Title
Narrative and natural history in the eighteenth century.

Author
Terrall, Mary

Publication Date
2017-04-01

DOI
10.1016/j.shpsa.2017.03.009

Peer reviewed

Studies in History and Philosophy of Science xxx (2017) 1–14

Contents lists available at ScienceDirect

Studies in History and Philosophy of Science

journal homepage: www.elsevier.com/locate/shpsa

Narrative and natural history in the eighteenth century

Mary Terrall

Department of History, Box 951473, UCLA, Los Angeles, CA 90095-1473, USA

ARTICLE INFO

Article history:
Available online xxx

Keywords:
Narrative
Natural history
René-Antoine de Réaumur
Abraham Trembley
Insects
Metamorphosis

ABSTRACT

In the eighteenth century, natural histories of animals incorporated narratives about animal behaviour and narratives of discovery and experimentation. Naturalists used first-person accounts to link the stories of their scientific investigations to the stories of the animal lives they were studying. Understanding nature depended on narratives that shifted back and forth in any given text between animal and human, and between individual cases and generalizations about species. This paper explores the uses of narrative through examples from the work of René-Antoine Ferchault de Réaumur and Abraham Trembley. In all cases, narrative took the genre of natural history well beyond straightforward description and classification. Prose accounts of insect actions and mechanisms worked in tandem with visual narratives embedded in the accompanying illustrations, where artists developed strategies for representing sequences of minute changes over time. By throwing into relief the narrative sections of natural histories, the examples considered here expose the role played by these tales of encounters with the insect world in the making of natural historical knowledge.

1. Introduction

The French naturalist René de Réaumur, arguably the standard-bearer for observational natural history in the eighteenth century, often recounted his search for the empirical facts of natural history as tales of quest and discovery. Within these first-person accounts he embedded narratives of animal life, tracing the plots of natural processes such as metamorphosis, mating and egg-laying, the cycle of life in colonies of social insects, the building of egg cases and hatching of young, or the trapping and eating of prey. For Réaumur, as for many of his empirically-minded contemporaries, writing natural history meant explaining not only what he had seen, but how he had managed to see it, and by extension, how his reader would be able to do the same. A very particular literary genre, the natural history of any given species incorporated narratives about animal behaviour into linked narratives of discovery or investigation. The latter, often set in a specified locality and fleshed out with the interventions of minor characters, recounted experiments and other interventions as part of the discovery story. The naturalist presented himself as protagonist of the story, deploying his tools and techniques to expose the hidden lives of animals, and to tell their stories in turn.

In what follows, I explore the uses of narrative in eighteenth-century natural history through examples from the work of Réaumur and his protégé Abraham Trembley. The "histories" of insects produced by these authors characteristically braided together narratives of nature and narratives of discovery.[1] Narrative functioned quite differently from anatomical description and taxonomy, the other key elements of natural history. Whether chronicling the stages of a life cycle, or telling the story of a spider eating her prey or spinning an egg case, naturalist-authors used narrative to show the dynamism of nature. Complex behaviours and processes – bumblebees constructing their nests and feeding their larvae, the stages of the chick's emergence from an egg, spiders spinning their webs and trapping their prey – were common currency in natural history writing. Tracking the life cycle of any creature meant following the sequential steps of its growth and development– a trajectory with a beginning, middle, and end like any good narrative. Static anatomical descriptions could go only so far; without the narratives of movements, mechanisms, and behaviours, Réaumur regarded natural history as barren and incomplete. Attending to how naturalist-authors deployed narrative brings us to the core of natural historical knowledge, the sequences of events that string together into the processes of life. Once he was in a position to construct the narrative, with all its ins and outs, the naturalist could claim knowledge of the species in question – with

[1] The general category "insects" was considerably more capacious in the eighteenth century than it is today. Spiders, worms, crustaceans and the microscopic bodies in organic infusions were all considered insects.

E-mail address: terrall@history.ucla.edu.

http://dx.doi.org/10.1016/j.shpsa.2017.03.009
0039-3681/

the caveat that the narrative could always be refined and amended when new opportunities afforded new knowledge. The other narrative strand, in which the naturalist and his associates took the active roles, served a slightly different function: by showing the naturalist in action, first-person accounts certified the truth of the narratives of insect life. At the same time, the protagonist was demonstrating how to do natural history. To put this slightly differently, narrative served to show how nature behaves (with the animal as protagonist) and also how naturalists behave when observing nature in action.

Natural histories, like experimental reports, routinely slipped in and out of first-person exposition, as Réaumur introduced his assistants and correspondents and friends into the story, alongside the non-human actors whose stories they followed. The life of a honeybee hive, for example, could be recounted in the third person as a sequence of tasks and transformations of the queen, the larvae and the drones. But when the life history of the bees unfolds within a discovery narrative about deciphering the complex sequence of activities in and around the hive – designing and building special glass-fronted hives, counting and sexing the bees, identifying the queen and drones, and so on – the whole "history" becomes a tale about doing natural history, with the story of the bees themselves interpolated within it. These nested narratives reveal both animal and human registers, shifting perspective from one to the other quite fluidly. Understanding nature, and the nature of living things, depended on these narratives, moving back and forth not only between animal and human, but also between individual cases and generalizations. Thus another function of narrative was to incorporate the particular and individual, with their contingencies, into a general account of the species, and perhaps of the broader class as well. Histories of different processes or different species wove together multiple interleaved narratives. These might include details about specific individuals, which in turn could be generalized to a narrative about how the species normally operates, and sometimes generalized further to encompass related species for a more inclusive history. Such generalizations then fold back into the investigation narrative, with the naturalist and his helpers building on previous, incomplete, knowledge to see what had not been seen before. At this level, another plot emerges, that of the progress of knowledge, where the author-naturalist claims a spot farther along the road to knowledge than his predecessors. In the seventeenth century, Réaumur reflected, "when the new philosophy had made some progress, … it was recognized that sudden transformations were not among the means that nature uses in the production of her works." The anatomists Malpighi and Swammerdam had exposed such transformations as "chimerical," through their artful and unprecedented dissections of insects. However admirable their techniques, "neither of them, nor any subsequent authors, pushed their observations as far as one would wish" (Réaumur, 1734, pp. 350–1). It remained to Réaumur himself to build on the insights of his predecessors, and thereby to advance the plot to the next chapter.

2. Metamorphosis: core narrative of the insect world

In the natural history of insects, the overarching narrative for each species was always structured around orderly development from pre-existing structures; generalized, this became the grand narrative for all forms of life. Réaumur devoted several long chapters of his multi-volume work on insects to unpacking every aspect of the mystery of metamorphosis, bringing to light the maneuvers of caterpillars as they took on the form first of chrysalis, and then of butterfly (or moth) with the capacity to mate and deposit eggs to start the cycle again. Based on hundreds and hundreds of observations of many different species, these chapters trace narratives and sub-narratives, frequently digressing from the central plotline to explore anatomical structures or properties of materials. For Réaumur, the focus on orderly development was also a definitive rejection of any sort of spontaneous production, whether of new life from inert matter or of one form transformed into something entirely different. He pursued the mechanics and behaviours associated with metamorphosis in the service of his anti-spontaneist program.[2] "If there were true productions of plants and animals, as some other philosophers suppose, we would have to give up on explaining how they make themselves" (Réaumur, 1734, p. 360). The kind of explanation he had in mind would take the form of narrative, unfolding step by step and punctuated with descriptions of every aspect of the process, however minute. Metamorphosis in insects may look like a spontaneous transformation from one thing into another, as new structures emerge and old ones disappear, but Réaumur insisted that this could not be the true story. With the appropriate methods and tools, a seasoned observer could uncover the complex sequence of subtle changes in the growth and consistency of structures already detectable within the caterpillar, and presumed by extrapolation to have been present in the egg as well, beyond the reach of the human senses.

Réaumur's exhaustive chapters on insect development zoom in from the teleological grand narrative of development to corroborating details amassed to compel assent from the reader, grounding general conclusions in particular observations of different kinds of insects. We learn that the caterpillar "animal machine" is an "organized garment" that gathers, processes, and delivers nourishment to that other "animal machine" contained within it, the chrysalis. And this turns out to be nothing other than the butterfly, with its delicate structures folded tightly inside the outer shell of the chrysalis. "A butterfly in the form of a caterpillar is in its infancy; it has only arrived at the state of perfection, at the age of full strength, when it appears as a butterfly" (Réaumur, 1734, pp. 362–3). This is a big claim, with theoretical consequences. Confirmation would depend on what the naturalist could contrive to see and then show (in text and image) to the reader, who might then attempt to witness the process directly by observing living insects.

Like many other naturalists, Réaumur embedded narratives about nature in a first-person narrative of exploration and discovery, recounting his line of reasoning, as well as his actions, and shifting frequently between levels of generality. Consider this general statement, synthesized from the simple inspection of many instances: "A chrysalis stays immobile for several weeks, and often for several months, without taking in any sustenance." The general observation led him to conjecture that some moisture must evaporate from the dormant creature over this period. Then he reflected on the quality and function of the internal fluids and how to detect and measure transpiration through the outer shell. Preliminary investigations afforded quite a different sort of general statement. "From any part where you [*on*] cut into a newly uncovered chrysalis, water comes out. … If you cut a little bit off the wings or antennae, immediately you see a great deal of water run out from the wound." I translate the impersonal pronoun "*on*" as "you" to capture the clear implication that anyone could slice into a chrysalis and see just what the narrator has seen. A little further down the page, such general statements give way to the first-person narrative report on a specific experiment: "To learn whether this last idea was correct, in the month of July I weighed two chrysalises at the instant when they had just emerged from the casing of the caterpillar skin" (Réaumur, 1734, p. 373). Weighing them each day until just before the butterfly emerged, he found that, contrary to

[2] On opposition to spontaneous generation, and the ongoing controversy in the 18th century, see Ratcliff (2009) and Terrall (2014).

