

Opening the Phosphoric “Envelope”: Scientific Appraisal, Domestic Spectacle, and (Un)“Reasonable Creatures” in Edgeworth’s *Belinda*

Nicole M. Wright

Maria Edgeworth’s novel *Belinda* (1801) has received increasing attention in recent years from scholars interested in the author’s pedagogical methods (introduced by Edgeworth and her father Richard Lovell Edgeworth in the treatise *Practical Education* [1798]). Yet there has been little sustained critical assessment of the novel’s scenes of empirical inquiry, specifically the two phosphoric spectacles, or attention to how these scenes reflect late-Enlightenment debates and Edgeworth’s call for a significant revamping of the period’s didactic scientific literature. Far from disavowing the value of all emotional response in favour of a frigid adherence to empirical inquiry, Edgeworth’s characters show that empiricism can bolster domestic harmony and strengthen emotional bonds within the household. Edgeworth responds to contemporary debates regarding the use of spectacle in teaching science, suggesting that proper scientific education liberates those benighted by superstition and societal prejudices. The scientific method’s appeal lies in its transformative effect on the novel’s characters, as it generates a shared empirically grounded discourse, fostering communication between characters differing in race, social rank, education, or age.

abstract

IN AN 1809 letter to her cousin Sophy Ruxton, the author Maria Edgeworth laments that the impeccable heroine of her novel *Belinda* (first published in 1801)¹ is an unfeeling “stick or stone”; “I was so provoked with her cold tameness ... that I could have torn the pages to pieces,” Edgeworth confided.² The problem with *Belinda* Portman, her creator implies, is that she is all too rational.

¹ The text referred to in this article is the “corrected and improved” (as Edgeworth described it) second edition of the novel, published in 1802, rather than the heavily revised third edition of 1810. See Kathryn J. Kirkpatrick, “Note on the Text,” in *Belinda*, ed. Kirkpatrick (Oxford: Oxford University Press, 1994), xxvii. References to *Belinda* are to this edition. I am grateful to Jill Campbell, Gregory Eow, Richard K. Mansfield, Brian D. Wright, Marguerite A. Wright, and the anonymous *ECF* reviewers for their input.

² Maria Edgeworth to Miss [Sophy] Ruxton, December 1809, in *The Life and Letters of Maria Edgeworth*, ed. Augustus J.C. Hare (London: Edward Arnold, 1894), 169.

Subsequent readers have concurred with this notion that Belinda's dispassionate nature renders her unworthy of interest and a failure as a romantic heroine.³ For Belinda to be otherwise, however, would contradict the novel's emphasis on the importance of empiricism. Belinda's cold rationality is specifically an application of the scientific method, rather than a model of feminine rational conduct that has little to do with scientific practice. Her consistent adherence to objective analysis does not alienate other characters, but instead eases her transition from wariness-provoking new arrival on the London scene to cherished friend, as she becomes a crucial advocate of empirical reasoning at the heart of the domestic realm. In *Belinda*, the scientific method operates as a mode of salvation, one that offers a measure of liberation to those hobbled by their own and others' magical thinking and prejudices.

Although the novel is conventional in its treatment of the marriage market, as it details Belinda's misadventures in courtship with various suitors and her eventual union with Clarence Hervey, most of its incidental characters and disparate, frequently non-converging subplots are connected not through the progress of a romance, but through the novel's innovative emphasis on empirical reasoning. This aspect of *Belinda* deserves further critical attention, and such analysis will supplement a number of fascinating recent treatments of Edgeworth's work.⁴ Julia V. Douthwaite includes a

³ Heather MacFadyen, citing the same passage, observes that "readers have frequently found the eponymous heroine of the novel to be a tiresome distraction from the witty woman of fashion, Lady Delacour." MacFadyen, "Lady Delacour's Library: Maria Edgeworth's *Belinda* and Fashionable Reading," *Nineteenth-Century Literature* 48, no. 4 (1994): 424. An anonymous contemporary reviewer found that Belinda "usurped the superior right of Lady Delacour to give title to the work; for it is to the character and agency of the latter ... that the tale owes its principal attractions" (Review of *Belinda*, *Monthly Review*, n.s. 37 [1802], 368; cited in MacFadyen, 424).

⁴ In 2009, a few scholars touched upon Edgeworth's scientific interests. In his account of scientific enquiry during the Romantic period, Richard Holmes mentions that Edgeworth travelled to visit prominent scientists, and in her letters "gave a novelistic spin to ... accounts of experiments." Holmes, *The Age of Wonder: How the Romantic Generation Discovered the Beauty and Terror of Science* (New York: Pantheon, 2009), 264. Holmes, however, marginalizes Edgeworth as an admiring correspondent of the male scientists; he excerpts her glowing descriptions of their work, while omitting attention to Edgeworth's own treatment of science in her novels. Kathryn Scantlebury and Colette Murphy inquire more extensively into Edgeworth's interest in science by surveying the author's nonfiction and fiction for children (they do not examine the treatment of science in Edgeworth's novels); they focus on "children's education" and "education for women." Scantlebury and Murphy, "Maria Edgeworth: Nineteenth-Century Irish Female Pioneer of Science Education," *Irish Educational Studies* 28, no. 1

discussion of “the ethics of meddling with human nature through pedagogy” in *Belinda* in her study of Enlightenment depictions of experiments.⁵ Emily Hodgson Anderson remarks upon the “pedagogical performances” featured in *Belinda* and Edgeworth’s early works;⁶ in these scenes, educators stage conditions in which pupils are guided to make discoveries for themselves, even as the preceptors disguise their own role in orchestrating the learning process. In a reading of the novel as a response to disparaging contemporary portrayals of “the female philosopher,” Deborah Weiss finds that in *Belinda*, “traits commonly ascribed to men, and those seen as natural to women, are set loose to float freely in the social sphere, attaching themselves to any individual, regardless of his or her sex.”⁷ It seems that the same could be said of the capacity for objective reasoning, a property not exclusive to any specific identity group in the novel.

Belinda includes several episodes in which the application of scientific methodology resolves the obfuscation that is perpetuated through superstition and trumped-up spectacle; these scenes indicate Edgeworth’s determination to establish experiment as a central, non-sensationalized aspect of a scientific education, an education that is important because of its potential to liberate all individuals from the debilitating effects of irrationality and ignorance. Crucially, this education takes place in the home, as characters are introduced to the unfamiliar process of empirical reasoning within a safe, familiar space. The domestic sphere

(2009): 103, 109. Historian Ruth Watts includes Edgeworth (focusing on her life and work apart from her novels) among an array of women writers in her study of views of science as a gendered discipline. Watts, “Whose Knowledge?: Gender, Education, Science and History,” *History of Education* 36, no. 3 (2007): 289–90. In an earlier reading, Andrew McCann briefly remarks upon instances of the “rational display of causal relations” in his compelling treatment of *Belinda*. McCann, “Conjugal Love and the Enlightenment Subject: The Colonial Context of Non-identity in Maria Edgeworth’s *Belinda*,” *Cultural Politics in the 1790s: Literature, Radicalism, and the Public Sphere* (London: Macmillan Press, 1999). In focusing specifically on empiricism in *Belinda*, my article expands on the thoughtful work and innovative approaches of these scholars.

⁵ Julia V. Douthwaite, *The Wild Girl, Natural Man, and the Monster: Dangerous Experiments in the Age of Enlightenment* (Chicago: University of Chicago Press, 2002), 163, 182–87. Douthwaite also examines the goldfish episode discussed below.

⁶ Emily Hodgson Anderson, *Eighteenth-Century Authorship and the Play of Fiction: Novels and the Theatre, Haywood to Austen* (London: Routledge, 2009), 165.

