian described in a letter to Clara Regina Imhoff, a former student and friend from Nuremberg: "If one wishes to . . . kill butterflies quickly, then one must hold the point of a darning needle in a flame, thus making it hot or glowing red, and stick it into the butterfly. They die immediately with no damage to their wings, and the little boxes in which they are then placed can be coated with lavender oil first, so that no worms can get in and feed on them."[39] The technique Merian describes for killing a butterfly was designed to preserve the insect's delicate structures from the violence of its own death. Once safely subdued and killed, the insect was placed in a small box to protect it from damage while being transported, stored, or displayed. A coat of lavender oil in the interior of the box protected the specimen from infestation. Depending on the type of insect being prepared, Merian may then have coated the insect with turpentine oil to further protect it and to give it a glossy finish, much like varnish on an oil painting.[40] It is ironic that Merian's success at crafting well-preserved and attractive insect specimens depended on her ability to prevent the life cycles of destructive insects from taking place, because these skills were at odds with those she cultivated in her research on insect metamorphosis in which the central goal was the collection and preservation of living specimens. As in her artistic training, Merian's ability to collect and preserve nature successfully was also dependent on a combination of firsthand observation and mastering a set of specialized skills. Merian's use of a darning needle in preparing specimens also suggests that working with fabric and thread and working with specimens were closely related practices for Merian and at times may have involved a shared set of instruments.

Another important lesson Merian would have learned from her visits to the collections, cabinets, and museums of Amsterdam was that collecting nature did not only involve preserving specimens but also the crafting of ingenious and sophisticated displays of these objects. Early modern collectors presented and stored their butterfly and moth specimens in boxes or flat panels, where they pinned the insects' wings flat in order to highlight their brilliant colors and intricate patterns. Some collectors created assemblages that were considered to rival the beauty and complexity of the insects themselves. Levinus Vincent and his wife Johanna Breda owned a well-known collection of rarities in Amsterdam, which was open to the public for an admission fee—an unusual practice for the time. The Vincents' collection is among those Merian mentions in the preface to *Metamorphosis,* and it was where she viewed examples of Surinamese insects before her trip to South America.[41] Aesthetic considerations played a central role in the Vincents' organization of their collection, and their techniques for displaying specimens were closely connected to the material

Figure 5.13. Levinus Vincent, *Wondertooneel der Nature . . .*, volume 2 (Amsterdam, 1715), Table I. Research Library, Getty Research Institute, Los Angeles.

and decorative concerns of embroidery and needlework. Tomomi Kinukawa has shown that embroidery was one of the conceptual tools the Vincents used for ordering the natural world as well as a technique for creating dazzling displays of specimens. According to Kinukawa, the Vincents did not classify their specimens by name but instead "chose an alternative order: they organized them according to their sizes and colors into patterns of embroidery, formal gardens, and still lifes."[42]

The displays that attracted the most admiration from visitors to this collection were the arrangements of exotic butterflies and moths on embroidered silk panels. In 1706 Vincent began publishing a series of illustrated catalogs that provide valuable information about the content and appearance of the collection and include several illustrations of these insect displays.[43] In one of the illustrations three silk panels of insect specimens are arranged in front of a cabinet containing numbered drawers of insect specimens (Figure 5.13). The two panels on the left present specimens of butterflies and moths in circular frames surrounded by embroidered borders and floral motifs. The third panel contains specimens of small beetles and what appear to be two small birds, also surrounded by embroidered ornamentation. Specimens of larger beetles—whose bulky bodies were unsuited to display on flat panels—are scattered in the foreground like objects in a still life painting. One visitor to the collection, impressed by the scope and variety of its contents, wrote as follows: "What surprised me most was the never-ending display of all kinds of insects, perfectly preserved, whose variety of colors formed the most beautiful sight nature could offer."[44] Another visitor noted that from a distance the insect displays "resembled embroidery or tapestry from Brussels." It was said that Peter the Great, perhaps the most distinguished visitor to the Vincent's cabinet, was so overwhelmed that "he knelt in front of the insects to pay homage to their beauty and display."[45] To some, including Levinus Vincent himself, insects were themselves considered to possess the qualities of embroidery and were understood in terms of the colors and patterns of needlework. Vincent invited several poets to contribute works to his catalogue, one of whom described the insects as "a thousand little animals as embroidery, row by row, / so beautifully variegated like a painting."[46] According to Kinukawa, "Vincent himself emphasized that the insects were arranged in figures like embroidery with observation of light and shadow, magnification and reduction. It was impossible to describe them by pen or tongue, so that everyone stood in front of them in wonder as if stupefied."[47]

Embroidery and painting were two of the key practices used by the Vincents to organize and display their collection of exotic specimens and rarities. The engraved title page to their catalogue presents a view of the room that housed the collection framed by two human figures personifying the arts of painting and embroidery (Figure 5.14). The figure on the left, who represents embroidery, is shown stitching a design into fabric stretched over an embroiderer's

Figure 5.14. Romeyn de Hooghe, frontispiece for Levinus Vincent, *Wondertooneel der Nature* . . . (Amsterdam, 1706). Research Library, Getty Research Institute, Los Angeles.

frame, while on the right side of the picture a figure representing the art of painting holds a paintbrush in one hand and in the other a drawing of a plant and a frame containing what appears to be an arrangement of shells. In her discussion of this image, Kinukawa has argued that Johanna Breda's role as the keeper of domestic order in the Vincent household was also one of the organizing principles of the museum, which was located inside the Vincents' home. Kinukawa writes that "the natural world cannot enter Vincent's neatly ordered room without being scrutinized and processed by these diligent guardians armed with needles and watercolors."[48] Johanna's work organizing and arranging the contents of the museum was also the subject of some of the poems included in Vincent's catalogue: "Poets assign to Johanna the essential role of standing at the threshold of the house and transforming the products of the dark womb of nature into the shining gems shown in their cabinets. It was an extension of the task conventionally assigned to the housemother, who oversees what her husband brings in, arranges it, and puts it in order . . . Johanna processes the natural wonder into gems/treasures of the house by choosing, embroidering, drawing, and neatly arranging them in the cabinets."[49]