Please cite this article in press as: Terrall, M., Narrative and natural history in the eighteenth century, Studies in History and Philosophy of Science (2017), http://dx.doi.org/10.1016/j.shpsa.2017.03.009

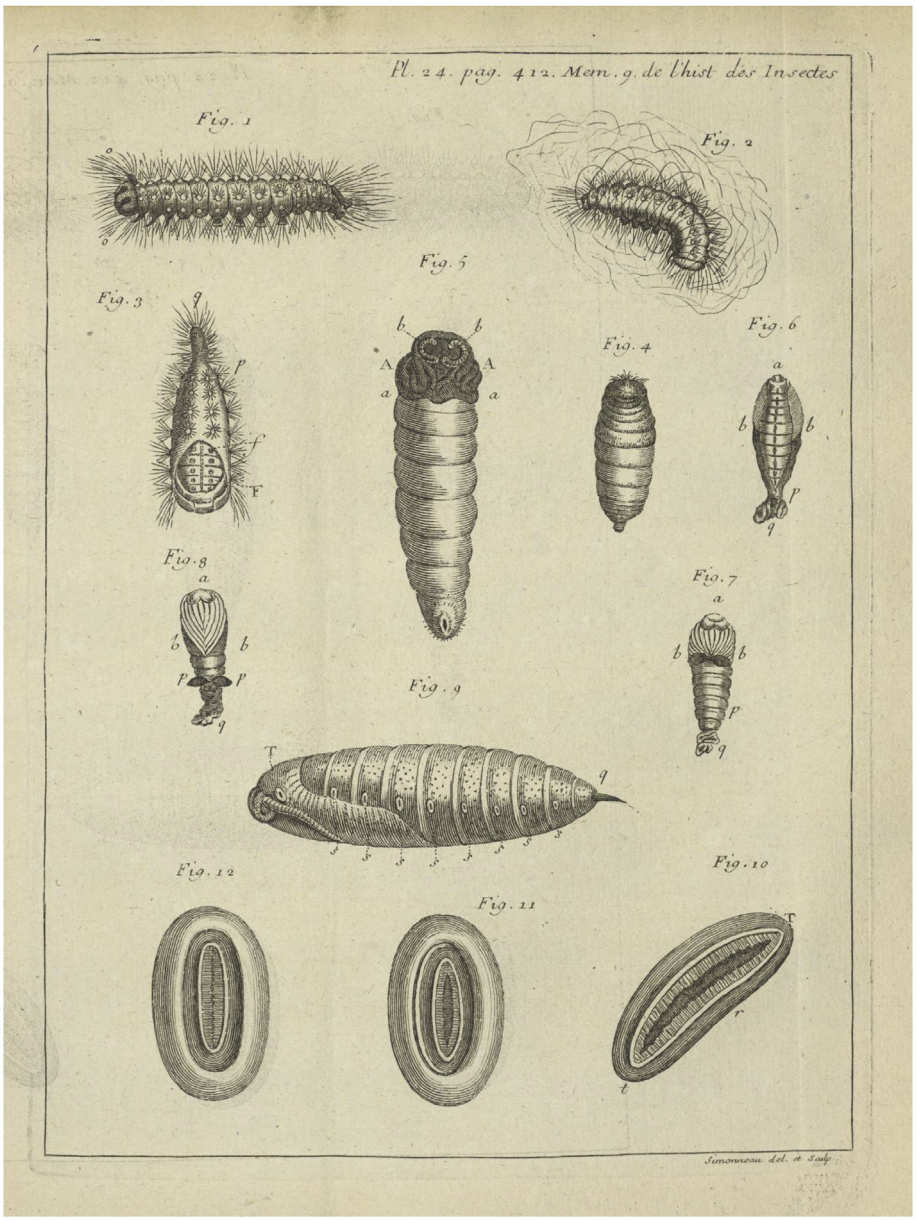

Fig. 1. Philippe Simonneau, Gypsy moth caterpillar, and various chrysalises. Fig. 3 shows caterpillar skin splitting on back, as tail end shrinks in preparation for emergence of chrysalis. Réaumur, *Mémoires pour servir à l'histoire des insectes*, vol. 1, plate 24. Wellcome Library, London.

expectation, the weight decreased by no more than one twentieth, suggesting that the gradual solidification and articulation of the parts could not be the consequence of transpiration.

In such experimental reports, interpolated into the description with specifics of time and place, Réaumur's own story unfolded alongside that of the insect. Here is an entirely typical example: a simple experiment designed to demonstrate the identity of the caterpillar's legs and those of the butterfly. "In one hand, I seized a caterpillar whose chrysalis was ready to emerge, and whose skin was already split down the back, and with scissors held in my other hand I cut the ends off three of the scaly legs on one side [of the caterpillar]. In spite of this ill treatment, the chrysalis continued its efforts to completely cast off the skin, and it soon succeeded. It was then easy to see if the legs of the butterfly had been lodged in the scaly sheaths of the caterpillar's legs. In that case, the chrysalis [i.e. the butterfly inside the outer shell of the chrysalis] should have had the three mutilated legs on one side, and it actually did have three legs on one side shorter than the corresponding legs of the other side" (Réaumur, 1734, p. 365). The act of cutting off the legs, followed by the undiminished activity of the insect and the final inspection, make for a dramatic confrontation between insect and naturalist – told from the point of view of the latter. The precision and violence of his intervention make the conclusion more compelling and convincing, not only conceptually or rationally, but also as literary strategy.

At other moments, the insect's own actions move it into the focal role, as in this description of the tricky maneuvers of a common caterpillar in the initial stages of its metamorphosis. (See Fig. 1, Réaumur's Plate 24, especially image 3):

> Finally … as the moment of the transformation approaches, the movements of its tail, the alternating lengthening and contracting, become more frequent. [The caterpillar] no longer seems to be in such a feeble state; it is soon ready to perform

Please cite this article in press as: Terrall, M., Narrative and natural history in the eighteenth century, Studies in History and Philosophy of Science (2017), http://dx.doi.org/10.1016/j.shpsa.2017.03.009

> actions demanding considerable vigor. The tail end and the last two legs are the first parts that the insect disengages from the caterpillar skin, pulling them up toward the head. The section of the skin they occupied is now empty and … it shrinks. [The insect] inflates and lengthens at the same time the two or three last rings of its envelope; it shortens all the front ones, in order to force the rear ones to extend in all directions (pp. 389–90).

Réaumur's prose style is rather cumbersome, to be sure, as he tracks every motion of the insect disengaging itself from its old skin. (The passage above is a severely shortened section of this narrative.) He distilled this blow-by-blow narrative thread, unpacked here in such detail, from hundreds of observations of caterpillars in the laboratory. In passages like this, the insect occupies the center of the frame, with the complex sequence unspooling like a slow-motion film clip.

Different species varied somewhat in their strategies for sloughing off the caterpillar skin, and Réaumur brought each variant into the full story of metamorphosis. Normally the whole transformation happened quite quickly, in less than a minute or two. Sometimes he contrived to freeze the action, and put an artist to work recording the event in series of drawings. "At the instant when the metamorphosis was beginning, I have often grabbed the caterpillar and thrown it into spirit of wine, in order to kill it. I wished by this means to seize some of these insects in the different stages of their transformation, in order to consider them afterwards at my leisure. If the crack in the upper back was [already] long enough, the chrysalis succeeded in shedding its skin even when submerged in the spirits of wine, which nevertheless caused its death shortly afterwards. Those I threw in at the moment when they had only just started to detach the tail [from the skin], did not rid themselves entirely of the skin, but they still managed to advance the operation."[3] Generally, the engraved plates illustrate these accounts with an array of images of insects and their parts (sometimes exposed through dissection), isolated from any context, as in Plate 24 (See Fig. 1). The first four numbered images in this plate depict the gypsy moth caterpillar and its chrysalis; they represent a clearly legible time sequence from the mature caterpillar at upper left, to the first stage of spinning its loose cocoon (note the threads), to the splitting of the caterpillar's skin and the new chrysalis, free of the caterpillar skin. Oddly, by our standards at least, the enlarged view in image 5 depicts a different species, and interrupts the time sequence of the individual gypsy moth caterpillar. It does, however, illuminate aspects of the story common to both species. The artist has drawn a magnified view of a chrysalis artificially extracted from the caterpillar skin in the laboratory, just before starting its metamorphosis, "in order to show the arrangement of the parts of the chrysalis, or (which is the same thing) the butterfly, when they are hidden under the caterpillar's coat." (The antennae are visible, curled up at *bb*, and the wings at *Aa*.) This view could only be achieved through the application of scalpel and magnifying lens. The next two images (6 and 7) show a chrysalis of yet another species, viewed from front and back, with the front portion of its body already out of the caterpillar skin, which it has pushed part way down its body. Then image 8 advances a few moments in time, when the skin is completely crumpled at the bottom end. Though they help the reader to visualize key points in the narrative, these images depend on the text for their interpretation, and sequentially numbered images are not necessarily adjacent to each other on the plate. There were no accepted artistic conventions for representing such processes, and it seems that the artist, Philippe Simonneau in this case, was searching for a visual language appropriate to the rather quick sequences narrated in the text.