⁷ Deborah Weiss, “The Extraordinary Ordinary Belinda: Maria Edgeworth’s Female Philosopher,” *Eighteenth-Century Fiction* 19, no. 4 (2007): 449.

remains a reassuringly secure pedagogical zone despite occasional intrusions by phosphoric apparitions and other apparently supernatural marvels that, as will be shown, the characters learn to demystify. The phosphorus scenes in *Belinda* have not yet been studied in tandem with or examined in light of various characters' remarks about empirical analysis elsewhere in the work.

The novel's endorsement of procedural methods of analytical reasoning is only strengthened through challenges posed by characters either unaccustomed to or openly hostile to empiricism. Such methods prevail despite Edgeworth's own misgivings as to whether the protagonist's unabating objectivity made the work a literary failure. Edgeworth was mistaken in identifying Belinda as an unworthy romantic heroine: rather than insisting on a frigid disavowal of all emotion, Belinda is the most prominent of several characters that show compassion by introducing empirical reasoning to others. Once presented with methods of testing their beliefs as falsifiable, the latter characters are no longer transfixed by spectacle. They are relieved of the negative feelings, supernatural preoccupations, and antiquated beliefs that haunt and isolate them, and they can then rejoin Belinda and other characters in the caring domestic community.

Among those who benefit from the heroine's subtle but unwavering advocacy of empiricism are characters who must be taught to use reason, including sufferers from imaginary illnesses (Lady Delacour believes that a bruise on her bosom is a terminal "cancer" and is well-deserved punishment for transgressions associated with her inadequacy as a mother)⁸ and unlearned folk in thrall to old superstitions (the black manservant Juba). Adherence to the scientific method reinstates these figures' dignity, while those who would misuse scientific tricks to exploit others or exalt themselves fail in their schemes. Conversely, other characters (including Belinda, Helena Delacour, and the Percival children) assume unexpected roles as agents of reason within the novel, challenging others' misperceptions. These characters may initially have been viewed as inferior—as possessing limited powers of reason—due to mainstream preconceptions about the correlation

⁸ Lady Delacour believes her wound resulted from her decision to participate in the unfeminine business of duelling (58), a choice she attributes to an "aching void" borne of "nothing at home, whether in shape of husband or child, to engage my affections." Her husband had taken to drink, and her first child was stillborn; when she breastfed her second child, she proved inadequate at the task and the infant died; and she sent her second daughter to live with another family (42).

between intellectual aptitude and attributes including gender, ethnicity, and age. Still other figures (such as “Solomon, the Jew”) do not themselves learn to be empirical, but their appearance in the narrative serves as a litmus test of objectivity, allowing readers to gauge other characters’ capacity for foregoing stereotype-guided assumptions in favour of empirical evaluation.

Belinda, for her part, is less a full-fledged personality than a standard of objectivity against which her fellow characters may be measured. She shares her empirical mindset with Dr X——, the novel’s ever-upstanding, inveterately rational practitioner of the scientific method. Dr X—— evinces a healthy scepticism of received notions and relishes the observation-based reasoning that is so crucial to the scientific method: “Every man who has any abilities,” he tells Belinda, “likes to have the pleasure and honour of finding out ... by his own penetration, instead of having it forced upon him” (97).

The doctor’s remark represents a celebratory endorsement of the keen observation and collection of data that are key steps in the scientific method, which by Edgeworth’s day had been evolving for almost two centuries. In developing a prototype of the method in his *Novum Organum* (1620), Francis Bacon emphasized that the proper application of the scientific method involved conclusions derived from observations, preferring “the *interpretation of nature*” to “[that which] we have chosen to call the reasoning which men usually apply to nature[:] *anticipations of nature* (because it is a risky, hasty business).”⁹ Isaac Newton later proposed in the fourth edition of his *Opticks* (1730) that “the investigation of difficult things by the method of analysis ought ever to precede the method of composition. This analysis consists of making experiments and observations, and in drawing general conclusions from them by induction.”¹⁰ Antoine Lavoisier’s definition of the scientific method

⁹ Francis Bacon, *The New Organon*, ed. Lisa Jardine, ed. and trans. Michael Silverthorne (1620; Cambridge: Cambridge University Press, 2000), 76.

¹⁰ Isaac Newton, *Opticks: Or, A Treatise of the Reflections, Refractions, Inflections and Colours of Light*, 4th ed. (1730; Amherst: Prometheus Books, 2003), 404. Edgeworth salutes Newton as a role model for students, noting that he both identified and demonstrated “steady, untired attention” as essential for facilitating “those discoveries in science, which brought heavens within the grasp of man, and weighed the earth in a balance.” Edgeworth, preface to *Moral Tales* (London: Baldwin and Cradock, 1832), 1:iv. Brigitte Falkenberg warns that Newton’s “famous ‘induction’ of ‘propositions gathered from phenomena’ pinned down in Newton’s methodological rules at the beginning of Book Three of the *Principia*, in Rule 4 ... should not be confused with induction in a modern, empiricist sense,” and further states that “in [the]

in his *Traité élémentaire de chimie* (1789) had shaped the career of Edgeworth's friend and correspondent, the eminent chemist Humphry Davy.¹¹ Lavoisier held that "when we begin the study of science, we are in a situation, respecting that science, similar to that of children"; he explained, "In a child, the idea is merely an effect produced by a sensation; and, in the same manner, in commencing the study of a physical science, we ought to form no idea but what is a necessary consequence, and immediate effect, of an experiment or observation."¹² Lavoisier implied that the practice of empiricism was not cold and inhuman (and thus performed only by those who had painstakingly learned to suppress their natural inclinations), but was rather a rechanneling of one's instinctual curiosity.

Others noted that empiricist activity was already part of everyday life, practised by ordinary people. David Hume found that "it is impossible for us to think of any thing, which we have not antecedently felt, either by our external or internal sense."¹³ As John Losee notes, "Hume included among 'sense impressions' desires, volitions, and feelings, as well as visual, auditory, tactile, and olfactory data."¹⁴ John Locke did not make much of the distinction between the robustness of the scientific conclusions made by the average person and those reached by the man of science.¹⁵

nineteenth century, the method of analysis and synthesis disappeared from philosophy, giving place to the modern empiricist view of induction and deduction." Falkenburg, "What Are the Phenomena of Physics?," *Synthese* 182, no. 1 (2011): 153.

¹¹ Holmes, 248. Edgeworth mentions the late scientist admiringly in her letters and visited Lavoisier's widow regularly during her travels in France; Mme Lavoisier flattered Edgeworth by reporting that another guest had praised *Belinda*. See *Maria Edgeworth in France and Switzerland: Selections from the Edgeworth Family Letters*, ed. Christina Colvin (Oxford: Oxford University Press, 1979), 28, 53–54, 72–73, 83, 153, 190–91, 277.

¹² Antoine-Laurent de Lavoisier, preface to *Elements of Chemistry, in a New Systematic Order, Containing All the Modern Discoveries*, trans. Robert Kerr, 4th ed. (1789; Edinburgh: William Green, 1799), xv. Cited in Holmes, 248.

¹³ David Hume, *An Enquiry Concerning Human Understanding* in *Enquiries Concerning Human Understanding and Concerning the Principles of Morals*, ed. Peter H. Nidditch and L.A. Selby-Bigge (1748; Oxford: Oxford University Press, 1975), 62.

¹⁴ John Losee, *A Historical Introduction to the History of Science* (Oxford: Oxford University Press, 2001), 93.