Like Johanna Breda, Merian utilized the arts of embroidery and painting to process the natural world, not only to display it but also to sell it. In her visits to the collections of Witsen, Ruysch, and Vincent, Merian learned to see nature as composed of objects that could be collected and displayed in cabinets and panels. This understanding of the natural world was also shaped by the design principles of needlework, embroidery, and other artisanal and craft practices that sought to represent nature as a series of isolated pictorial elements. The process of preparing specimens for display and long-term preservation involved transforming nature into objects. Once their forms were fixed and stable, these objects could be bought and sold for profit. Before leaving for Surinam, Merian would have seen that collectors such as Ruysch, Vincent, and Witsen and others like them formed a lucrative market for exotic specimens from the East and West Indies. When she returned, she brought many specimens of insects, reptiles, and other animals that she offered for sale, and she continued to receive specimens from her contacts in Surinam in the years after her return to Amsterdam. Merian's daughter Johanna Helena returned to Surinam with her husband and served as Merian's supplier for some time. Merian also received specimens from other individuals in Surinam, and she seems to have had contact with potential suppliers in Barbados and other Caribbean islands from which she was pursuing plans to import specimens when hostilities between the Dutch and the English subsided.[50] Merian's correspondence shows that she sold exotic specimens to her friends Georg Volkammer and Clara Imhoff in Nuremberg. In one of her letters she asks Imhoff to tell other interested parties of the specimens she offered for sale, and that she would also be interested in receiving specimens from Germany as an exchange.[51]

Although Merian was sharply attuned to the commercial possibilities the natural world offered and was skilled in preparing attractive specimens, she was not always completely successful in negotiating the complex social interactions and cultural practices involved in the exchange of specimens in early modern Europe. In the Amsterdam cabinets and museums Merian frequented, nature provided an entertaining and elegant spectacle for owners and their visitors. However, even a collector who charged admission such as Levinus Vincent did not consider the museum to be a commercial establishment offering luxury goods for sale. Vincent and others like him collected and displayed nature as a leisure-time activity and not as a source of income. Wealthy collectors exchanged specimens with each other as gifts and of course purchased specimens from brokers, but they did not generally buy from each other or sell their specimens to museum visitors—although on occasion entire collections were sold at once, earning their owners large profits. Collectors did not part with their treasures piecemeal unless in great financial distress, and they routinely rejected offers from museum visitors to purchase individual items. As Kinukawa has pointed out, "The capital of the Republic [of Letters] was never money. Instead, service was returned by service, friendship by friendship. The exchanges were never supposed to be for profit."[52] Merian thus occupied an ambiguous and sometimes problematic position within these networks of exchange. As an entrepreneur who depended on the sale of her drawings, specimens, and books for her livelihood, Merian often violated the codes of the collecting community by seeking to sell rather than exchange items. In a letter to James Petiver, Vincent complained that Merian never kept any of the gifts of specimens that were sent to her, but "preferred instead to sell everything she obtained or produced . . . for the sole purpose of turning it into money."[53] Vincent, of course, speaks from the position of a retired merchant whose wealth allowed him the luxury of disdain for Merian's commercial activities. But as we have already seen in her rejection of Petiver's insect specimens, Merian's single-minded dedication to her research on insect life cycles at times interfered with her ability to engage in the genteel rituals of gift exchange. Merian earned the respect and admiration of this community of collectors and naturalists for her skills as a researcher and artist, but she was not always able to manage her multiple roles within that community smoothly. Unlike the insects she painted, preserved, circulated, and sold, Merian herself remained a somewhat unstable commodity within the cultural economy of natural history.

Processing Nature in the New World: The *Metamorphosis insectorum Surinamensium*

When Merian and her daughter Johanna Helena set sail for Surinam in June 1699, Merian possessed a broad range of skills and interests that would shape her

approach to studying, observing, and representing nature. In *Metamorphosis,* the publication that resulted from this trip, Merian would draw upon her experiences designing patterns for embroidery, her skills at observing and recording the life cycles of insects, and the techniques she developed for preparing specimens in order to process nature in the New World for European audiences. The vision of Surinam presented in *Metamorphosis* satisfied this audience's desire for exotic, elegant, and ordered spectacles of nature, and can thus be understood as part of the broader interest of Dutch authors and publishers in marketing the non-European world to European consumers. Benjamin Schmidt includes Merian's *Metamorphosis* among the enormous quantity of illustrated "geographical" materials published in Holland at the end of the seventeenth century that treated "exotic" subjects. Dutch "geography," as defined by Schmidt, comprised not only texts on geography and cosmology but also atlases, works of natural history, travel narratives and anthologies, and cartographic texts. Together these items "sold an *idea* of the world that appealed to readers, viewers, and consumers across Europe, and this idea marketed a world that was identifiably 'exotic.'"[54] Schmidt argues that the "resolutely disordered world" pictured in the frontispieces of these works erased distinctions and borders between non-European lands, thereby presenting European audiences with a world of curiosities, diversions, and delights in which commercial rivalries and colonial polemics had no presence: "Diffuse, digressive, often disorienting, sometimes recycled, purposely decontextualized: Dutch geography ended up being specific to none and thus palatable to all. The exotic world designed by the Dutch was a brand, ultimately, of very wide appeal."[55] Although Merian's *Metamorphosis* is resolutely specific to the local context of Surinam and does not engage in the type of "bric-a-brac" mixing of objects, curiosities, and people described by Schmidt, Merian's book did take part in constructing the non-European world as both exotic and accessible. In both their content and style, the images in *Metamorphosis* were designed to transform the natural world of Surinam into "purposely decontextualized" objects capable of entering into international exchange and circulation.

Merian's illustrations of insects and plants in *Metamorphosis* employed the same visual style and techniques she developed in the *Blumenbuch* and *Raupenbuch,* and she continued to rely on design principles of the decorative arts to structure her compositions. In plate 50 of *Metamorphosis,* for example, the leaves, stem, and blossom of the *Ipomoea alba* (white batatas) plant are arranged against the white ground of the page to form a pattern of positive and negative space, which in turn creates compartment-like areas that frame the insects (Figure 5.15). Merian frequently employed this framing technique in the illustrations for *Metamorphosis,* and it is conceptually linked to the "scrolling stem" embroidery patterns discussed earlier in this chapter, in which plant stems form compartments that frame and visually isolate pictorial elements. This technique resulted in orderly if somewhat improbable compositions. The beetle pupa shown at

Figure 5.15. Maria Sibylla Merian, *Surinaamsche insecten* (1726). First published as *Metamorphosis insectorum Surinamensium* (Amsterdam, 1705), plate 50. Photograph copyright The Natural History Museum, London.

the top of plate 50 rests upon a slender looping tendril that would not be able to support its weight. Below it, the larval instar clings to the stem of the plant, although Merian's text indicates that she actually found this specimen underground among the roots, where she also found another species of beetle larva that she has shown feeding on the root. The beetles and beetle larvae arranged on the leaves of the *Argemone mexicana* (Mexican pricklepoppy) in plate 24 of *Metamorphosis* are framed in a similar manner, and the composition is made up of pictorial elements that can be easily distinguished from one another, much like the elements of a pattern for embroidery or needlework (Figure 5.16). Although these configurations of insects and plants did not necessarily reflect the actual places where Merian found her specimens, they offered viewers a clear understanding of both the insects' appearance and their relationships to the plants they feed on.