In the next plate, Simonneau accomplished this more successfully, probably aided by the technique of drowning the emerging chrysalis in spirits to interrupt the process for closer examination. (See Fig. 2, Réaumur's Plate 25.) The plate shows a species that lives on nettles, with the adult butterfly at the top, showing both sides of the wings. Here the artist supplied a bit of context, with the nettle plant depicted in some detail, as well as some generic twigs, as necessary props to the action. We see a rapid sequence as the caterpillar transitions to chrysalis, broken down into ten distinct images, and numbered sequentially – though the arrangement on the page disrupts the numerical order of the images at a few points.[4] (This is an artifact of the way images were selected and cut from sheets of drawings and arranged to fit onto the plate for the engraving.) Although the images purportedly represent an individual caterpillar, they were very likely drawn from different specimens killed in the alcohol bath, as well as from life.

The insect hangs in various attitudes from twigs or stems. This plate is striking, and unusual, for the artist's efforts to depict the chrysalis in motion (especially in images 7, 8 and 11); callouts in the margin of the text directed the reader to the corresponding image.

The relation of text to image was further complicated by the essential role of the discursive figure explanations, printed on the pages immediately preceding the plates. These recapitulate relevant points from the main text in truncated form, pointing in turn to all parts of the images to explain exactly what they represent. The story starts with the caterpillar's departure from the nettle, where it had fed and grown, to find an appropriate spot for the next phase of its life by attaching itself to the underside of a leaf or twig, to hang upside down. (The artist took some liberty here, showing the caterpillar hanging on the nettle rather than a different plant.) The text digresses at this point to follow the process of building the anchor point with a sticky mound of silk (shown in an enlarged view in image 18). Once attached, the insect settles into a J-shape, preparing to split open along the curve of the back, and the artist tracks the ensuing narrative in images 5 through 13.

> As soon as the skin of the back cracks open, however small the opening is, the moment has arrived for the beginning of an amusing spectacle for the observer – but it will elude him if he does not start observing right away. Out of the slit in the skin of the caterpillar emerges a part of the body of the chrysalis; from moment to moment a greater portion of the body of the chrysalis appears; the emerging part rises above the edges of the opening; the chrysalis inflates this part, and by inflating it, causes it to act like a wedge that cracks open the skin even more: the opening … allows a larger part of the body of the chrysalis to come out, which acts like a larger wedge. Thus that slit, whose origin was close to the head, is pushed successively up to the last pair of legs and beyond (p. 420).

From this point, the chrysalis flexes and twists vigorously to get rid of the superfluous skin, and eventually succeeds in sloughing it off (Fig. 3, Plate 25 detail, image 11).

In this example, significantly abridged for present purposes, the grand narrative of development played out in the life cycle of a particular species, through the actions of individual insects. The observer-narrator follows the twists and turns of the plot

[3] Réaumur (1734, p. 394). This was an adaptation of the killing jar, or "*cimetière des insectes*" in Réaumur's parlance, used by insect collectors in the field.

[4] The plate accompanied a chapter on "The Skill [*Industrie*] of caterpillars that hang themselves vertically by the hind end, with the head down, for their metamorphosis." Figures correspond to text on Réaumur (1734, pp. 416 ff).

Please cite this article in press as: Terrall, M., Narrative and natural history in the eighteenth century, Studies in History and Philosophy of Science (2017), http://dx.doi.org/10.1016/j.shpsa.2017.03.009

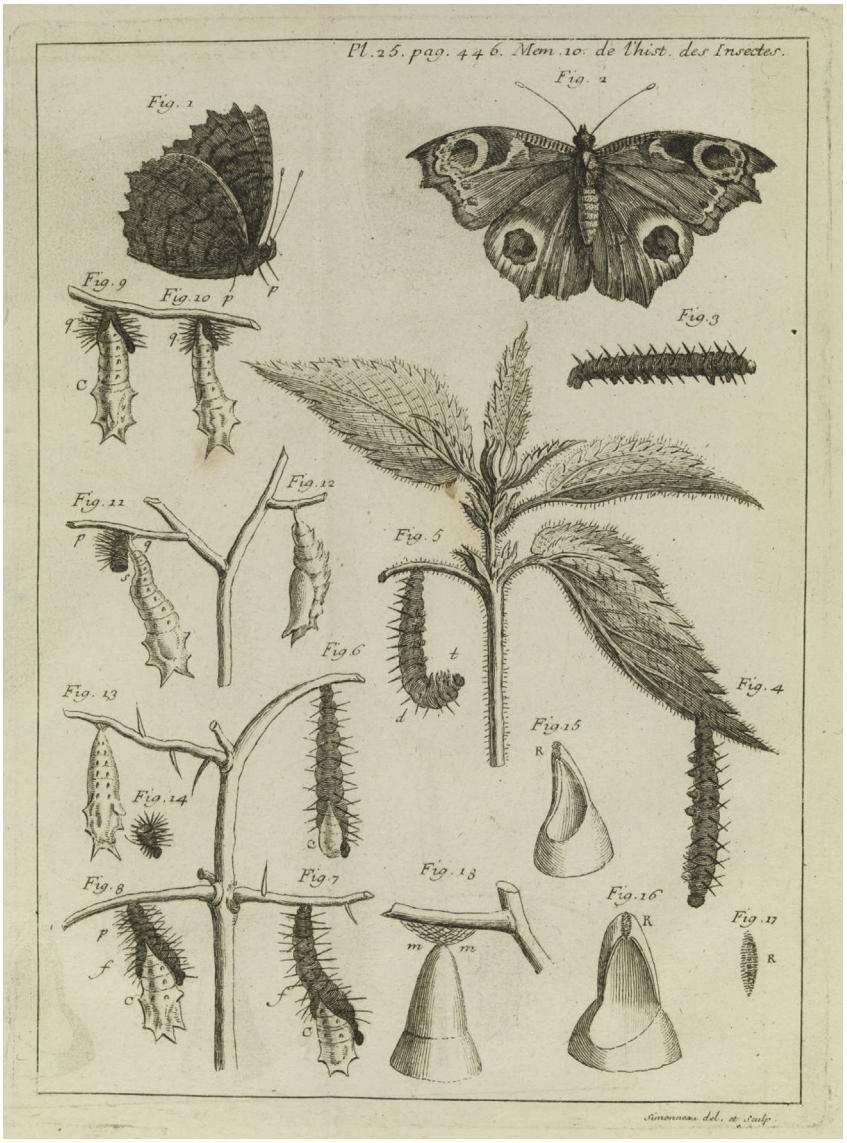

Fig. 2. Philippe Simonneau, stages of transformation from caterpillar to chrysalis, with butterfly. Réaumur, *Mémoires pour servir à l'histoire des insectes*, vol. 1, plate 25. Wellcome Library, London.

meticulously, imparting judicious hints to the reader about how to witness the "amusing spectacle" in real life. Occasionally, he lapses into the first person and inserts himself into the unfolding action, cutting off the legs of his subjects at just the right moment, or throwing them into the killing jar. Meanwhile, the artist was sketching as many views of the event as possible, drawings that would later be arranged for engraving, and tagged with references back to the text. Readers of Réaumur's natural history would have become familiar with sequences of images showing processes unfolding in time, in parallel with the written narratives. Where movements were rapid, the narrative (sometimes recapitulated in compressed form in the figure explanations) had to supplement the discrete images. For the nettle caterpillar's metamorphosis, the pictures alone could not convey either the quickness of the process or the pirouetting motion of the chrysalis; on the other hand, without the images, the narrative would have been difficult to follow.

We can spot visual representations of time sequences throughout Réaumur's six volumes on insects. Another nice example appears in the representation of metamorphosis in dragonflies, drawn by Hélène Dumoustier (See Fig. 4).