¹⁵ Locke states, "I deny not, but a man accustomed to rational and regular experiments shall be able to see farther into the nature of bodies and guess righter at their yet unknown properties, than one, that is a stranger to them: but yet, as I have said, this is but judgment and opinion, not knowledge

The phrase “scientific method” was not common terminology in Edgeworth’s day,¹⁶ but it is appropriate for describing the empirical “analysis” practised successfully by Belinda and Dr X—throughout the novel.

In depicting characters with no access to formal science education who overcome initial trepidation to gradually warm to such methods of “analysis,” Edgeworth tacitly reflects upon not only previous advances in the development of the scientific method, but also the efforts of high-profile figures vying to shape public attitudes towards science in her day. Even a cursory review of the historical context suggests that Edgeworth had ample reason for specifying phosphorus as a key component of two characters’ separate disastrous attempts at scientific deception. The novel contains a pair of flamboyantly staged phosphorus-featuring scenes that constitute Edgeworth’s literary response to debates, initiated by members of the Royal Society and continued by eighteenth-century authors of domestic science experiment manuals, regarding how best to guide and control public access to and understanding of the scientific process. The phosphorus episodes also bolster the novel’s more general championing of empirical reasoning, establishing a context for other scenes lauding scientific experimentation and diagnosis. As I will show, the author of *Belinda* was on the leading edge of writers who ushered in an era of truly popular science and scientific literature, eschewing superstition and spectacle in favour of what she and her father referred to as “Practical Education” in their best-selling multivolume work of the same name.

A bit of trawling through archived correspondence reveals that Edgeworth enjoyed uncommon access to information about the latest chemistry experiments, beyond what she gleaned from

and certainty.” Locke, *An Essay Concerning Human Understanding*, ed. Peter H. Nidditch (1689; Oxford: Oxford University Press, 1979), 645.

¹⁶ In her account of scientific discourse during the period, Maureen N. McLane explains that in the early nineteenth century “the word ‘science’ had yet to restrict its range to what we now denominate the physical and social sciences.” McLane, *Romanticism and the Human Sciences: Poetry, Population, and the Discourse of the Species* (Cambridge: Cambridge University Press, 2000), 95. Nor was the term “scientist” used in the eighteenth century as it is today; as Holmes explains, “it is significant that [Edgeworth’s friend Humphry] Davy (and his mentor [John] Tonkin) clearly saw this [his scientific training] as a step forward to a career in medicine, not in chemistry or physical sciences. Such a career—that of the professional research scientist—did not yet exist. (Neither of course did the term ‘scientist’ itself.)” (253). This accounts for Dr X—’s scientific expertise; he qualifies not only as a doctor, but also as a scientist.

her friendship with Davy and other scientists.¹⁷ Edgeworth may have heard accounts of phosphorus demonstrations from her father. Richard Lovell Edgeworth joined the Lunar Society and the Royal Society's counterpart, the Royal Irish Academy, in early 1785, and in an account of the latter group's September 1785 meeting, his close friend James Watt reports witnessing the demonstration of "Mr. [Matthew] Kirwan's discovery of an air from phosphorus, which takes fire of itself on being mixed with common or dephlogisticated air."¹⁸ Although she did not witness this spectacular event, Maria Edgeworth satisfied herself, as does her heroine, with gleaning scientific concepts from relatives and family friends who could tailor explanations for her, instead of from strangers intent on dazzling.¹⁹

Why did Edgeworth choose phosphorus for the centerpiece of two key scenes of failed tricks in her novel issued a few years later? The element, discovered in the late seventeenth century, had long played an important role in debates about the dissemination of scientific information to the general public. The element's rise to prominence coincided with growing acknowledgement towards the end of the seventeenth century by members of the newly founded Royal Society and other elite scientific associations

¹⁷ Holmes provides an overview of Edgeworth's friendship and visits with Davy (253, 264, 291).

¹⁸ James Watt to Matthew Boulton, 20 September 1785, cited in *Transactions of the New York Academy of Sciences* (New York: New York Academy of Sciences, 1888), 6:204.

¹⁹ Phosphorus experiments were inspired by ordinary activities and could be conducted at home. Edgeworth's friend, the scientist Mary Somerville, learned of one such endeavour from their mutual friend, the astronomer John Herschel: "Herschel had noticed that a dead lobster (no doubt intended to be eaten) glowed in the dark ... he had the idea of passing the phosphorescent light through a prism." Allan Chapman, *Mary Somerville and the World of Science* (Bristol: Canopus, 2004), 68. (Chapman cites an unpublished 11 April 1865 letter from the Royal Society Herschel Papers collection.) Prior to writing *Belinda*, Edgeworth had framed scientific endeavour as an appropriate domestic pursuit. In her first published work, *Letters for Literary Ladies* (1795), the letter-writing father deems chemistry an appropriate subject for the girl's future education: "Chemistry is a science well suited to the talents and situation of women; it is not a science of parade; ... it demands no bodily strength; it can be pursued in retirement; it applies immediately to useful and domestic purposes; and whilst the ingenuity of the most inventive mind may in this science be exercised, there is no danger of inflaming the imagination, because the mind is intent upon realities." The father includes chemistry under the umbrella of "the considerable portion of knowledge" that "the mother, who now aspires to be the esteemed and beloved instructress of her children, must have." Edgeworth, *Letters for Literary Ladies* (1795; London: Everyman, 1993), 20–21.

that they would do well to cultivate a positive image for their work. The scientists' public relations campaign entailed targeting audiences from hitherto ignored demographics, including those unaccustomed to contemplating subjects beyond the purview of the domestic sphere. As the historian Jan V. Golinski notes, "servants, women, and children could not be admitted to the company of natural philosophers, but they were recruited as audiences for experiments performed outside the Royal Society."²⁰ Letters and diary records indicate that phosphorus experiments were the main event of many such public demonstrations, but such use of the refulgent element was controversial. Some champions of inquiry, including John Beale and Robert Boyle, regarded the crowd-pleasing phosphoric reactions—in which unprepossessing bits of matter were coaxed into furnishing a glorious display—as a means to stoke public excitement about scientific endeavour. Yet they expressed doubts in their writings and proceeded with caution: fearing the "mischievous consequences" of public viewings, Boyle admonished his fellow enthusiasts that a beguiling spectacle could disable such an audience's already inferior powers of ratiocination.²¹

²⁰ J.V. Golinski, "A Noble Spectacle: Phosphorus and the Public Cultures of Science in the Early Royal Society," *Isis* 80, no. 1 (1989): 26.

²¹ In correspondence with Royal Society associates, as Golinski observes, Boyle underscores his concern that onlookers might be so entranced they could not think critically about what they saw before them, and that this disabling of the faculties could have long-term detrimental effects. In the essay "The *Aerial Noctiluca*" (1680), Boyle echoes the Royal Society member Daniel Cox's 1674 encomium to the "prettiness" of certain chemical elements, and cautions against making much of it: "Divers ludicrous Experiments, very pleasant and surprizing, may be made with the Noctiluca, by him that has enough of it. But these Trifles, though very pretty in their kind, I purposefully pass over: as also an use that may be of great, but I fear of mischievous, consequence." Boyle, *The Aerial Noctiluca: or Some New Phoenomena, and a Process of a Facitious Self-Shining Substance Imparted ...* (London: Thomas Snowden, 1680), 20–21. Golinski notes that the Society's phosphorus experiments were significantly truncated and simplified for public viewing, and that Boyle went so far as to order that the directions for the preparation of certain experiments remain sealed until after his death. It seems that Boyle's anxiety was justified: his colleague John Evelyn had attested to the potential of phosphoric displays to capsize the audience's powers of reason when observing a Royal Society experiment in 1671. The sight inspired Evelyn to remember a *mountebanque* enthralling an audience on the Piazza Navona, reporting the charlatan first presented a phosphorus show that attracted a mixed crowd of commoners and aristocrats; then, "having by this surprising trick, gotten Company about him, he fell to prating for the vending of his pretended Remedies." Evelyn, *The Diary of John Evelyn*, ed. E.S. de Beer (Oxford: Oxford University Press, 1955), 4:253; noted in Golinski, 27; cited in William Eamon, "Markets, Piazzas, and Villages," in *The Cambridge History of Science III: Early Modern Science*, ed.