Merian's written entries include information about the customs of the indigenous inhabitants of Surinam, which at times converge with her interest in the decorative and aesthetic aspects of the natural world. In one entry she describes how the red seeds of the annatto plant were used by indigenous peoples for making a paste "with which they paint various decorative patterns on their naked skin." In her observations of the musk flower, Merian notes that "the girls string them [seeds] on silk threads and wear them round their arms for decoration."[56] Merian considered information about the human uses of plants and insects for personal adornment to be as relevant in her observations of plants and insects as the information about life cycles, behavior, and habitat. Merian's observations of insects were also directed toward those aspects of their visual appearance that were most attractive and pleasing. She described the beetle shown in the lower-left corner of plate 50 (Figure 5.15) as a "beautiful golden beetle" having a "lovely gold-green color," and she has presented the beetle with its wings open in order to further highlight its colorful appearance.

In her illustrations for *Metamorphosis,* as with her prepared specimens, Merian preserved the appearance of insects by stabilizing their forms and fixing their positions. Once Merian established an insect's visual appearance in a drawing, she made very few modifications to its form. While in Surinam, Merian drew individual insects on small sheets of parchment and pasted these into her working journal, the *Studienbuch.* All but two of Merian's compositions for *Metamorphosis* were based on the studies gathered in the *Studienbuch,* which has been described as an "entomological archive."[57] Merian also executed several larger-format watercolor studies on parchment, some of which may have been made in Surinam. These watercolors represent an intermediate stage in the process of creating the final versions of the compositions that would appear in *Metamorphosis,* and they also incorporated motifs from the *Studienbuch.* In one of these studies several beetles are shown with one beetle larva (Figure 5.17). The insects are depicted in lively, dynamic positions but do not interact

Figure 5.16. Maria Sibylla Merian, *Surinaamsche insecten* (1726). First published as *Metamorphosis insectorum Surinamensium* (Amsterdam, 1705), plate 24. Photograph copyright The Natural History Museum, London.

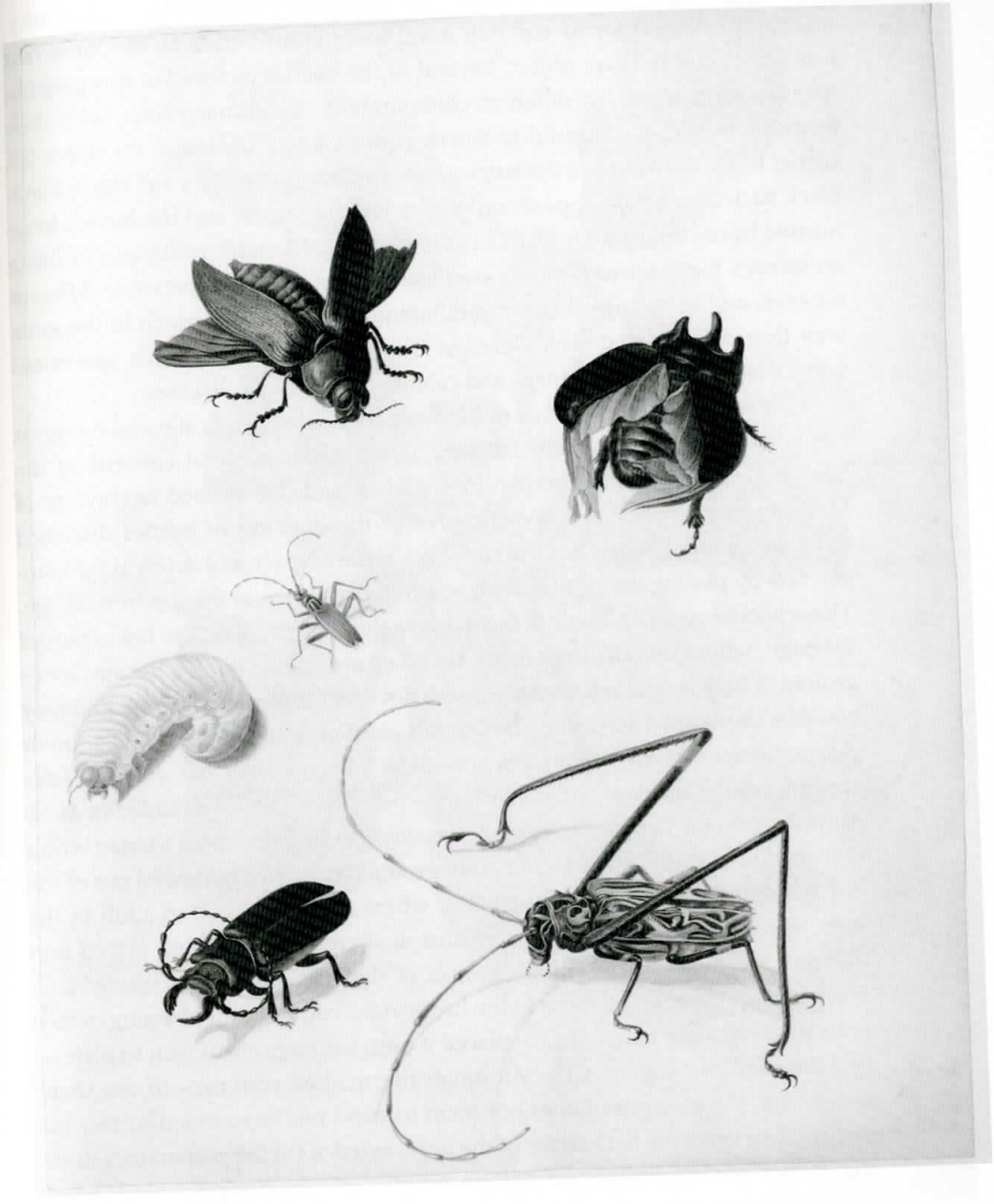

Figure 5.17. Maria Sibylla Merian, watercolor on parchment, *Studienbuch*, page IX. Copyright St. Petersburg Branch of the Archive of the Russian Academy of Sciences.

with one another and there is little to suggest any relationships between them. Within the empty space of the page, each insect exists as an independent entity, its crisply outlined forms and rich jewel tones contributing to the sense that it is a precious and rare object. Several of the beetles pictured in this preparatory drawing appear in different configurations in *Metamorphosis,* with their forms unaltered: the colorful *Euchroma gigantea* beetle shown in the upper-left corner of the drawing and the larva appear in plate 50 (Figure 5.15), the red-and-black harlequin beetle appears on plate 28 (Figure 5.18), and the brown long-horned beetle appears on plate 24 (Figure 5.16). Merian's technique of fixing an insect's form allowed her to circulate images of insects between different contexts and to arrange them into different configurations, much in the same way that embroidered slips were used by needleworkers or that specimens were arranged in boxes, panels, and cabinet drawers by collectors.