In this plate, the first four numbered images show the adult emerging from the shell of the nymph's body. Between the second step, with head down and wings still flattened against the thorax, and the third, the dragonfly has curled itself forward into a position where only the tip of the body is still trapped in the old skin. The artist captured a moment of stillness immediately after an sudden burst of activity: "she has just made a kind of jump that one would have thought well beyond her strength a moment before; that is to say, from a position like that of the dragonfly in image 2, she managed to jerk her head and body upwards abruptly, and to grab the front part of the old skin with her legs" (Réaumur 1742, p. 449). The insect's swift and unexpected motion escaped the limitations of the before-and-after sequence of images, the best the artist could do with the rapidly changing scene. Making the effort to switch from text to image and back, however, the reader could read the four moments depicted in the first four images as a sequence leading up to the denouement at the upper left of the plate, where

Please cite this article in press as: Terrall, M., Narrative and natural history in the eighteenth century, Studies in History and Philosophy of Science (2017), http://dx.doi.org/10.1016/j.shpsa.2017.03.009

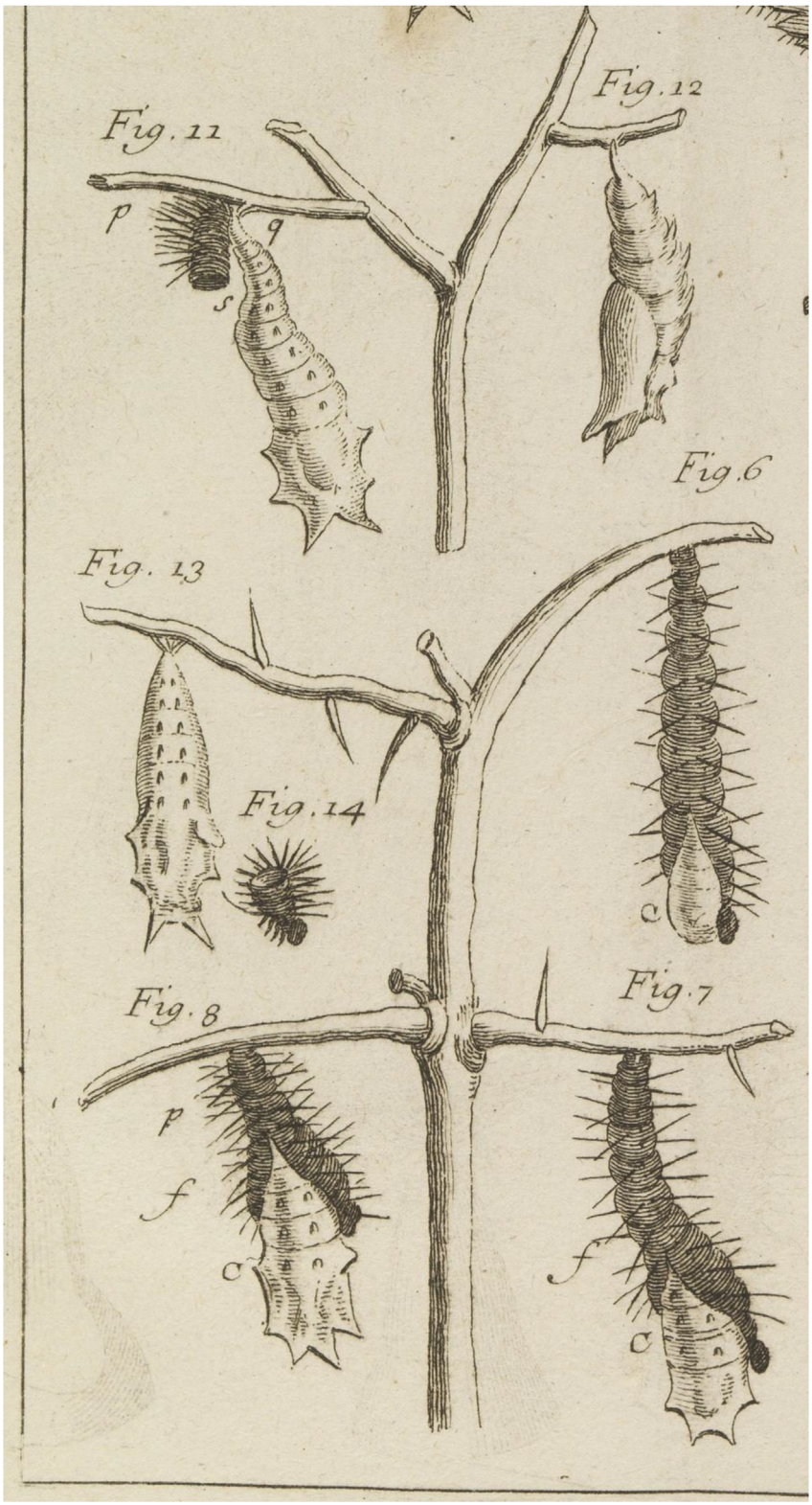

Fig. 3. Chrysalis emerging from caterpillar skin. Réaumur, *Mémoires pour servir à l'histoire des insectes*, vol. 1, plate 25 (Detail).

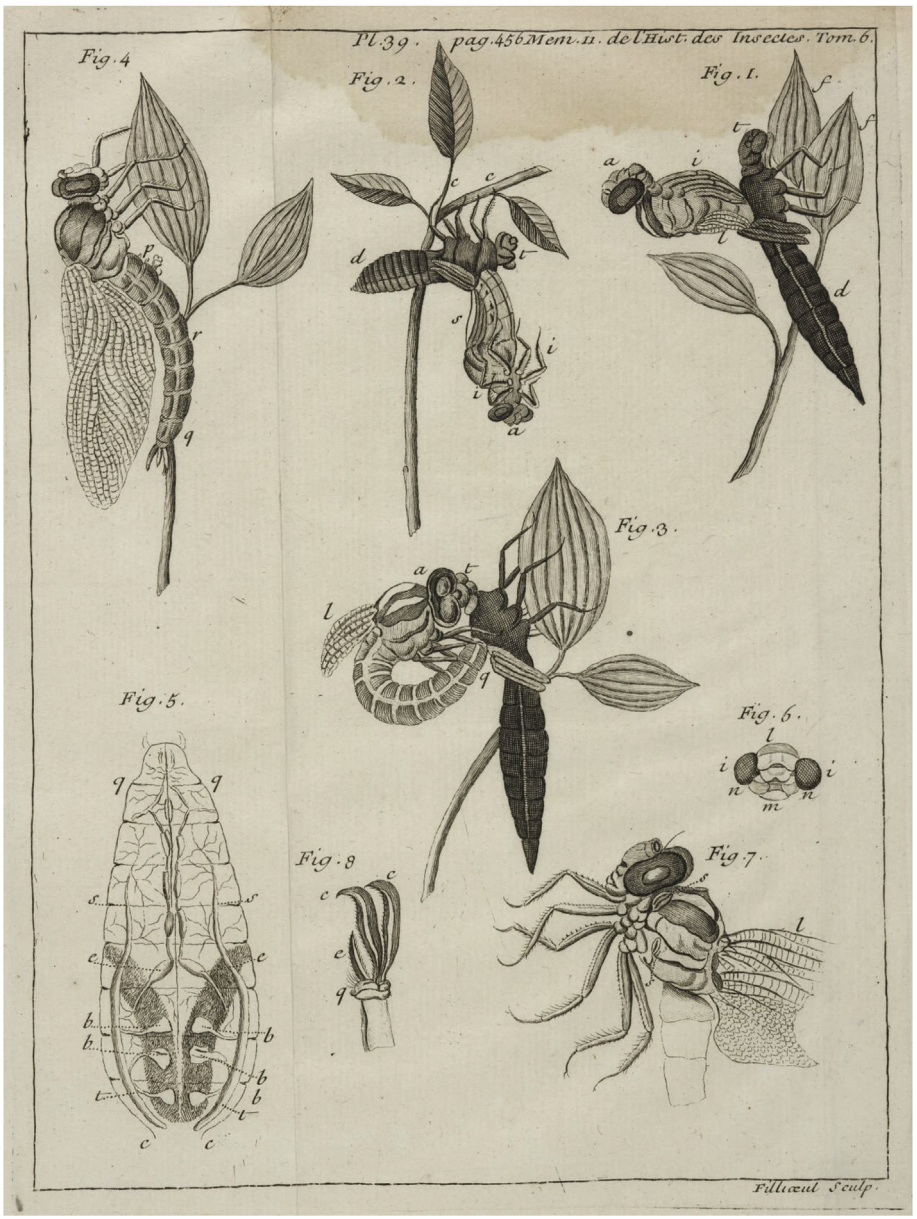

Fig. 4. Hélène Dumoustier (engraved by P. Fillioeul), Stages of transformation of dragonfly. Réaumur, *Mémoires pour servir à l'histoire des insectes*, vol. 6, plate 39. Huntington Library.

the adult rests peacefully on the stem of the plant after its exertions, letting its wings expand and dry.

Metamorphosis was a common thread running through the natural history of insects. Naturalists reclaimed for empirical science the mythical theme of transformation — familiar to eighteenth-century readers from the poems of Ovid and other classical texts — by exposing the steps involved in these changes in external appearance. These new narratives of replicable processes effectively countered commonplace assumptions about the mysterious nature of metamorphosis, redolent of the mythical plot where physical transformation served as the tale's denouement. Unlike the emerging chrysalises and butterflies in the laboratory, the sudden transformation of humans into animals, or trees, or stars, characteristic of the classical myths, was never a regular, mechanical process. The bay laurel tree did not lie hidden in Daphne's body before her transformation, nor were her body parts discernible in the tree afterwards. To decipher the structures of the butterfly folded up in different shapes inside the caterpillar was to demystify metamorphosis and to remove the process from the realm of the supernatural. Similarly, to follow all the stages, from mating and the deposit of eggs through larva, nymph and adult, erased the possibility of equivocal or spontaneous generation. One function of the observation narrative, particularly crucial for metamorphosis, was to show the apparently miraculous event as mechanical, and predictable. Particular circumstances might differ, but the plot for any given species always followed the same line.

3. Engineering and predation in the insect world

Metamorphosis — the stages of the life cycle — provided a common storyline for the natural histories of insects, with seemingly endless variations from species to species. Plenty of other aspects of insect also life lent themselves to narrative description. Tales of complex and intriguing behaviours like predation or nest-

Please cite this article in press as: Terrall, M., Narrative and natural history in the eighteenth century, Studies in History and Philosophy of Science (2017), http://dx.doi.org/10.1016/j.shpsa.2017.03.009

building pulled readers in and allowed them to follow the naturalist into the laboratory or the field. To eighteenth-century observers, such behaviours were understood as skill or dexterity [*industrie*], the kind of instinctual behaviour that seemed eerily like artisanal know-how. Understanding the way insects deployed their skill meant laying out the stages of the operation, in the same way that artisanal processes were examined and understood in the period.[5] Tales of insect skills can be found in any of Réaumur's volumes. Here, I look at just one example for narratives of dramatic hunts (or battles) and engineering works, coupled as usual with first-person narratives of how to investigate such things in the diminutive scale of the insect world.