Along with contemporaries such as John Evelyn, Boyle presumed that for common audiences, exposure to scientific demonstration could have the paradoxical effect of fostering ignorance rather than dispersing it. Moreover, in his view, the injurious effects of spectacle could not be significantly mitigated through parallel measures; Boyle seems to despair of the practicability of tempering unwarranted fascination via detailed explanation in the form of lectures or supplementary literature.

More than a century later, Edgeworth expressed reservations in her nonfictional works about a similar phenomenon: the tendency of later eighteenth-century science education writers to leaven their scripted demonstrations of the scientific method with superstition, magic, and spectacle. Her warnings gained urgency as scientific discourse spread from the rarefied domains of the lecture hall into the heart of the domestic arena.²² Using her platform as an increasingly prominent author, Edgeworth called for re-evaluation of a widespread phenomenon enabled by burgeoning middle-class appetites for scientific literature, that is, domestic experiments performed by parents or tutors for children, with each trial conducted according to instructions given in mass-produced manuals designed for nursery laboratories.

Edgeworth and her father criticize juvenile library favourites in *Practical Education* (1798). They recommend that “in the selection of chymical experiments for young people, it will be best to avoid such as have the appearance of juggler’s tricks, as it is not to our purpose to excite the amazement ... for the moment, but to give ... a permanent taste for science.”²³ The Edgeworths specifically cavil

Katharine Park and Lorraine Daston (Cambridge: Cambridge University Press, 2006), 215.

²² This debate was reinvigorated by members of the recently established (1799) Royal Institution, a group devoted to “diffusing the knowledge, and facilitating the general introduction, of useful mechanical inventions and improvements ... [and] teaching, by courses of philosophical lectures and experiments, the application of science to the common purposes of life,” as one founder, Benjamin Thompson, Count Rumford, explained in the title of a plan for establishing the group: “Proposals for Forming by Subscription, in the Metropolis of the British Empire, a Public Institution” (1799). Thompson married Lavoisier’s widow (who frequently hosted Edgeworth during her time in France) after the chemist perished in the Terror. Cathy Cobb and Harold Goldwhite, *Creations of Fire: Chemistry’s Lively History from Alchemy to the Atomic Age* (New York: Plenum Press, 1995), 168.

²³ Maria Edgeworth and Richard Lovell Edgeworth, *Practical Education*, ed. Susan Manly (1798; London: Pickering & Chatto, 2003), 24. References are to this edition.

with “a well-known book, called ‘Hooper’s *Rational Recreations*,’ [in which] there are many ingenious experiments; but through the whole work there is such a want of an enlarged mind, and such a love of magic and deception appears, as must render it not only useless, but unsafe, for young people, in its present state” (25).²⁴ William Hooper underscores the importance of trickery to lure participants, despite the ostensibly “rational” aspect trumpeted by his title. Experiments with deception-emphasizing titles, such as “The Magic Lantern,” “To Produce the Appearance of a Phantom,” “The Magician’s Mirrors,” and “The Real Apparition,” feature centrally in Hooper’s 1774 work, with most adhering to a pedagogical template of misleading spectacle followed by demystifying explanation.²⁵

In *Practical Education*, the Edgeworths despair of such “absurd titles, which only obscure the understanding, and spoil the taste” (26). Hooper introduces his work by purporting to hope that “the reader will readily discover, at the same time he admires the phenomena” that “far from being marvellous or incomprehensible, they are the regular and necessary effects of the laws of nature”; but he indicates that he selected the “recreations” included in the volumes with an eye as to those that “for surprize are inferior to none” (1:i). The father-daughter Edgeworth team parts ways with Boyle and Evelyn in identifying why staging such “juggler’s tricks” is “unsafe”: in the Edgeworths’ view, using chemical tricks to draw a crowd or to entrance a child condones the use of science to duplicitously enthrall others, where it should instead be used to rescue those spellbound by unsubstantiated beliefs. Such lesson plans as those recommended by Hooper prescribe reliance on mesmerizing deceptions, and only belatedly introduce the use of scientific analysis to clarify any number of presumed “mysteries.” Edgeworth claims in her treatise and, more implicitly, in her novel that scientific education has a profound social impact if it is properly conducted, but Hooper’s methods cloud students’ understanding of the scientific process.

²⁴ Simon During has shown that Hooper lifted many of the procedures from Edmé-Gilles Guyot, *Nouvelles récréations physiques et mathématiques* (1769). During, *Modern Enchantments: The Cultural Power of Secular Magic* (Cambridge: Harvard University Press, 2002), 87.

²⁵ William Hooper, *Rational Recreations, in Which the Principles of Numbers and Natural Philosophy Are Clearly and Copiously Elucidated, by a Series of Easy, Entertaining, Interesting Experiments*, corrected 2nd ed., 4 vols. (London: L. Davis, 1783), 2:32, 44, 96, 132. References are to this edition.

One of the novel's opening scenes portends later episodes of characters' eventual rehabilitation by way of empiricism, with a portrayal of the risk of bodily harm produced by a deliberately misleading scientific spectacle gone awry. The scene has not featured in critical readings of the novel, save for an account of its Miltonic resonance by Jeffrey Cass.²⁶ Here, Belinda's suitor, as yet unreformed into a proper beau, enters a masquerade ball:

[Clarence] Hervey ... was not in a masquerade dress. He had laid a wager with one of his acquaintance, that he could perform the part of the serpent, such as he is seen in Fuseli's well-known picture. For this purpose he had exerted much ingenuity in the invention and execution of a length of coiled skin, which he manoeuvred with great dexterity, by means of internal wires; his grand difficulty had been to manufacture the rays that were to come from his eyes. He had contrived a set of phosphoric rays, which he was certain would charm all the fair daughters of Eve. He forgot, it seems, that phosphorus could not well be seen by candlelight. When he was just equipped as a serpent his rays set fire to part of his envelope and it was with the greatest difficulty that he was extricated. He escaped unhurt, but [the] serpent's skin was utterly consumed; nothing remained but the melancholy spectacle of its skeleton. He was obliged to give up hopes of shining at the Masquerade. (23)

Hervey's voluminous, body-obscuring costume—"his *envelope*" (23)—invites conflation of spectator and spectacle, with his eye-emitted "phosphoric rays" designed to draw the fascinated attention of masquerade onlookers. He does not sufficiently heed the cues of the physical world for anticipating outcomes and instead trusts to his own inflated self-concept as a master of disguise. In this way, Hervey is similar to the novel's other fully enveloped character: a sham "oracle." Lady Delacour, accompanied by her paramour Colonel Lawless, visits this figure at the behest of Harriet Freke, a malicious friend who bombards the purported seer with questions regarding the fate of the pair's extramarital affair. In response, the "tall figure completely enveloped in fur" (47) utters prognostications that are ultimately discredited, but terrify Lawless, who eschews scientific reasoning and "believes *tout de bon* in conjuration, and the devil, and all that" (such is Freke's derisive aside to Lady Delacour) (47). The theriomorphic garb

²⁶ Jeffrey Cass, "Ithuriel's Spear and Detecting the Counterfeit: Edgeworth's Miltonic Allusions in *Belinda*," in *Romanticism: Comparative Discourses*, ed. Larry H. Peer and Diane Long Hoeveler (Burlington: Ashgate Publishing, 2006).

donned by Hervey and the "oracle" is telling, since they aim to prompt onlookers to join in a cognitive regression to a primitive, bestial state of limited reason. Each envelope conceals a schemer who aims to elude an audience's powers of inspection but deserves further scrutiny.