The stability of the forms of Merian's objectlike insects allowed her great flexibility in circulating them between the different pictorial contexts of the *Studienbuch,* intermediary preparatory studies, and the finished engravings of *Metamorphosis.* Merian did not conceive of the drawing of beetles discussed above as a finished work, but she conveys a sense of space and depth in the composition by placing the beetles with outstretched wings at the top of the page. These beetles seem to hover in flight above those pictured on the lower part of the page, whose cast shadows imply that they are resting upon a flat surface or ground. These spatial relationships were not specific to this drawing, and they could be dismantled according to Merian's compositional needs. The *Euchroma gigantea* beetle shown "flying" in the upper-left corner of the drawing later appears among the roots of a plant in the published version included in *Metamorphosis* (Figure 5.15). In the text accompanying this illustration, Merian writes that she found this beetle's larvae underground, in a space hollowed out of the dirt surrounding the roots of the plant, where she also found an adult of the same species. The beetle's form remains unaltered despite being placed into different surroundings. Another example of this fixity of form is the red-and-black harlequin beetle pictured in the lower-right corner of the drawing, which retained its shadow when Merian placed it onto the large citrus fruit in plate 28 of *Metamorphosis* (Figure 5.18). Although the shadow conforms to the shape of the fruit, the insect itself does not seem to stand on the rounded surface but instead rests upon the flat surface of the page, as it does in the preparatory drawing. In her accompanying text Merian writes that "the beautiful black beetle decorated with red and yellow flecks shown resting on the fruit was added on account of its rarity to complete and decorate the engraving although I do not know its origin."[58] This spectacularly colored beetle almost completely overshadows the presence of the moth pictured on one of the leaves, which is the insect Merian actually found on the plant and to which she devotes a lengthy account in the text. Merian's use of the harlequin beetle to "complete

Figure 5.18. Maria Sibylla Merian, *Surinaamsche insecten* (1726). First published as *Metamorphosis insectorum Surinamensium* (Amsterdam, 1705), plate 28. Photograph copyright The Natural History Museum, London.

and decorate" the composition reflects not only her own strong interest in the colorful, unusual, and decorative aspects of the natural world but also her audience's desire to see highlighted these features of nature in the New World. A harlequin beetle and other specimens of exotic beetles appear in the illustration of Levinus Vincent's insect collection (Figure 5.13), and Merian's familiarity with her audience's tastes and preferences may have influenced her decision to feature the harlequin beetle so prominently in her composition for *Metamorphosis*.

Merian's focus on the decorative and aesthetic qualities of nature resulted in compositions that are both orderly and intricate, presenting specimenlike insects as precious objects among the undulating stems and leaves of vibrant plants. The contrast between the immobile insects and the dynamic plants that entwine them is one of the many sophisticated visual delights Merian offers her viewers and is the product of her unique background and training in designing patterns for embroidery, still life and flower painting, and preparing specimens. Maria Sibylla Merian is associated with the changing forms of insect metamorphosis, but the visual style she used to depict the life cycle rested upon fixing insect forms in precise configurations. Ironically, it is this immobility and lack of change that allowed her great freedom to circulate insects as if they were objects, both within the spaces of her drawings and engravings and as specimens in the marketplace. When Merian departs from her usual approach, the effect is startling. One of Merian's best-known illustrations from *Metamorphosis*, plate 18, possesses a very different character and feel than the other images from the book. In this image, a violent struggle takes place between spiders and ants for control of a guava tree (Figure 5.19). On one branch of the tree a spider is shown in the process of devouring a hummingbird, and on the trunk several ants attack a cockroach.[59] Throughout the image, Merian presents ants and spiders in chaotic and deadly encounters, thereby abandoning the tightly controlled configurations of insects and plants found in her other compositions in *Metamorphosis*. This scene falls outside of her usual insect repertoire of butterflies, moths, and beetles, and she used a different visual style to emphasize the violence and drama of the non-European natural world. The image is a striking contrast to the peaceful objects of beauty pictured in the other illustrations in the book, but as such it contributes to Merian's broader goal of offering her audience a glimpse of a foreign and mysterious world.

Selecting, Framing, and Selling the Natural World of Surinam

Merian did not always succeed in her efforts to find and record the life cycles of unusual and beautiful species of Surinamese insects, but this did not hinder her ability to create fascinating visual images of these subjects. Merian sought out caterpillars that she believed would develop into large, brightly colored adults,

Figure 5.19. Maria Sibylla Merian, *Surinaamsche insecten* (1726). First published as *Metamorphosis insectorum Surinamensium* (Amsterdam, 1705), plate 18. Photograph copyright The Natural History Museum, London.

but she was sometimes disappointed in this search for continuity and beauty in nature. In the text accompanying plate 15 she describes her deep disappointment that an extravagantly colored "four-angled" caterpillar produced an uninteresting adult moth: "I was expecting something out of the ordinary from this unusual caterpillar, but my hopes were deceived when on August 10, 1700, such an unsightly moth emerged. It has happened to me that the most beautiful and unusual caterpillars turned into the plainest creatures, while the plainest caterpillars turned into the most beautiful moths and butterflies."[60] Despite this setback, in Merian's illustration the caterpillar, its cocoon, and the resulting "unsightly" moth are set upon the fruit and stems of a melon with bright yellow flesh, where together they form an elegant and harmonious image. In Surinam, it was not always possible for Merian to employ the techniques she had developed in Europe for observing and raising caterpillars in her home, in part because of the very different climate. She collected over one hundred specimens of a certain type of caterpillar and was careful to collect leaves from the tree they lived on, but all of the caterpillars except for one died for lack of food because "the leaves of this tree become hard and dried up as soon as they are broken off and then the caterpillars cannot eat them."[61]