Ant-lions, named for their fierce predation on ants, dig conical holes in sandy soil, moving backwards in circles and shifting the loose sand out of the hole with pincer-like horns on their heads. Lying concealed at the bottom of the holes, they wait for their prey (usually ants or other small insects) to slip down the unstable sides of the trap and into the waiting pincers, the only part of the predator's body not covered by sand. The pincers close on the prey, immobilizing it, and the ant-lion retreats to feed on the morsel by sucking out its insides, leaving only the exoskeleton. Its meal concluded, it moves its head out of the sand, still holding the carcass, and with a toss of the head, flings it up out of the hole. Though not hard to find once you know where to look for the telltale signs of its activity, the ant-lion is also a challenge to observe, since it can hide patiently in the sand for hours or days on end without being noticed. The process of digging the trap, dealing with obstacles and then immobilizing and ingesting the prey, is rather elaborate, and makes a good story.

Ant-lions are relatively common insects in Europe, familiar to eighteenth-century readers from Abbé Pluche's popular work of natural theology, *Spectacle de la nature*. Pluche mined contemporary natural history for his engaging vignettes, transposed into dialogue format to elicit admiration for divine design. In his version of the natural history of the ant-lion, Réaumur retold the saga of its trap-building and feeding behaviour, fleshing it out with a wealth of newly observed details. Surrounding the story of the action in and around the trap were descriptions of newly-discovered peculiarities of the insects' anatomy, eating habits, habitat, and their transformation into winged adults. All of this was interlarded with narratives about the naturalist's own strategies and maneuvers. He cut off the insect's legs to confirm that it did not use them to propel itself backwards through the sand (Réaumur, 1742, p. 346). He offered a fly to an ant-lion held between his fingers, so he could watch through a magnifying lens as the tiny sucking mechanism in the horn evacuated the fly. He cut off one of the horns to expose the piston within. He identified the sex organ of the male adult fly, and its mechanism. He tested the effect of temperature on the activity of the ant-lions in captivity. Then he supplemented his own observations with details sent to him by Charles Bonnet in letters from Geneva.[6] The ant-lion's story incorporated another story about the production of knowledge as well, in a narrative moving back and forth in time, and across geographical boundaries.

Réaumur kept large numbers of ant-lions at his home, in a large chest filled with sand, so he could watch their maneuvers indoors, and interfere at will. "I often took pleasure," he confessed, "in flattening the surface of the sand where they were, to fill in all their holes. Some of them worked almost right away to rebuild them and a greater number put off getting back to work during the heat of the long days, … until the sun had nearly set" (pp. 350–1). Another time, he collected hundreds of ant-lions in the same sandbox, assuming that he would be able to watch them at work. Frustrated after hours of perceiving no sign of motion from the insects, he left the room, returning after half an hour to find that dozens of traps had been dug in his absence. "Having learned in this way that my presence kept them inactive, I again left the vicinity of the box, but not far enough to lose sight of it. As soon as I was several steps away, the whole thing came to life again. On all sides I saw jets of sand thrown continuously into the air. As soon as I moved in to a certain distance, the number of jets diminished. … I could only contrive to see the whole process of their operation after holding myself so still that I was, as far as they were concerned, like a tree trunk" (pp. 356–7).

Réaumur told an elaborate tale of the ant-lion's construction of its trap, a feat of instinctual engineering, and the subsequent violent encounters with passing ants. He constructed his story from many separate observations, indicated by the use of "sometimes" or "often" to show the insects' ability to adapt to shifting circumstances. The stories present the insects locked in drama of one sort or another. Here the narrative takes the form of a hunt and dramatic struggle to the death.

> [S]ometimes [the ant] falls immediately to the bottom of the precipice, into the veritable lion den. Its fall is not always so precipitous; the ant, sensing danger, tries to climb up the grains of sand that form the slope, some of them give way beneath her feet, but by means of repeated attempts and redoubled efforts, she finds some more stable ones, onto which she clings; often she even manages to climb towards the lip of the hole. But the ant-lion has yet another resource for mastering the prey making its escape: this is one circumstance where he benefits from having a head with such a flat top, which he can raise suddenly, tilting it from one side or the other. … By means of a sudden toss of the head in the right direction, he throws a stream of sand into the air. This rain of sand falls on the miserable ant, who is already having enough difficulty climbing up. The little blows she receives from so many grains of sand pushes her downwards; … the ant, despite all her efforts, is knocked to the bottom of the hole, the two horns of the ant-lion, which were open to receive her, seize her body and pierce it when they close (p. 342).

The particular actions of individual insects merged into the general account of how ant-lions behave. Sometimes the ant falls directly to the bottom, sometimes she tries to escape; sometimes the predator can seize the prey immediately, sometimes it has to go after the ant with streams of sand. The plate accompanying this text shows key moments in the construction of the trap; Réaumur's favored artist, Hélène Dumoustier, developed various visual strategies to capture the order of events in time (See Fig. 5). (Note the traces of the backwards motion of the burrowing ant-lion, the ant falling down the slope of the finished trap, and an enlarged view of the pincers grasping the prey.)

The two intermediate phases of trap-construction appear in the next plate (See Fig. 6). In the first image, the trail of the backward-moving ant-lion enters from the right; the artist has depicted the first complete circle of the trap itself, where the insect has removed the sand from its track. Small stones ejected from the track can be seen littering the sandy surface outside the perimeter. The second imageshows a larger hole, sometime later, with a cone of sand remaining at the center, still to be removed. As in the metamorphoses discussed above, the time sequences are not necessarily

[5] Not coincidentally, Réaumur spent years on the "Description of arts and crafts," for the Paris Academy of Sciences, filled with narratives of artisanal activity. See e.g. Réaumur (1722) for narratives of steel production processes and experimental tests. On the emerging identity of the *artiste*, between artisan and savant, see Bertucci and Courcelle (2015) and Bertucci (2017).

[6] Bonnet published his own account a few years later, in a similar narrative format (Bonnet, 1745).

Please cite this article in press as: Terrall, M., Narrative and natural history in the eighteenth century, Studies in History and Philosophy of Science (2017), http://dx.doi.org/10.1016/j.shpsa.2017.03.009

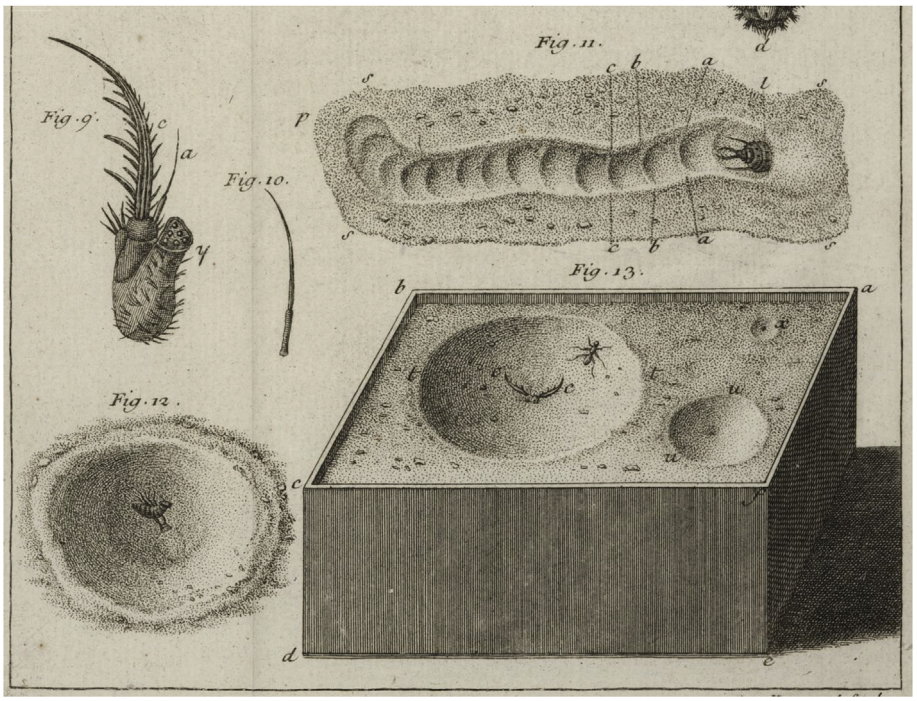

Fig. 5. Hélène Dumoustier (engraved by J. B. Haussard), Ant-lions constructing trap (11), lying in wait for prey (13), and grabbing ant (12).– Réaumur, *Mémoires pour servir à l'histoire des insectes*, vol. 6, plate 32 (detail). Huntington Library.

presented visually in a single obvious sequence, due to the space limitations of each page.[7]

Réaumur liked to devise situations to test the abilities of his little subjects. The narrative of the struggle of the ant-lion and its prey draws in the reader as a potential observer as well. "You can set up a spectacle that torments our insect and amuses the observer, by throwing into the bottom of its hole a little stone too heavy to be removed by a blow from the head. I have sometimes put ten or twelve ant-lions into the same difficult situation at once. The little stone in each hole was however not of the same shape or weight." Some of them managed to eject the stone, if it was small enough; if it proved impossible to move, they might abandon the hole altogether; sometimes one would try to load the pebble onto its back and carry it out. "The difficult thing [for the ant-lion] is to keep it balanced while carrying it, climbing backwards up the length of a steep slope. At every moment, the load is ready to fall, either to right or left. The ant-lion manages to keep it in place only by lowering or lifting certain sections of its body. Finally, in spite of all its efforts, and in spite of everything it knows about balance, the stone sometimes escapes, and rolls to the bottom of the precipice. It has the courage to go and find it and to make new trials of his skill and his strength" (p. 352).