While eyesight usually serves a functional purpose in the novel as the primary means of empirically assessing visible phenomena, Hervey constructs a visual apparatus itself—the phosphoric eye-rays—as the supremely compelling focal point of his costume. Hervey reduces himself from observant man to gazed-upon aesthetic object, styling himself after an oft-perused exhibition piece—"Fuseli's well-known picture." He obscures his human body in a shroud of "coiled skin" and "wire" to fashion himself after the Biblical serpent: a creature wrongfully "endued / With sanctity of reason"²⁷ (to borrow a phrase from the epic poem directly quoted elsewhere in the novel), who is made to use his newfound powers of rationality for deceiving innocent observers. The incident thematizes the novel's emerging preoccupation with various modes of seeing and the privilege of a reasoned perspective (a privilege here abused).

The passage supports the distinction drawn in *Belinda* between upstanding, disinterested scientific inquiry and self-serving exploitation of science: the novel implicitly contrasts Dr X's professional analysis (as shall be seen) and Belinda's irreproachable penchant for deliberation with the manipulative efforts of the showman Hervey. In this episode, more so than in any of the hands-off exchanges between the courting pair Hervey and Belinda, the reader is for a while subtly enjoined to cast a decidedly unscientific gaze on Hervey's form. The heroine's suitor is viewed primarily as a corporeal being while he handles the material of the costume—"exerting" himself on "a length of coiled skin" and "manoeuver[ing] with great dexterity." The reader's attention is diverted from the designer's cerebral qualities of "ingenuity" and "invention" (the words have a pejorative ring in Edgeworth's time, reminiscent of the attributes of Jonathan Swift's "Projectors") to the costume's mechanical features; the amateur scientist is demoted to tinkerer, and finally to abashed perpetrator of a "melancholy spectacle." Instead of garnering acclaim by rousing the masquerade-goers' scientific curiosity, Hervey intends to kindle the crowd's unthinking awe, but before

²⁷ John Milton, *Paradise Lost*, ed. David Scott Kasten, 3rd ed. (1674; Indianapolis: Hackett Publishing, 2005), book 7, lines 507–8, p. 230.

he even departs for the masquerade he generates a domestic blaze that yields only ashes. In using his scientific knowledge to whet others' appetite for spectacle rather than to appeal to cool reason, Hervey only narrowly escapes damaging his home and being himself "utterly consumed."

Harvey anticipates that the "fair daughters of Eve" in attendance at the ball will harbour cravings that he expects to stimulate; he understands, with Milton, just how "inordinate desires, / And upstart passions / Catch the government from reason."²⁸ The "fair daughters" phrase traces the anticipated female observers' lineal connection to Eve, who famously longed not for romance but for knowledge—for science, in its broadest sense. In casting Hervey as the serpent, and his anticipated female observers as descendants of Adam's sorely tempted helpmeet, Edgeworth charges the designer of the costume with giving free rein to his own self-aggrandizing ambition and to his anticipated onlookers' fascination with spectacle. Blame for the danger of the spectacle is clearly attributed to the misleading practitioner of science rather than to any unguarded prospective believers. Hervey assumes that his "envelope" will drive the ladies to distraction; his costume is meant to foster amazement in a masquerade atmosphere already inimical to the dispassionate and distanced analysis that is so requisite for scientific inquiry. In accordance with the novel's frequently asserted antipathy towards mystifying spectacle, the scheme fails. Denuded of his costume, Hervey arrives undisguised at the masquerade and so cannot participate fully in the social communion that the rest of the crowd enjoys. With this episode, Edgeworth offers an illustration of the myriad failures of science as spectacle. Yet the author's tolerant dispensation of second chances must be noted: the novel's aforementioned antipathy towards fascination with spectacle is equivocal, for characters like Hervey are eventually rehabilitated. Their scientific aptitude and curiosity must simply be channelled appropriately.

After portraying scientific effects misused to stymie viewers' use of reason, Edgeworth examines the salutary potential of the scientific method. In the novel's second phosphorus-focused scene, which comes long after Hervey's fiery debut, Edgeworth illustrates the possibility that the scientific method can eradicate superstitions and liberate the disempowered from societal hindrances. There, the cross-dressing rabble-rouser Harriet Freke (the same character

²⁸ Milton, *Paradise Lost*, book 12, lines 87–89, p. 385.

who initiates the aforementioned visit to the “oracle”) uses a phosphoric drawing to fool her neighbour’s manservant Juba into believing that his bedchamber is haunted by an “obeah-woman,” or sorceress, on a mission from his Jamaican homeland to seek vengeance. Juba, who has been unusually “melancholy” for weeks and whose health “seemed every day to grow worse” (220), eventually bursts into tears and explains the reason for his silence as “the figure of an old woman [that] had appeared to him in his bedchamber every night, and he was sure that she was one of the obeah-women of his own country, who had pursued him to Europe” (221). Belinda automatically suspects something amiss: “The moment that she heard of the flaming apparition, she recollected having seen a head drawn in phosphorous, which one of the children had exhibited for her amusement, and it occurred to her that, perhaps, some impudent or ill-natured person might have terrified the ignorant negro by similar means” (222). Significantly, Belinda does not begin by attempting to explain the chemical trick to Juba; instead, she emulates the perpetrator by arranging for another phosphoric image to be created on Juba’s wall. The reader learns that “Miss Portman proposed that a figure should be drawn with phosphorous, as nearly as possible to resemble that which Juba had described, and that it should be shown to him at night, to try whether it would excite his apprehensions” (222). The proposal initiates a pedagogical moment in which Belinda teaches Juba through experience.²⁹ She prepares the conditions for successful replication of the first observed result: fright elicited in a cowering spectator who shies from inquiring into the workings of what he sees before him. Using experiment, she can assess the consequences of the restaged scientific spectacle on Juba in an effort to relieve him of his fear.

As with Hervey’s costume, Edgeworth suggests that deceptive spectacle is pernicious for viewer and producer alike. In both instances, however, Edgeworth reserves the greater dangers of bodily harm and social opprobrium for those who stage the display, as opposed to the naive audience: Hervey is engulfed in flames, and Freke risks exile from her closest friend’s social circle—“an irreparable breach would have ensued,” the narrator discloses, had

²⁹ The repetition of Juba’s exposure to the spectre causes emotional strain that seems excessive and undeserved. Anderson, who reads the encounter as an instance of “pedagogical performance,” notes that “Belinda’s method of educating Juba initially seems rather cruel ... Juba’s epiphany is the result of suffering” (124).