Thus, offering European audiences an exotic vision of nature in the New World necessitated that Merian present only a narrow selection of her observations and experiences. *Metamorphosis* was not a comprehensive survey of South American flora and fauna, and neither did Merian attempt to present a study of every insect inhabiting Surinam. Most of the plants depicted in *Metamorphosis* are agricultural crops that were cultivated on or near the plantations where Merian lived, and some were imported from other regions of the world for the purposes of commercial production. Although she included several examples of plants native to Surinam, obtaining specimens of plants growing outside of agricultural contexts was extremely difficult. As Segal has noted, "her selection of motifs clearly suggests that Maria Sibylla Merian did not wander far from the Surinamese plantations. As she wrote in her commentaries, the rain forest was practically impenetrable, and her slaves were forced to hack their way through the thorns and thistles with axes."[62] The insects Merian studied and recorded were native to South America, but her selection of insects was guided by a relatively narrow set of criteria. Merian's primary interest was in studying insect life cycles, and as noted above she favored insects that experience complete metamorphosis, such as beetles, butterflies, and moths. Furthermore, Merian focused her attention on unusual and colorful insects that could serve as subjects of dazzling illustrations or sophisticated displays in collectors' cabinets. Although she included a great deal of information about the suffering caused by insects to the European and non-European inhabitants of Surinam, she did not choose to depict many of these insects in her images, with the exception of the cockroach. In one of her commentaries Merian describes cockroaches as "the

most infamous of all insects in America on account of the great damage they cause to all the inhabitants by spoiling their wool, linen, food and drinks"; in the accompanying image a cockroach is shown perched upon a perfect, unspoiled pineapple rather than with any of its less visually appealing foods.[63]

Absent also from Merian's illustrations in *Metamorphosis* is evidence of the human labor involved in cultivating the plants she depicted. Merian herself relied on the labor of enslaved Africans to assist her in obtaining insect specimens from difficult locations, such as the tops of trees or the stalks of banana plants. They also were responsible for cultivating the garden she maintained, which was presumably a central source of food for her and her daughter. The indigenous inhabitants of Surinam were also important sources of specimens and information, and the European inhabitants also provided her with some information on the uses and growth cycles of plants. Merian was not completely unsympathetic to the plight of the enslaved Africans and indigenous inhabitants of Surinam whose labor and knowledge she depended upon. Her remarks in the commentary accompanying the illustration of the *Flos pavonis* plant have been extensively discussed by historians in relation to questions of European colonization and the history of female reproductive biology.[64] In one passage, Merian criticizes the Dutch plantation owners' harsh treatment of enslaved Africans and native people, but with an eye toward the economic benefits of more "benign" handling. "Indians, who are not well treated when in the service to the Dutch, use [the seeds of the plant] 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."[65]

Intermixed with Merian's call for more humane treatment of slaves is a shrewd business sense that would have been appreciated by the Dutch plantation owners whose practices she criticized. Merian offers a number of other criticisms of the plantation owners in her commentaries—mostly directed toward the sugar monoculture—that reveal a similar concern with achieving economic self-sufficiency for the colony by reducing its reliance on expensive imported goods.[66] It was this sense of the commercial possibilities offered by the natural world of Surinam that made Merian adept at extracting the most spectacular and beautiful examples of insects and plants from their surroundings and including them in her illustrations. Merian's actual experiences of the natural and human world in Surinam were sometimes confusing, difficult, and dangerous, but the illustrations she produced convey only the exotic and beautiful aspects of that world, thereby giving her European audiences a safe and fully accessible vision of the New World on which to feast their eyes.[67] Collectors and other individuals who traded in exotic specimens utilized the infrastructure established by the much larger and economically significant movements of agricultural products,

raw materials, and people conducted by European states and organizations such as the Dutch West India Company. With her images and specimens, Merian inserted the natural world into the overlapping networks of exchange that characterized both the practice of natural history and the commercial world of Europe at the end of the seventeenth century.

The 1719 Frontispiece to *Metamorphosis*

A second edition of Merian's *Metamorphosis* was published in 1719 by her daughters after the author's death. The 1719 edition differs from the first edition in that it contains an additional twelve illustrations as well as an illustrated frontispiece (Figure 5.20). The frontispiece tells us a great deal about Merian's legacy and how her descendents understood both the significance of the book and how they wanted readers to understand the contents and its author. In the foreground a finely dressed female figure—a personification of Merian—sits at a table preparing plant and insect specimens surrounded by putti assistants. She looks down to her left at a vignette of a book and a potted plant. The book shown is the *Metamorphosis* itself, and the potted plant is a living specimen of the pineapple plant pictured in the open book. The living specimen indicates to the reader that the contents of the book are based upon firsthand observations, and the open book functions as an advertisement of Merian's wares. The book is presented as a product made for the specific audience of wealthy collectors. The Merian figure resides in an elegant room decorated with classical motifs that make it clear that this is a book for an intellectual, educated audience, and that its author was also an educated person. This emphasis on Merian's learning was important, as is the emphasis on the putti as the workers who organize and assemble her specimens. By showing Merian as engaged with the materials of nature, but not expending too much physical effort on them, Merian's daughters sought to show her not as a businesswoman who collected specimens only for profit but as an upper-class person pursuing knowledge of nature as a serious but leisurely activity.

On the right side of the frontispiece one of Merian's putto assistants stands at the door of an elaborate specimen cabinet, and other putti are shown working on elegantly arranged trays of insect specimens. Although they do not feature embroidered decorations like those in Levinus Vincent and Johanna Breda's collection, these trays are meant to appeal to the same sensibilities and tastes for artfully presented natural objects. Following the gaze of the putto at the cabinet, the viewer's attention is drawn through the opening of the archway toward a view of Surinam. In the center of this scene is a female figure leaning close to the ground and holding a net, presumably Merian herself shown in the act of capturing one of the spectacular butterflies pictured in *Metamorphosis*. She is dressed in fine clothing, as are the two European men who observe her. Farther

Figure 5.20. Maria Sibylla Merian, *Metamorphosis insectorum Surinamensium* (Amsterdam, 1719), frontispiece. Photograph copyright The Natural History Museum, London.

back on the left side are two additional figures, a female and a male, who are very likely the servants or slaves who accompanied Merian and her daughter on their collecting expeditions in Surinam. The cultivated grounds, the familiar-looking buildings, and the lack of dense vegetation present Surinam as a cultivated and controlled natural environment, exotic but unthreatening. The frontispiece also tells the reader that Merian's activities took place under the watchful eyes of European men who offer their protection and approval. Of course, the vision of Surinam presented in the frontispiece—a serene playground for European aristocratic living—is not maintained by either the illustrations or text of the *Metamorphosis*. Instead, the contents of Merian's book often hint at the instability and the difficulties posed by plants and insects to both European and non-European residents of Surinam despite Merian's efforts to present it as a world of immobile and timeless objects of beauty. However, in encapsulating many of the major themes of Merian's professional activities and publications, the frontispiece is an important example of the ways that visual images continued to shape both the European vision of nature and the construction of an artist's persona well into the eighteenth century and beyond.