With a captive population ready at hand, Réaumur could also experiment with feeding the ant-lions, determining for example that they would not eat dead insects. Having killed a fly, he offered it successively "to more than twenty ant-lions, who all refused it" (p. 359). They happily engaged in battle with living prey considerably larger than ants, however. Again, the naturalist intervened to place his subjects in novel scenarios, to test the limits of their hunger and rapacity.

> One day I pulled off the four wings of a bee, without otherwise harming it, and taking all necessary precautions to avoid losing its stinger. While it still had all its natural vigor … I threw it into the pit of an ant-lion, which instantly seized its body from the back. … In this position the bee could not use its weapon against its enemy: but it made the greatest efforts to escape. … [F]rom moment to moment the ant-lion beat it as roughly as he could; after lifting it without letting it go, he brought it down with great speed, hitting it against the sand. The bee held up against such blows repeated frequently over more than a full quarter of an hour. The ant-lion, while it was hitting the bee against the sand, was also sucking on it intermittently, and finally, the bee could no longer move, and [the ant-lion] succeeded in eating comfortably (pp. 357–8).

When the naturalist initiated the action by giving the ant-lion stones to remove from the trap, or presenting it with a wingless bee, the narrative revolved around two main characters, human and insect. The experimental intervention and the insect's vigorous response combine into a narrative vignette, presenting a lively spectacle, while simultaneously exemplifying how to do natural history. Réaumur engaged in scientific investigation in the laboratory and in the field, but also at the writing desk, where his literary efforts brought the ant-lion (and the narrator himself) to life on the page. In this kind of natural history, the narrative ordered observations or facts in time and space. Why tell these episodes as dramatic encounters or displays of bravado? Narratives about combat between predator and prey, or feats of insect engineering, or the emergence of the chrysalis from the caterpillar and the butterfly from the chrysalis point to the dynamic tensions in nature, and the ingenuity of observers who contrive to witness them. The quest to unravel such stories, following through their plots and subplots, motivated naturalists to devise their own strategies and experimental interventions. In doing so, they became part of the story, as they filled in the missing pieces and passed the full narrative results

[7] The balance between the larger depictions of activities in process, what we might call narrative vignettes, and the magnified images of structures does not seem to be entirely an aesthetic choice. There were practical considerations as well, having to do with the inclusion of as many images as possible in one plate, without sacrificing legibility.

Please cite this article in press as: Terrall, M., Narrative and natural history in the eighteenth century, Studies in History and Philosophy of Science (2017), http://dx.doi.org/10.1016/j.shpsa.2017.03.009

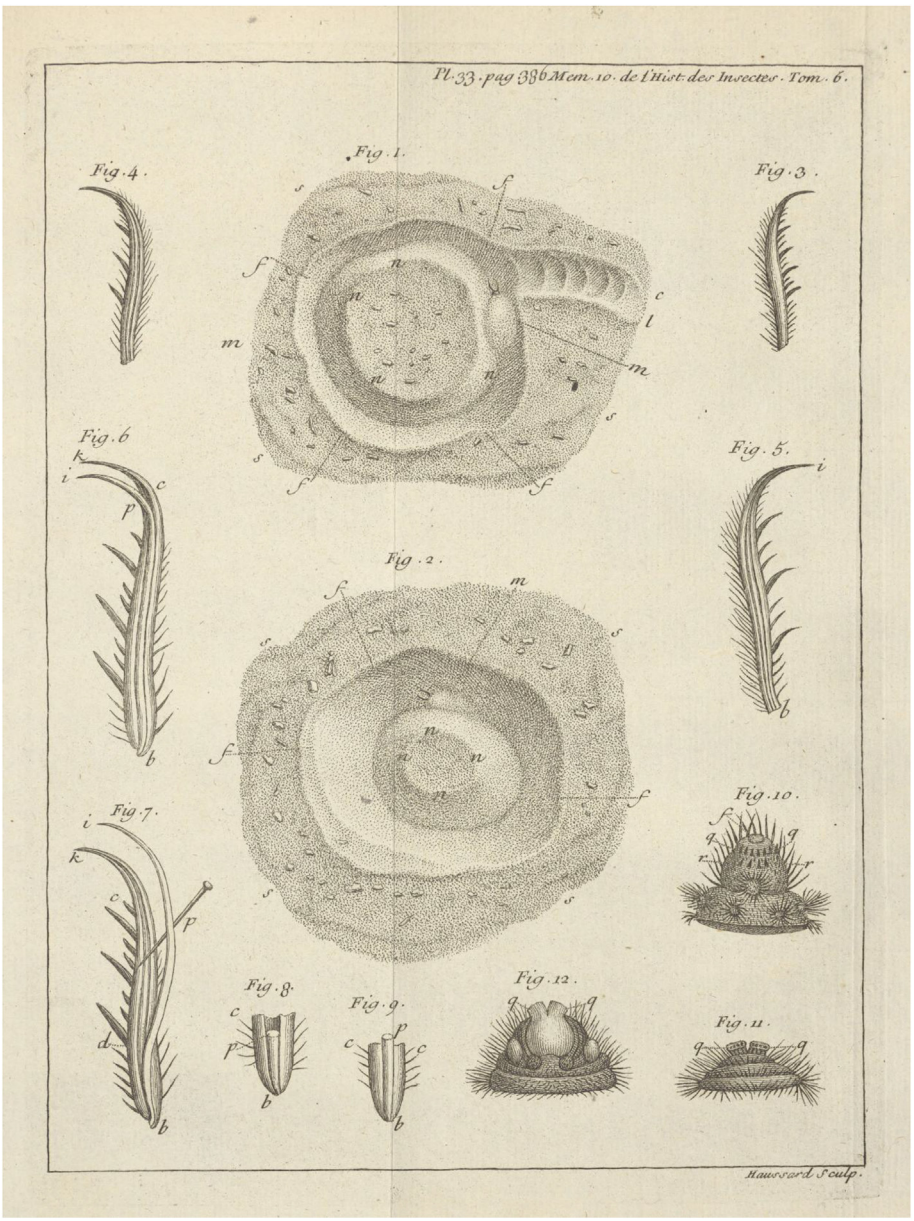

Fig. 6. Hélène Dumoustier (engraved by J.B. Haussard), Ant lion digging its trap. Réaumur, *Mémoires pour servir à l'histoire des insectes*, vol. 6, Plate 33. Wellcome Library, London.

on to their readers. The first-order record of these investigations – bits and pieces of notes, journal entries, and sketches – fed into the final accounts, replete with literary devices to build suspense and resolve tension.

4. Trembley's polyps: normalizing the extraordinary

If the ant-lion was a more or less familiar insect, albeit with peculiar habits and abilities, the freshwater polyp (now known as the hydra) was a spectacular novelty in the 1740s. When he first found these small "organized bodies" in ditch water, Abraham Trembley could not be sure whether they were plants or animals.[8] Their greenish tubular bodies, less than half an inch in length with a ring of fine threads or filaments at one end, anchored onto the stems of aquatic plants such as duckweed, or suspended themselves from the surface of stagnant water. They also attached themselves to the sides of glass jars in Trembley's work room, where he could watch them through his magnifying lens.

Trembley explicitly modeled his investigations of polyps on the observational and experimental practices narrated in Réaumur's books on insects. Long before committing his discoveries to print, he reported them faithfully to Réaumur. His first letter on the subject, illustrated with simple sketches of the polyps in different attitudes, recapped six months of work. Introducing the peculiar features of these aquatic beings, Trembley recounted the story of his increasingly intense engagement with them. His initial narrative about the polyps in these early letters included his own questions and perplexity in the face of what he had seen in his glass jars, and recounted his trials of increasingly invasive experiments. "In order to better observe them, I put some in small, shallow glass dishes," he wrote. "I found a way to cut one of them halfway

[8] On Trembley's discovery, see Dawson (1987, pp. 85–136). Leeuwenhoek had observed the same species many years earlier, but he had not noted any of their peculiarities.

Please cite this article in press as: Terrall, M., Narrative and natural history in the eighteenth century, Studies in History and Philosophy of Science (2017), http://dx.doi.org/10.1016/j.shpsa.2017.03.009

through, such that the parts were still connected."[9] After a few days, the cut edges had rejoined so thoroughly that he could detect no sign of the injury. This was strange enough, but Trembley's tale led up to a climactic moment with the discovery of "the most remarkable fact": when sliced transversally, into two separate pieces, the two polyp segments remained alive, lengthening and contracting as usual. The front section, with its tentacles intact, was able to attach to the glass as usual, and the rear section gradually produced new filaments from the cut edge. As the days passed, each section regrew into what appeared to be a complete individual.[10] Trembley carefully composed his letter to end with this revelation, and then left it hanging there, as a tantalizing conundrum. Were the polyps regenerating in the way that crabs or crayfish regenerate severed claws? Or were they reproducing as some plants grow from cuttings? If so, how could their "mechanical progressive motion", a kind of rudimentary walk, be reconciled with their plant nature? Even in this preliminary epistolary report, Trembley used narrative techniques to heighten the striking nature of his discovery, postponing the striking discovery of the polyp's regrowth until near the end of the letter, and framing his own state of uncertainty as the driving force of his story, as he narrated his own trials step by step.