Freke not promised to take specific measures to make amends (213). Significantly, Lady Delacour refers to Freke herself as a “spectre” (301, 312), and Freke, like her phosphoric female creation, is but an ephemeral presence in the domestic sphere. Edgeworth thus manages an implicit critique of those who would use science to mystify or indulge in show(wo)manship rather than to educate or empower. She counters these negative examples with laudatory instances of the triumph of the scientific method: as when Belinda adroitly formulates a hypothesis about the apparition’s cause, when she devises an experiment that involves controlling for variables (the scene is exactly recreated, with the only difference its restaging so that it may be observed), and finally when she assesses the collected data (including observations of Juba’s unfeigned terrified reaction, and of the physical scene) to reach a reasonable conclusion.³⁰

The theory and practice of the scientific method were not, of course, among the topics generally taught to genteel young women in the eighteenth century. Belinda has acquired her informal scientific education in the same way that Edgeworth did—that is, during unspectacular encounters within the private confines of the home. The new generation of science writers targeting a domestic audience seem to have concurred with this approach, for subsequently published guidebooks follow Edgeworth’s lead in diminishing the prominence of spectacle in science education. These works, which were published after Edgeworth’s treatise and novel were released, provide context regarding the changing nature of the era’s scientific pedagogy, and perhaps illuminate how Edgeworth and other authors contributed to the revamping of approaches to scientific education. Previous works in the manner of *Rational Recreations* recommended that the learning process involve a sequence of deceptions, to be practised by the amateur-scientist teacher or parent, followed by clarification for

³⁰ Jordana Rosenberg offers an alternative reading to interpretations of the novel by other scholars that have “traditionally accepted that Belinda’s rational tour through the Delacour household thematizes the progress of Enlightenment demystification” asserting that “*Belinda* ... details a domesticity that is in crucial ways aligned with mystification.” Rosenberg, “The Bosom of the Bourgeoisie: Edgeworth’s *Belinda*,” *ELH* 70, no. 2 (2003): 592. Her argument is primarily concerned with Belinda’s “mistaken impression” (592) of the cause of Lady Delacour’s illness. I address the question of rationality in *Belinda* by focusing on the demystifying potential of scientific endeavour in the novel. Elsewhere, Rosenberg comments that “the novel ... attempts to make an ‘egalitarian gesture’ by presenting Juba—Mr. Vincent’s (Belinda’s third suitor’s) servant—as utterly educable and rational” (595).

the overawed child's sake. In contrast, the new works, including Samuel Parkes, *The Chemical Catechism* (1806), were styled as so-called dialogues or conversations between authority and pupil, in which matter-of-fact demonstrations (as opposed to dramatic spectacle) are incorporated as a learning aid.³¹ These new works include phosphorus experiments, but refrain from sensationalizing the effects.

Jane Marcet likewise desists from including show-stopping extravaganzas in *Conversations on Chemistry* (1806).³² The fictional pupils, Emily and Caroline, watch tranquilly as their tutor Mrs B. demonstrates phosphoric combustion, and then move on to the next question without comment. Later, Emily asks about "letters written with phosphorus, which are invisible by day-light, but may be read in the dark by their own light"³³—the very same trick used by Harriet Freke on Juba. Both girls express more interest in the mechanisms than in the striking appearances of chemical reactions. Caroline remarks that "country people, who are so much frightened by those appearances, would soon be reconciled to them, if they knew from what a simple cause they proceed" (167). This seems to be the sort of response that Edgeworth was aiming to inculcate in readers of all ages.

In Edgeworth's novel, a wishful notion akin to that expressed by Caroline—that fright may be abated through contact, familiarity, an attitude of empirical inquiry, and an openness to considering alternative causes—is first conveyed through the episode of Juba's encounter with the spectre. Belinda's trial of the obeah-woman

³¹ Samuel Parkes emphasizes that a scientific education can inoculate children against "specious reasoning": "If a youth has been taught to receive nothing as true, but what is the result of experiment, he will be in little danger of ever being led away by the insidious arts of sophistry, or of having his mind be bewildered by fanaticism and superstition." Parkes, *The Chemical Catechism: With Notes, Illustrations, and Explanations*, 6th ed. (1806; London, 1814), 22. *The Chemical Catechism* debuted to laudatory reviews in leading journals. Twelve editions were released between 1806 and 1826.

³² Edgeworth later befriended Marcet, as an indirect result of the release of *Conversations*. Watts mentions that "Maria Edgeworth first became Marcet's friend after writing to her in gratitude following her younger sister's life being saved when someone thought how to neutralize the poisonous acid she had swallowed, by recalling the relevant statement in Marcet's book" (Watts, 289). The incident was noted earlier in Bette Polkinghorn, *Jane Marcet: An Uncommon Woman* (Aldermaston: Forestwood, 1993).

³³ Jane Marcet, *Conversations on Chemistry; in Which the Elements of that Science are Familiarly Explained and Illustrated by Experiments* (Greenfield: Denio and Phelps, 1820), 166. References are to this edition.

is an exercise in superstition-debunking by way of scientific explanation.³⁴ Although England was usually considered to be beyond the spiritual jurisdiction of obeah practitioners by those who hailed from the islands, a distance-barrier is not referenced in the novel. One modern scholar who interviewed Caribbean immigrants residing in London found that they generally believed “that obeah emanating from the West Indies is powerless in England because of the great distance.”³⁵ Yet Juba continues to fear the consequences of obeah even after he has moved to England, thus reiterating the strong emotional appeal of old beliefs. Nor is he alone; by including episodes such as Lady Delacour’s aforementioned visit to the fur-bound oracle, the novel disallows simplistic notions of England as a land of unmitigated rationality. Similarly terrifying magical thinking, then, can beset those from exclusive English social circles, as further evidenced by Lady Delacour’s superstitions about her bosom wound. Edgeworth is representative of the more progressive elements of Enlightenment thought in implicitly arguing that people from any culture can learn to discredit such bogeys via scientific explanation: “Juba, familiarised by degrees to the object of his secret horror, recovered his health and spirits” (222).³⁶ In portraying Juba’s rapid

³⁴ Belinda’s use of the scientific method to eliminate the figurative obeah woman provides a humane alternative to the real-life torture and execution of obeah men. The punishments, which involved scientific instruments, are described in Bryan Edwards, *The History, Civil and Commercial, of the British Colonies in the West Indies* (London: John Stockdale, 1793), vol. 2, book 4, pp. 94, 98: “Various experiments were made with electrical machines and magic lanterns.” As McCann notes, Edwards’s work seems to have been Edgeworth’s primary source on obeah (196).

³⁵ Ari Kiev, “Beliefs and Delusions of West Indian Immigrants to London,” *British Journal of Psychiatry* 109 (1963): 360. “Only one of the hundred people interviewed believed that obeah might be influencing her” (360).

³⁶ McCann contends in his discussion of the novel that “in *Belinda* Juba ... demonstrates that a former slave, mired in the fetishism of Afro-Caribbean culture, can be transformed into a subject capable of displaying the rationality and autonomy that apparently typify an Enlightenment culture” (181). McCann argues that Juba’s “assimilation” constitutes an “index of domestic enlightenment’s ability to absorb racial difference.” It seems, though, that Juba’s phosphorus scene could be more broadly construed not specifically as a racial matter, and not as an instance of absorbing difference, but instead as one of several wishful illustrations of the ways in which a shared attitude of scientific empiricism can enable people of various cultural, racial, gender, and other backgrounds to communicate constructively despite difference. Also, Juba never gains true “autonomy”—to the end of the novel, he remains emotionally tethered to his master, sobbing when he delivers an apology on behalf of a distraught Mr Vincent (449). His continued display of fealty

adjustment to practising reasoned appraisal, Edgeworth shows that there is nothing essentially English about the empirical mindset.

While Edgeworth indicates the scientific principles behind each phosphoric trick, she also takes care to note that the materials involved in both Hervey's and Freke's chemical displays are entirely destroyed by conflagration. Likewise, as Anderson notes, the manuscript version of "The Mental Thermometer" (a short story that Edgeworth published the same year as the first edition of *Belinda*) concludes with the shattering of an experimental apparatus that attracts spectators' inordinate visual fixation.³⁷ The story narrator is captivated by the instrument, which measures the holder's "degree" on a "scale of happiness" and is inscribed with "bright characters ... in Arabic."³⁸ When the boy who possesses it decides to give it to a metaphysician who proposes using it for experiments, the thermometer breaks "with such violence ... with a sudden explosion" (548). Those who foster their own and others' preoccupation with the dazzling appearance of scientific effects and devices are deprived of their materials. With her characters bereft of spectacle, Edgeworth shifts the focus away from the tantalizing show to questions about the technical particulars that produced the scientific effect, as well as to larger epistemological and moral concerns about the proper use of scientific knowledge—a transition that, the Royal Society scientist Boyle had feared, most audiences could not manage.