5. Stitches, Specimens, and Pictures

1. Elisabeth Rücker, ed., *Maria Sibylla Merian, 1647–1717* (Nuremberg, Germany: Germanisches Nationalmuseum, 1967); as quoted in Kurt Wettengl, "Maria Sibylla Merian: Artist and Naturalist between Frankfurt and Surinam," in *Maria Sibylla Merian, 1647–1717: Artist and Naturalist*, ed. Kurt Wettengl (Ostfildern, Germany: G. Hatje, 1998), 18.

2. This account of Merian's life is based on the biography of Merian found in Natalie Zemon Davis, *Women on the Margins: Three Seventeenth-Century Lives* (Cambridge, Mass.: Harvard University Press, 1997). For a shorter biography and an introduction to the literature on Merian, see Wettengl, "Maria Sibylla Merian," which also includes important essays by Merian scholars and provides excellent reproductions of many unpublished drawings. Both of these publications contain exhaustive bibliographical information on Merian. Additional biographical information and useful analyses of Merian's illustrations can be found in Ella Reitsma, *Merian and Daughters: Women of Art and Science* (Los Angeles: J. Paul Getty Museum, 2008), and Kim Todd, *Chrysalis: Maria Sibylla Merian and the Secrets of Metamorphosis* (Orlando, Fla.: Harcourt, 2007). Invaluable facsimiles of Merian's major works have been published in recent years; for a useful explanation and summary of these, see Sharon Valiant, "Maria Sibylla Merian: Recovering an Eighteenth-Century Legend," *Eighteenth-Century Studies* 26, no. 3 (1993): 467–79. David Freedberg's essay on the relationship between Merian's *Metamorphosis* and seventeenth-Century Dutch art, commerce, natural history, and the New World provides an important basis for understanding the historical and historiographical issues explored in this chapter. Freedberg, "Science, Commerce, and Art: Neglected Topics at the Junction of History and Art History," in *Art in History, History in Art: Studies in Seventeenth-Century Dutch Culture, Issues and Debates* (Santa Monica, Calif.: Getty Center for the History of Art and the Humanities; distributed by University of Chicago Press, 1991), 377–428.

3. Davis, *Women on the Margins*, 151. Davis's discussion of the topos of the remarkable woman appears on 154–56.

4. The problem of spontaneous generation was discussed by many natural philosophers. The two major published works on the topic from this period are Redi, *Esperienze intorno alla generazione degl'insetti;* and Jan Swammerdam, *Historia insectorum generalis* (Amsterdam, 1669). The topic is discussed in relation to the development of the microscope in Edward G. Ruestow, *The Microscope in the Dutch Republic: The Shaping of Discovery* (Cambridge: Cambridge University Press, 1996); and in Catherine Wilson, *The Invisible World: Early Modern Philosophy and the Invention of the Microscope* (Princeton, N.J.: Princeton University Press, 1995). On Swammerdam's research and experiments on the question of spontaneous generation, see Matthew Cobb, "Reading and Writing *The Book of Nature:* Jan Swammerdam (1637–1680)," *Endeavour* 24, no. 3 (2000): 122–28. On Antony van Leeuwenhoek's work in this area, see Edward Ruestow, "Images and Ideas: Leeuwenhoek's Perception of the Spermatozoa," *Journal of the History of Biology* 16 (1983): 185–224. For an extensive bibliography on the topic, see also Tomomi Kinukawa, "Art Competes with Nature: Maria Sibylla Merian (1647–1717) and the Culture of Natural History" (Ph.D. dissertation, University of Wisconsin, 2001), 14 n. 32.

5. Wettengl, "Maria Sibylla Merian," 33.

6. First editions of the *Blumenbuch* series are now exceedingly rare. For publication details and information on these early editions, see Thomas Bürger, epilogue to Maria Sibylla Merian, *Neues Blumenbuch* (Munich: 1999 [1680]), 81–95.

7. As quoted in Wettengl, ed., *Maria Sibylla Merian*, 98.

8. General information on early modern pattern books can be found in Janet S. Byrne, *Renaissance Ornament Prints and Drawings* (New York: Metropolitan Museum of Art, 1981); and Edward F. Strange, "Early Pattern-Books of Lace, Embroidery, and Needlework," *Transactions of the Bibliographical Society* [London] 7 (October 1902–March 1904): 209–46. For the history of European embroidery, see Mary Eirwen Jones, *A History of Western Embroidery* (London: Studio Vista, 1969); Marie Schuette and Sigrid Müller-Christensen, *A Pictorial History of Embroidery* (New York: Praeger, 1964); and Pamela Warner, *Embroidery: A History* (London: B. T. Batsford, 1991). The relationship between embroidery and gardening has been extensively treated in Thomasina Beck, *Gardening with Silk and Gold: A History of Gardens in Embroidery* (London: David and Charles, 1997). Analyses of pattern books and embroidery in the construction of gender roles can be found in Ruth Geuter, "'The Silver Hand': Needlework in Early Modern Wales," in *Women and Gender in Early Modern Wales*, ed. Simone Clarke and Michael Roberts (Cardiff: University of Wales Press, 2000); Rozsika Parker, *The Subversive Stitch: Embroidery and the Making of the Feminine* (London: Women's Press, 1984); and Stacey Shimizu, "The Pattern of Perfect Womanhood: Feminine Virtue, Pattern Books and the Fiction of the Clothworking Woman," in *Women's Education in Early Modern Europe: A History, 1500–1800*, ed. Barbara J. Whitehead (New York: Garland, 1999). These works concentrate primarily on the rhetoric of the written portions of pattern books rather than on the visual qualities of the images. The work of the Italian printmaker Isabella Parasole forms an interesting comparison to Merian's work in this area. Parasole published pattern books for lace design and was also involved in creating botanical illustrations. See Evelyn Lincoln, "Models for Science and Craft: Isabella Parasole's Botanical and Lace Illustrations," *Visual Resources* 17 (2001): 1–35.

9. Sam Segal, "Maria Sibylla Merian as a Flower Painter," in Wettengl, ed., *Maria Sibylla Merian*, 74.

10. Other sources include Merian's maternal grandfather Jan Theodor de Bry's *Florilegium novum*; Jan Jonston's *Historia naturalis de insectis*; and Joris and Jacob Hoefnagel's *Archetypa* series. See Segal, "Maria Sibylla Merian as a Flower Painter," 69–87.

11. Merian's copies of Robert's iris engraving have also been discussed by Segal and Bürger. See Bürger's epilogue in Merian, *Neues Blumenbuch*, 90; and Segal, "Maria Sibylla Merian as a Flower Painter," 70.

12. Another copy of Robert's composition, a drawing attributed to Merian, is in the collection of the Senckenbergische Bibliothek, Frankfurt. It presents a reversed version of the Robert composition illustrated here. An illustration of the drawing is available in Wettengl, ed., *Maria Sibylla Merian*, 70.