As soon as he figured out how to pack them to survive the overland journey, Trembley sent living polyps to Paris so that his mentor could see the regeneration for himself. For several years before he published anything, he shipped living specimens to correspondents in England, France and Switzerland, with instructions for keeping them alive and experimenting with them. By the time his book came out in 1744, laying out the results of three years of experiments and observations, the polyps' ability to regrow was well known to the scientific and literate public across Europe. Réaumur had presented the startling phenomenon to the Paris Academy of Sciences in 1741, and discussed Trembley's discovery in the preface to his sixth volume on insects shortly thereafter; several of Trembley's letters had been published in the *Philosophical Transactions* of the Royal Society of London; and many people had replicated his experiments following his instructions.[11]

When he got around to publishing his observations and experiments, Trembley adopted Réaumur's format and style. Regeneration became, in the narrative of compounding discoveries, just another chapter in the natural history of the polyp. By amassing his observations of every aspect of the attributes and behaviour of three different species, Trembley normalized what had initially seemed outside the ordinary course of nature. Instead of trying to explain how the animals could regenerate themselves, or what this phenomenon might reveal about the properties of organic matter or the divisibility of the animal soul, he told a straightforward story about what he had seen, detailing the ever more elaborate techniques he had devised for exploring the properties and behaviors of his captive polyps. He was certifying the knowledge by telling it as a discovery narrative, making his own ingenuity and dexterity a key part of the story.

We have seen how Réaumur intertwined narratives of insect lives with the story of his own actions. Trembley followed a similar literary strategy, bracketing the narratives of specific experiments within the unfolding story of his discovery, of his own reactions, and of the steps he took to keep his polyp story from migrating into the realm of the marvelous. However striking – even fabulous – the regrowth of full individuals from their segmented parts, Trembley eschewed figurative language and refrained from giving his account even a whiff of sensationalism. The narrative conventions of Réaumur's natural history, which he must have studied closely, allowed Trembley to control his material, showing readers at every point how they could reproduce his results, as well as how polyps behaved. In his opening pages he explicitly defused potential skepticism with the story of his own initial incredulity and his shifting interpretations of what he was seeing. "At first I had difficulty believing my own eyes," he admitted, "and I had every reason to think that others would have difficulty believing [what I had seen]" (Trembley, 1744, p. 2). He then systematically recounted the steps he had taken to make his discovery credible, starting with recruiting local witnesses, then writing to Réaumur, dispatching live specimens, followed by months and years of accumulating further results, identifying related species, and so on. Again, the story of the polyp's behaviour and life cycle was also a story of making scientific knowledge.

Rather than starting with the polyp itself, Trembley began by recalling the initial response of his friends and acquaintances to his experiments – it was, after all, by cutting the diminutive creatures that he had discovered their remarkable abilities. Everyone had wanted to know, he said, why he had sliced into the polyps in the first place. He used his unfolding narrative to answer this question, painting himself as a naive observer trying one thing after another, leading up to the "happy chance" that led him to watch the polyps regenerate for the first time. The story opened in the country house of the Count of Bentinck in Sorgvliet, near The Hague, where Trembley lived as the tutor to the young sons of the count (See Fig. 7).

"Having noticed divers little animals on some vegetation I had pulled out of a ditch, I put several of these plants in a large glass filled with water, which I placed on a windowsill, and I then occupied myself with examining the insects enclosed in it" (p. 7). Among the teeming life in his glass, he saw what he later knew as polyps, though they did not particularly spark his interest at first. Attached to the stems of water weeds, they looked like plant parasites: "it was not that they could not move, but just that I knew nothing about it at that point."

Noticing the motion of their arms slowly undulating in all directions, he assumed they were plants, swaying in the currents produced by the many insects swimming around in the same container. He watched the jar for some time; then one day he gently rocked the glass to see how the motion of the water would affect the arms. "I did not at all expect the effect it produced. Instead of seeing, as I expected, the arms and even the body of the polyps simply agitated in the water, and dragged along by its motion, I saw them contract abruptly, and so strongly that the body of the polyps looked like no more than a grain of green matter, and the arms disappeared entirely from view" (p. 9). Startled, he watched more closely, scanning the population with a magnifying glass, and soon saw them begin to stretch out to their original length. So maybe they were animals after all.

The narrative continued in this vein, as he noticed the way they "walked" by measuring out steps the way an inchworm does, and their sensitivity to light, causing him to vacillate about whether they were plants or animals (See Fig. 8; walking sequence in images 1 through 9). This went on for months, until he decided to cut one of them in two to see what would happen. Why did he make this dramatic intervention? "I thought that if the two parts of a single polyp could stay alive after being separated, and if each became a perfect polyp, it would be clear that these organized bodies were plants. I was leaning toward believing that they were animals, so I was not really expecting much from this experiment; I expected to see the cut polyps die" (p. 13).

[9] Trembley to Réaumur, 15 December 1740, in M. Trembley (1943), p. 13.

[10] Trembley to Réaumur, February 1741, M. Trembley (1943), *p.* 24.

[11] Ratcliff (2004). Henry Baker scooped Trembley in England, reproducing experiments reported in the *Philosophical Transactions*: H. Baker, *An Attempt towards a Natural History of the Polype* (London, 1743).

Please cite this article in press as: Terrall, M., Narrative and natural history in the eighteenth century, Studies in History and Philosophy of Science (2017), http://dx.doi.org/10.1016/j.shpsa.2017.03.009

Fig. 7. C. Pronk, Collecting polyps in ornamental pond at Sorgvliet manor house. Abraham Trembley, *Mémoires pour servir à l'histoire naturelle d'un genre de polypes d'eau douce*, 1744, p. 1. Wellcome Library, London.

Although most of his readers already knew what was going to happen, because of the polyp's celebrity, the narrative communicated both the suspense of the original experiment, and the stolid reliability of Trembley's reporting. Locating his actions precisely as to time and place and motivation, he took his reader back to a time when the outcome of the experiment was not known. "It was the 25th of November 1740 when I cut the first one. I put its two pieces in a flat glass, with water to a depth of just four or five lines" (p. 13). On the ninth day, he saw three little bumps on the cut end of the second segment, located precisely where the arms should have been if it had been a complete polyp. "This excited me enormously, and I waited impatiently for the moment when I would know definitively what they were" (p. 15). Day by day, the first bumps lengthened out into filaments, a few new ones sprouted and grew, until it looked and behaved just like the original polyp before it was cut in two. Though he had imagined that this outcome would confirm the plant-like nature of the polyp, he remained in doubt because of its animal-like modes of locomotion and spontaneous contraction and expansion. The uncertainty drove him, and his narrative, on.

The rest of Trembley's book followed him through his observations of the normal reproduction of the polyps through budding — another plant-like attribute — and their mode of trapping prey with their tentacles. He explained how to feed them, how to watch their food being digested, and the source of their green coloration. He found several related species, some with more elaborate arms. And he got increasingly bold with his interventions. He cut the polyps into more and more pieces and tracked their regrowth; he cut them longitudinally, fully and in part; he devised a way to turn them inside out to investigate the interior of their bodies; he dissected them in every possible way. At one point, he sliced partway down from the head, and watched a Y-shaped polyp form, with one tail and two heads. After feeding it through its two mouths, he cut both of these branches, producing four heads, and he could then watch them take in food through all four mouths at once. "As one may well imagine, after having produced hydras, I did not stop there. I cut the heads off the seven-headed one, and after several days, I saw a prodigy hardly less strange than the fabulous Hydra of Lerna. Seven new heads grew, and if I had continued to cut them as soon as they grew, there is no doubt that even more would have grown. But here is something more that even the fable did not dare to invent. The seven heads that I cut from this hydra, having been fed, became perfect animals, from each of which I could easily have made another hydra" (p. 246). Having established his credibility as a careful naturalist, here Trembley is playing with his story's resonance with the mythical hydra battled by Hercules. As he does so, he transforms the apparently fabulous or preternatural into something that anyone, given enough dexterity with a scalpel, might produce. The narrative of his discoveries threaded the simple stories of the polyps, as they moved around in the jars, capturing prey, digesting it, reproducing, and so on, through the first-person account, which did at times verge on the incredible. From the beginning, Trembley knew he would face skepticism, and he used narrative strategies to forestall disbelief in his readers. "It is not enough to say that one has seen such-and-such a thing. It is as good as saying nothing, if one does not at the same time indicate how one saw it, if one does not make it possible for his readers to assess how the facts being reported were observed" (p. 1). Told entirely with the detachment of a god's-eye perspective, even empirical reports risked sounding incredible. In the end, the credibility of these reports about the behaviour and peculiarities of freshwater polyps depended to some degree on the framing discovery narrative, with its details about human observations, interventions, and experiments.