Moreover, upon the destruction of each phosphoric spectacle in the novel, readers are compelled to revise their views of characters formerly more noted for their corporeal form and features—handsome and claustrophobically costumed Hervey, comely Belinda, and servile and dark-skinned Juba. These characters, introduced as physically alluring or visually captivating bodies—as spectacles unto themselves—are, however temporarily, portrayed instead as reflective, cognitively agile thinkers. Although the characters may

seems excessive, and perhaps reflects Edgeworth's reservations about the liberating consequences of her celebration of scientific empiricism.

³⁷ Anderson discusses this episode in light of what she sees as Edgeworth's emphasis on the importance of self-knowledge and of "reflecting on one's feelings": "While the published version of the tale preserves the thermometer as a potentially useful tool, the manuscript version makes a joke of its efficacy, and the completed fable reflects on the insufficiency of science and scientific tools to do this type of work" (114).

³⁸ Maria Edgeworth, "The Mental Thermometer," in Grace A. Oliver, *A Study of Maria Edgeworth: With Notices of Her Father and Friends* (Boston: A. Williams, 1882), 546. References are to this edition.

be taken in by appearances at first, all are adaptive individuals who are capable of learning to govern their reactions through empirical assessment of the sensory data available to them.

Edgeworth scrupulously refrains from condoning Juba's culturally derived superstitions or supporting perceptions of black women as inherently menacing. The phosphoric display does not inspire entirely new fears; it is a physically visible manifestation of the dreadful images already lurking in Juba's mind, simply exaggerating and literally illuminating his views. The novel instead recommends vigilant adherence to the scientific method as a safeguard against the general error of engaging in prejudices and superstitions that can be readily confuted by empirical analysis. The minimally literate Juba's ordeal, during which he is compelled to relinquish such views, inches him closer to the status of an educated empiricist. While "spelling out the words" of a letter near the end of the novel, the manservant is surprised by a menacing, grossly stereotyped Jewish moneylender "concealed behind a curtain" (446). Although mistaken in his belief that Solomon is an intruder intent upon robbery, Juba does not make any more grievously wrongheaded assumptions based on stereotypes. His earlier encounter with the phosphoric spectre has inoculated him against unwarranted prejudice. Now, "fears of supernatural appearances were out of the question ... our negro was a man of courage," and thus Solomon "did not unnerve him like the idea of the obeah-woman" (446). The narrator explicitly refers back to the manservant's beguilement by the spectre; Juba, the reader must admit, has made progress. Moreover, his empirical training has not altered Juba into someone improbable or unrecognizable; instead, it has enhanced one of his defining characteristics, his unflinching willingness to defend his master. The episode reinforces the argument, implicitly promoted throughout the novel, that moral improvement and social progress are among the fruits of a proper scientific education. Even the little learning that accrues to Juba empowers him to face otherwise alarming situations with a measured confidence.

The inclusion of such scenes in Edgeworth's work seems to have been fostered by a general cultural climate in which some urged the necessity of improving the general public's capacity for renouncing fear through scientific thinking. With her extensive travels in France and knowledge of its literature, Edgeworth may have been influenced by a prominent Frenchman who advised that uneducated labourers ought to witness scientific demonstrations. Lawyer and would-be educational reformer Louis

Philipon de la Madeleine had recommended a course of direct exposure followed by scientific explanation almost two decades earlier in his *Vues patriotiques sur l'éducation du peuple* (1783). As the historian Harvey Chisick remarks in his discussion of the pedagogical schemes, Philipon regarded "superstition and fear of the unknown ... as liabilities in poor peasants and laborers, and suggested that they be taught a modicum of natural science as a corrective" and expected that "by being shown the true cause of thunder and lightning, for example, they would lose their fear of these phenomena."³⁹ Philipon also proposed nocturnal visits to graveyards for young students, who would, he presumed, thereby be disabused of irrational fears of darkness or of roaming ghosts. Scientific encounters, he suggested, could be arranged as a means to an end, as a way to make vulnerable members of society (underclass workers and children) more productive, so that others far removed from them would enjoy more profit.

Edgeworth's intentions are less calculating. In *Belinda*, scientific demonstrations and experiments diminish, rather than delineate, social boundaries: in the aforementioned phosphoric episode, the brash, affluent gentleman Hervey must appear sans costume in the presence of Belinda, the heroine of modest means; while in the second phosphorus scene, the demonstration further solders the platonic sympathy between Belinda and Juba.⁴⁰ In contrast to Philipon's fearful labourers and students, who show no inborn sense of wonder, even the most humble

³⁹ Harvey Chisick, *The Limits of Reform in the Enlightenment: Attitudes toward the Education of the Lower Classes in Eighteenth-Century France* (Princeton: Princeton University Press, 1981), 170.

⁴⁰ Edgeworth's views regarding educational access are complex. In the manuscript piece "On the Education of the Poor" (ca. 1800), which reiterates some of the ideas included in *Practical Education*, she declares, "The enemies of liberty would take advantage of the tide in public opinion, and would insinuate that all potential power should be taken from the people that they should be kept in ignorance that they may be held in subjection. But it is too late to uphold that system of mental coercion. The operations of thought are invisible to the eye of power, and no force can counteract them but that of reason." Michael Hurst cites this passage, then observes that Edgeworth, from a family of Anglo-Irish landowners, tempers her remarks by stating that "the education of the lower classes must obviously differ from that of the higher." Increasing access to education could destabilize the class hierarchy: Edgeworth proposes that (as Hurst puts it) "misplaced instruction would aggravate a dangerous situation, but well-conceived curricula would inculcate laborers' children with the spirit of 'obedience, truth, and honesty.'" Hurst, *Maria Edgeworth and the Public Scene: Intellect, Fine Feeling, and Landlordism in the Age of Reform* (London: Macmillan, 1969), 24–25.

among Edgeworth's characters in *Belinda* and elsewhere are driven to empirical exertions by curiosity. This tendency is evident in Edgeworth's earliest literary productions, as in her 1798 comedic play *Whim for Whim*—in which the suspicions of another black manservant, Juba's prototype Quaco, inspire him to test whether some jewels are made of paste or of genuine diamonds.⁴¹

Edgeworth consistently affirms that women, children, and lowly characters, such as the black servants Juba and Quaco, also harbour the capacity for rational thought and for understanding scientific concepts.⁴² Yet she attaches no problematic intellectual aspirations to that capacity. The obeah-woman episode decisively locates heroine Belinda as the satisfied and assiduously resourceful emotional centre of her domestic sphere, far from an aspirant for female membership in the Royal Society. Edgeworth exonerates her heroine from any implication of presumptuous intellectual ambition by carefully showing the reader that Belinda gleaned her knowledge of phosphorous not from scientific tracts or lecture synopses, but rather from the children in her care:⁴³ far from seeking out knowledge, she is “shown a head drawn in phosphorus” by her young charges for “amusement” rather than for edification (222).