13. Merian, *Neues Blumenbuch*, 90; Segal, "Maria Sibylla Merian as a Flower Painter," 70.

14. Beck, *Gardening with Silk and Gold*, 36. For a discussion of the technique of slip-work, see also Warner, *Embroidery*, 73–77.

15. Warner lists Gessner's *Catalogue plantarum* (1546) and Gerard's *Herbal* (1597) among the widely used sources for embroidery design in the sixteenth and seventeenth centuries, and Thomas Moffet's *Theatrum insectorum* (1634) and Edward Topsell's *Historie of Four-Footed Beasts* (1607) as sources for the seventeenth century. Warner, *Embroidery*, 67, 94.

16. Warner, *Embroidery*, 95.

17. Jacob and Joris Hoefnagel, *Archetypa studiaque patris Georgii Hoefnagelii* . . . . Merian based the damselfly in the pansy illustration and the swallowtail butterfly in the iris illustration on insects appearing in plate 7 of part 1 and plate 12 of part 3, respectively.

18. Segal has shown that several of these garlands were adapted from Robert's designs, and he has noted that Merian's garlands were also influenced by the work of her stepfather Jacob Marrel. See Segal, "Maria Sibylla Merian as a Flower Painter," 72–73.

19. Dirck van Rijswijck was a Dutch goldsmith active in Amsterdam during the third quarter of the seventeenth century. For further information on Van Rijswijck and a complete catalogue of his inlay work, see Danielle Kisluk-Grosheide, "Dirck van Rijswijck (1596–1679): A Master of Mother-of-Pearl," *Oud Holland* 111, no. 2 (1997): 77–152. Information on Merian's friendship with Koerten, along with further references to Koerten's life and work, can be found in Kinukawa, "Art Competes with Nature," 157, n. 69.

20. Wettengl, ed., *Maria Sibylla Merian*, 98.

21. As quoted and translated in ibid.

22. Translated in ibid., 103.

23. The first *Raupenbuch* was published in 1679 while Merian was living in Nuremberg, the second volume was published in 1683, and the third was published posthumously in 1717. For further publication details about the *Raupenbuch* series, see Heidrun Ludwig, "The Raupenbuch, a Popular Natural History," in Wettengl, ed., *Maria Sibylla Merian*, 52–67, esp. 53–54.

24. Segal, "Maria Sibylla Merian as a Flower Painter," 70.

25. Ludwig, "The Raupenbuch, a Popular Natural History," in Wettengl, ed., *Maria Sibylla Merian*, 59.

26. Johannes Goedaert, *Metamorphosis et historia naturalis insectorum*, 3 vols. (Middleburg, 1662–69).

27. Merian's preparatory watercolors utilizing this format are found in the artist's *Studienbuch*, as noted by Wettengl, "Maria Sibylla Merian," 24–25. On Goedaert's influence on Merian, see also Davis, *Women on the Margins*, 152–53.

28. George McGavin, *Insects, Spiders, and other Terrestrial Arthropods* (New York: Dorling Kindersley, 2000), 158.

29. Wettengl, "Maria Sibylla Merian," 21.

30. The *Studienbuch* contains entries from Merian's childhood years, but these were added later by Merian when she began assembling the journal in the 1680s. A facsimile edition of the *Studienbuch* was published as Maria Sibylla Merian, *Schmetterlinge, Käfer und andere Insekten: Leningrader Studienbuch*, ed. Wolf-Dietrich Beer, 2 vols. (Leipzig: Edition Leipzig, 1976). For details on the discovery of the *Studienbuch*, see also Valiant, "Maria Sibylla Merian," 469.

31. As quoted and translated in Wettengl, "Maria Sibylla Merian," 25. Merian made other analogies between insects and fabric; in one passage in the *Raupenbuch* (1:32) she compares the color in moths' wings to dyed wool. See Kinukawa, "Art Competes with Nature," 134.

32. Wettengl, "Maria Sibylla Merian," 21.

33. British Library, Sloane MS 4064, fol. 70. Translated by Elizabeth Rücker and published in Wettengl, ed., *Maria Sibylla Merian*, 268.

34. For information on Cornelis van Aerssen van Sommelsdijk's activities in Surinam and a detailed account of the Labadist presence there, see Trevor J. Saxby, "Disaster in the Jungle: Labadist Colonial Enterprise in Surinam, 1683–1719," in *The Quest for the New Jerusalem: Jean de Labadie and the Labadists, 1610–1744* (Dordrecht, Netherlands: M. Nijhoff Publishers, 1987).

35. Saxby believes that this collection of butterflies awakened Merian's interest in the insects of Surinam, but he provides no further discussion of this point. The collection of Surinamese butterflies at Waltha Castle has also been noted by Elisabeth Rücker, who states that the butterflies were brought back to Waltha Castle by Labadists who had traveled to Surinam. Although it is not possible to determine for certain the origin or fate of this collection of butterflies, it is true that they must have played a role in Merian's later decision to travel to South America. See Saxby, *The Quest for the New Jerusalem*, 277, 384; and Elisabeth Rücker, "Life and Personality of Maria Sibylla Merian," in *Maria Sibylla Merian in Surinam*, 10–11.

36. The English were the first European presence in Surinam, dating from Francis Willoughby's claim of the land for England in 1650. Control over the area was contested for a number of years until 1667, when the Dutch reached a settlement with the English. On the early history of the European presence in Surinam, see Rudolf Asveer Jacob van Lier, *Frontier Society: A Social Analysis of the History of Surinam* (The Hague: Martinus Nijhoof, 1971), 1–37.

37. Maria Sibylla Merian, *Metamorphosis insectorum Surinamensium*, ed. Elisabeth Rücker and William T. Stearn, 2 vols. (London: Pion, 1980), 1:85. Nicolaas Witsen and his nephew Jonas Witsen had close contacts with Surinam; Nicolaas served as a director of the Dutch East India Company and Jonas's wife was the daughter of plantation owners in Surinam who maintained a collection of rarities at their estate there. This collection was inherited by Jonas and was incorporated into Nicolaas's collection in Amsterdam, where Merian is believed to have encountered more specimens of Surinamese insects during the 1690s. See Roelof van Gelder, "Art, Commerce, Passion and Science," in Wettengl, ed., *Maria Sibylla Merian*, 143. Van Gelder's essay provides a useful introduction to the community of collectors in Amsterdam in the late seventeenth century.

38. Elisabeth Rücker, "Maria Sibylla Merian: Businesswoman and Publisher," in Wettengl, ed. *Maria Sibylla Merian*, 259.

39. Stadtbibliothek Nürnberg, Manuscript no. 167. Translated by Elisabeth Rücker and published in Wettengl, ed., *Maria Sibylla Merian*, 264.