5. Conclusion

Not all natural history took the form of narrative; the arcs of plotlines unfolded alongside other elements of the naturalist's toolkit: anatomical and physiological description, methods for the care and feeding of living creatures, physical and chemical tests and measurements, and classification schemes. By throwing into relief the narrative sections of natural histories, the examples considered here expose the role played by these tales of encounters with the insect world in the making of natural historical knowledge. At one level, narratives served a literary or expository function, engaging the reader by bringing nature, and the naturalist, to life on the page. But as we have seen, they also carried epistemological weight. For Réaumur and his followers, narrative was a way to connect with readers, but also provided access to the truths of nature, from very

Please cite this article in press as: Terrall, M., Narrative and natural history in the eighteenth century, Studies in History and Philosophy of Science (2017), http://dx.doi.org/10.1016/j.shpsa.2017.03.009

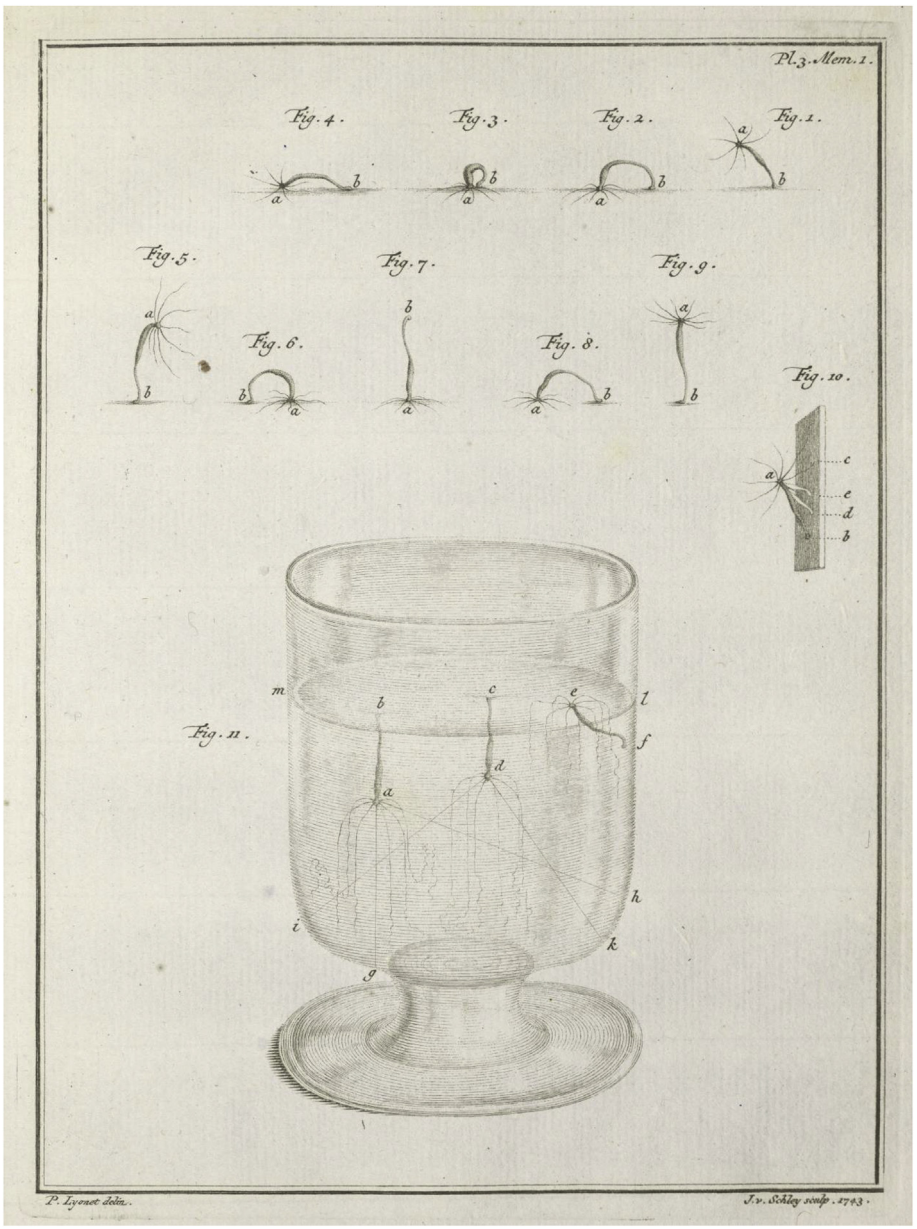

Fig. 8. Pierre Lyonet (engraved by van der Schley), Locomotion of freshwater polyps (Figs. 1–9); polyps suspended from water surface, and anchored to glass walls of container (Fig. 11). A.Trembley, *Mémoires pour servir à l'histoire naturelle d'un genre de polypes d'eau douce*, plate 3. Wellcome Library, London.

simple details to more general principles. Knowing the narrative sequence – put together from the results of observations and experimental interventions made at different times on different individuals – meant knowing nature. Or we might say that narrative order represented or reflected natural order. Only once the story was known could other questions be decided: Are polyps plants or animals? Do organic infusions spontaneously produce life? Can insects adapt to circumstances outside the ordinary course of events? How can insect infestations be controlled?

In these texts, we have encountered narratives with different kinds of plot, some with human and some with animal protagonists. Human naturalists acted out plots of quest and discovery (including experiment, and various interventions), and in teleological narratives about the progress of knowledge and particularly the history of natural history. The quest for knowledge, like Jason's quest for the golden fleece, often entailed violent interventions as the naturalist-hero cut off the wings of flies, excised the legs of caterpillars, suffocated chrysalises, submitted insects to drops in air pressure and increases in temperature, sliced up polyps into ever more fragments. Meanwhile, insects, subjected to these interventions and observations, took their places in life-cycle narratives of orderly development, a process that might look mysterious or miraculous until all the steps were told in the right sequence. Within these life stories, in which the lives of individuals folded together to become the life of the species, insect lives often devolved into action narratives of various classic forms: hunts, battles, quests (overcoming obstacles to achieve a goal), seduction and mating, and so on.

These narratives played out visually in the illustrations accompanying these texts, as we have seen in the image sequences showing the polyp walking, the dragonfly freeing itself from its old skin, and the ant-lion digging its trap. On first viewing, most of the

Please cite this article in press as: Terrall, M., Narrative and natural history in the eighteenth century, Studies in History and Philosophy of Science (2017), http://dx.doi.org/10.1016/j.shpsa.2017.03.009

plates look quite static, with arrays of anatomical structures in various states of either magnification or dissection. Closer attention, guided by the discursive figure "explanations," reveals many action sequences, some of only two or three images, some of many more. Although artists did not adopt any fixed conventions for showing these sequences, and readers apparently did not expect numbered images to be laid out on the page in numerical order, the practiced eye can learn to put these frozen images into motion. Indeed, for many actions like the shedding of a skin or the digging of a trap, the images turn out to be essential to making sense of the detailed exposition in the text. Even sequences showing the different stages from egg to larva to chrysalis to adult expressed the narrative of development visually, and the reader would have found this crucial for identifying insects in the field (See Fig. 2 above). The human actors were never represented, by even so much as a finger, in these images. For the narratives of their investigations, the reader had to rely on the text.

Acknowledgements

Thanks to the editors of this special issue of *SHPS*, Mary Morgan and Norton Wise, for aiding and abetting in the development of this article.

References

Bertucci, P. (2017). *Artisanal enlightenment: Science and the mechanical arts in early modern France*. Yale University Press.
Bertucci, P., & Courcelle, O. (2015). Artisanal knowledge, expertise, and patronage in early eighteenth-century paris: The société des arts (1728-36). *Eighteenth-Century Studies, 48*, 159-179.
Bonnet, C. (1745). *Traité d'insectologie, ou observations sur les pucerons*. Durand, Paris.
Dawson, V. (1987). *Nature's enigma: The problem of the polyp in the letters of Bonnet, Trembley, and Réaumur*. Philadelphia: American Philosophical Society.
Ratcliff, M. (2004). Abraham Trembley's strategy of generosity and the scope of celebrity of the mid-eighteenth century. *Isis, 95*, 555-575.
Ratcliff, M. (2009). *The quest for the Invisible: Microscopy in the enlightenment*. Burlington, VT: Ashgate.
Réaumur, R. A. F. de (1722). *L'art de convertir le fer forgé en acier, et l'art d'adoucir le fer fondu, ou de faire des ouvrages de fer fondu, aussi finis que de fer forgé*. Paris: Michel Brunet.
Réaumur, R. A. F. de (1734). *Mémoires pour servir à l'histoire des insectes* (Vol. 1)Paris: Imprimerie royale.
Réaumur, R. A. F. de (1742). *Mémoires pour servir à l'histoire des insectes* (Vol. 6)Paris: Imprimerie royale.
Terrall, M. (2014). *Catching nature in the Act: Réaumur and the practice of natural history in the eighteenth century*. Chicago: University of Chicago Press.
Trembley, A. (1744). *Mémoires pour servir à l'histoire des polypes d'eau douce*. Leiden: Jean & Herman Verbeek.
Trembley, M. (Ed.). (1943). *Correspondance inédite entre Réaumur et Abraham Trembley*. Geneva: Georg & Compagnie.

Please cite this article in press as: Terrall, M., Narrative and natural history in the eighteenth century, Studies in History and Philosophy of Science (2017), http://dx.doi.org/10.1016/j.shpsa.2017.03.009