40. Merian's technique of coating insect specimens with turpentine oil is described by her in a letter accompanying a shipment of specimens from Surinam to Georg Volkammer, another friend from Nuremberg. See Universitätsbibliothek Erlangen, Trew-Bibliothek, Brief-Sammlung Ms. 1834, Merian No. 2, translated by Elisabeth

Rücker and published in Wettengl, ed., *Maria Sibylla Merian*, 265. Turpentine oil, also known as terebinth, was a key ingredient in the preparation of specimens in early modern Europe. For a discussion of the substance in this context, see also Harold J. Cook, "Time's Bodies: Crafting the Preparation and Preservation of Naturalia," in Smith and Findlen, eds., *Merchants and Marvels*, 238–40.

41. Merian and Levinus Vincent were personally acquainted, and in later years they shared some of the same contacts and correspondents. Vincent, a Mennonite silk merchant specializing in brocade fabric, came from a family of merchants specializing in overseas trade. Vincent's business earned him much wealth, which allowed him to spend most of his time on leisurely pursuits. Vincent and his wife Johanna Breda worked together on developing, organizing, and displaying their collection of rarities, the nucleus of which was formed by the collection of Johanna's brother Anthony Breda. The material discussed here on their collection is based on Kinukawa's invaluable study of Levinus Vincent and the culture of collecting in Amsterdam. See Kinukawa, "Art Competes with Nature," 167–216.

42. Ibid., 183.

43. Romyn de Hooghe completed the engravings for the catalogues; see Levinus Vincent, *Wondertooneel der Nature . . .* (Amsterdam, 1706). For a complete bibliography of Vincent's publications, see Kinukawa, "Art Competes with Nature," 177 n. 133.

44. Edmé-François Gersaint, *Catalogue raisonée de coquilles et autres curiosités naturelles* (Paris: Flahault et Prault, 1736). As quoted and translated in Barbara Maria Stafford and Frances Terpak, *Devices of Wonder: From the World in a Box to Images on a Screen* (Los Angeles: Getty Research Institute, 2001), 148.

45. Stafford and Terpak, *Devices of Wonder*, 150.

46. As quoted in Kinukawa, "Art Competes with Nature," 200.

47. Kinukawa, "Art Competes with Nature," 200.

48. Ibid., 185.

49. Ibid., 195. Kinukawa provides evidence that other women also participated in ordering and arranging cabinets in this manner in the Netherlands during this time. A collection in Harlem belonging to a man named Dorville contained shells arranged in displays that were embroidered with silk thread by his wife. See Kinukawa, "Art Competes with Nature," 199.

50. Letter to Volkammer, Universitätsbibliothek Erlangen, Trew-Bibliothek, Brief-Sammlung Ms. 1834, Merian No. 1, as quoted and translated by Rücker in Wettengl, ed., *Maria Sibylla Merian*, 264–65.

51. Stadtbibliothek Nürnberg, Manuscript no. 167. As quoted and translated by Rücker in ibid., 264.

52. Kinukawa offers a detailed discussion of the culture of specimen exchange in Amsterdam during Merian's time. See Kinukawa, "Art Competes with Nature," 217–46.

53. British Library, Sloane MS 4064, fol. 3, quoted and translated in Gelder, "Art, Commerce, Passion and Science," 148.

54. Benjamin Schmidt, "The Project of Dutch Geography and the Marketing of the World, circa 1700," in Findlen and Smith, eds., *Merchants and Marvels*, 349, 354.

55. Ibid., 361–62.

56. Merian, *Metamorphosis insectorum Surinamensium*, 1:124.

57. For further details on the contents of the Studienbuch, see Wettengl, ed., *Maria Sibylla Merian*, 134, 224.

58. Merian, *Metamorphosis insectorum Surinamensium*, 1:111.

59. This illustration was cause for controversy during the eighteenth century, since many people did not accept Merian's account as truthful due to its unusual subject matter. See Valiant, "Maria Sibylla Merian," 474; and Davis, *Women on the Margins*, 198.

60. Merian, *Metamorphosis insectorum Surinamensium*, 98.

61. Plate 51. Ibid., 1:130.

62. Segal, "Maria Sibylla Merian as a Flower Painter," 78. For further discussion of the plants in Merian's book, see William T. Stearn, "The Plants, the Insects and Other Animals of Merian's *Metamorphosis insectorum Surinamensium*," in Rücker and Stearn, eds. *Metamorphosis insectorum Surinamensium*.

63. The cockroach and pineapple appear on plate 1 of *Metamorphosis*.

64. The two major discussions of Merian's remarks on the *Flos pavonis* are found in Davis, *Women on the Margins*, and in Londa Schiebinger, "Lost Knowledge, Bodies of Ignorance, and the Poverty of Taxonomy as Illustrated by the Curious Fate of *Flos Pavonis*, an Abortifacient," in *Picturing Science, Producing Art*, ed. Caroline A. Jones and Peter Louis Galison (New York: Routledge, 1998). For an analysis and critique of Davis's and Schiebinger's arguments, see Viktoria Schmidt-Linsenhoff, "Metamorphosis of Perspective: 'Merian' as a Subject of Feminist Discourse," in Wettengl, ed., *Maria Sibylla Merian*.

65. Merian, *Metamorphosis insectorum Surinamensium*, 125–26.

66. For plantation owners and their financial backers in Amsterdam, however, the enormous profits generated by the sugar trade far outweighed the costs of importing food, livestock, manufactured goods, and laborers.

67. When Merian returned to Amsterdam from Surinam, she brought with her the indigenous woman who had worked either as her servant or her slave. This person, with whom Merian may have had a more complex relationship than she had with any of the other people she met in Surinam, received the least amount of attention in Merian's accounts, and her presence is known only from the manifest of the ship on which they traveled home. Natalie Zemon Davis discusses the relationship between Merian and this woman in her biographical account of Merian in *Women on the Margins*, 194. Elizabeth Honig's discussion in "Making Sense of Things" of the question of human labor, and its absence, in the context of seventeenth-century Dutch still life painting and collecting practices provides a valuable model for understanding these aspects of Merian's approach. For a discussion of the ambiguous relationships between identity and property in representations of enslaved Africans on Dutch plantations in Surinam, see the discussion of the work of the Dutch painter Dirk Valkenburg in Charles Ford, "People as Property," *Oxford Art Journal* 25, no. 1 (2002): 1–16.

Conclusion

1. The connection between European colonialism and the study of the natural world has been the focus of a number of studies that have concentrated on the history