In keeping with the heroine's role within the domestic realm, at no point in the novel does Belinda directly observe the application of phosphorus. She views the children's luminescent artwork after it has been completed; later, she hears others'

⁴¹ Maria Edgeworth, *Whim for Whim*, in *Popular Tales, Early Lessons, Whim for Whim* ed. Elizabeth Eger, Cliona O'Gallchoir, and Marilyn Butler (London: Pickering & Chatto, 2003). In the play, the treacherous footman Felix pockets a lady's real diamonds and gives Quaco a case containing some false gems, expecting that the owner's suspicions will fall upon the “little foolish fellow ... the blackamoor” (360). Hypothesizing that the contents of the case are fakes, he then “puts the false diamonds to his tongue” (so goes the stage direction), and exclaims, “No cold!—no diamonds!” (361) and scurries off to report his discovery. Quaco's *solus* scene appears to be a rehearsal of the empirical analyses in *Belinda*—although Edgeworth does not endow Juba with similar capacities for testing his suspicions on his own. Anderson describes this “tongue-test” as a “primitive experiment” in the course of her discussion of Edgeworth's drama.

⁴² George E. Boulukos claims that in her short story, “The Grateful Negro” (1804), “Edgeworth sees slaves as dangerously irrational, although she prefers sentimental to physically coercive solutions.” Boulukos, “Maria Edgeworth's ‘Grateful Negro’ and the Sentimental Argument for Slavery,” *Eighteenth-Century Life* 23, no. 1 (1999): 20. It seems that in *Belinda*, Edgeworth suggests that irrationality is a condition, a matter of impoverished educational and cultural exposure, rather than an inherent trait.

⁴³ Thanks to Jill Campbell for this observation.

accounts of the success of her devised experiment, without setting foot in Juba's bedchamber. In her remote engineering of the re-enactment of Juba's traumatizing vision, the heroine is thus permitted to emulate vicariously the "Freke"-y performance with nary a reprimand. Propriety alone may be sufficient to cause the heroine to keep her distance from the site of the spectacle, but her absence is appropriate for another reason. Belinda's detachment can be construed as Edgeworth's way of de-emphasizing the more problematic aspects of empirical methodology's entanglement with sensory (and sensual) perception. It is not Belinda's physical sensory capacity that is exemplary: her eyes do not see more acutely, nor is her hearing more sensitive than that of her fellows. Instead, it is her superior intellectual ability to form valid hypotheses and arrive at logical conclusions by using the sensory data available to her—rather than being emotionally overwhelmed by sensory impressions—that sets her apart from others. The obeah-woman spectacle may incite household gossip, but Edgeworth's paragon of rationality expresses no unseemly desire to view the phosphorescent figure herself. Since Belinda is the novel's standard of objective reasoning, she must be conspicuously distanced from any potentially compromising fascination with the material world and its array of spectacle.

The unlearned Juba's transition, courtesy of Belinda's guidance, from superstitious to more scientifically minded is remarkable. Edgeworth is careful to show, however, that well-born characters who lack systematic training render themselves similarly vulnerable to mistakes of perception. The novel's most prominent aristocratic character, Lady Delacour, is a highly intelligent bibliophile, but her education seems to have followed a self-indulgent, desultory path, as evinced by the pile of spurious Methodist texts cluttering her bedside table; as such, she is subject to the same type of magical thinking as that which perturbs Juba. She styles herself as an independent thinker, but admits that she sometimes gives way to "superstition" because "the habits of my life ... have naturally inclined me rather to incredulity than superstition. But there are things which no strength of mind, no temerity, can resist" (307). Host to Belinda for much of the novel, Lady Delacour is initially hostile to expert treatment for the wound in her bosom; she refuses to be visited by Dr X——, an eminently rational practitioner and advocate of the scientific method. Lady Delacour prefers the ministrations of a "quack" (xvi) who will attempt a cure in "secrecy" (177).

Belinda at length cajoles her host into accepting a visit from the doctor, who finds that the charlatan has further exacerbated his patient's ailment: "He knew too well how to make a wound hideous and painful, and so continue her delusion for his own advantage" (314). The quack has capitalized on his patient's tendency to draw erroneous conclusions from valid sensory data (in this case, the gruesome appearance of her wound). This tendency is most explicitly revealed on a related occasion, when Lady Delacour declares to Belinda that she has seen "a vision" and insists that "it is impossible I should be convinced that my senses have deceived me with respect to what I have beheld when I am as broad awake, and in perfect possession of my understanding, as I am at this instant" (308). She did see a figure, but the ghost she claims to have witnessed is merely Freke in drag, attempting to distress her. Lady Delacour's senses never fail her; rather, she is imperiled by her propensity to allow her emotions rather than her intellect to guide her in processing and arranging data gleaned via her senses, such that her viewing of the spectacle reaffirms her irrational beliefs.

Having discovered Freke's deceit, Lady Delacour renounces superstition in general and finally consents to undergoing surgery in the care of Dr X—— and trusting in his empirical methods. She seems to have realized that the quack's manipulation of appearances is similar to Freke's trickery. Like Freke, the quack uses what little scientific knowledge he has to reinforce superstitions and to take advantage of those who credulously observe without thinking to question what they see. Dr X—— notes that if "Lady Delacour would have permitted either the surgeon or him to have *examined* sooner into the real state of the case, it would have saved herself infinite pain, and them all anxiety" (314). The word "examined" is italicized in the text, signalling the importance of Dr X——'s inductive, observation-based approach. As did Belinda in the obeah-woman episode, Dr X—— voices a hypothesis, tests it through visual observation and further analysis, and arrives at a conclusion. Repeatedly, adherence to the scientific method facilitates a character's elimination of a "delusion" abetted by "secrecy" and hitherto unchallenged by rational inquiry. Superstitious patterns of thought are once more discredited.

Unlike the several adults in Edgeworth's novel whose reactions to spectacle are guided by sclerotic prejudices, magical thinking,

and hoary superstitions, the younger generation readily adopts the practice of empirical thinking. The offspring of *Belinda*'s friend Lady Anne find entertainment in applying the scientific method's tenets of inductive reasoning and in listening to tales of experiments:

The children at Lady Anne Percival's happened to be looking at some gold fish, which were in a glass globe, and Dr X——, who was a general favourite with the younger as well as with the elder part of the family, was seized upon the moment he entered the room: a pretty little girl of five years old took him prisoner by the flap of the coat, whilst two of her brothers assailed him with questions about the ears, eyes, and fins of fishes. One of the little boys filliped the glass globe, and observed, that the fish immediately came to the surface of the water, and seemed to hear the noise very quickly; but his brother doubted whether the fish heard the noise, and remarked, that they might be disturbed by seeing or feeling the motion of the water, when the glass was struck ... Dr X—— observed, that this was a very learned dispute, and that the question had been discussed by no less a person than the Abbé Nollet; and he related some of the ingenious experiments tried by that gentleman, to decide whether fishes can or cannot hear. (98–99)

This scene provides an example of beneficial scientific education, a superior alternative to the fright-inducing scientific exposure of the previous scenes. A fishbowl offers but a modest focal point in comparison to the phosphoric extravaganzas, but the unspectacular setting holds no distractions that could interrupt an intellectually rewarding experience. With their developing empirical mindset, the children find occasions in their everyday experience to increase their capacity for informed judgment. Hervey and the Percivals improve on Beale's method of incorporating children and other unaccustomed witnesses into the process of scientific inquiry. When he attempted to resolve the enigma of shimmering meat that was brought to him by the female villager who had pickled it, Beale invited women, children, and servants to participate. They were there to perform a tactile, physical task: "I desired all the company (whereof some were young children, who have the tenderest touch) to try, whether the most flaming parts had any perceptible degree of tepidity," Beale states, favourably comparing children's sensory capacities to those of adults. No mention is made of the cognitive abilities of those gathered, save Beale's concern that this particular audience was especially susceptible to ghost stories and would leave the scene with illuminated hands but unenlightened

minds. Beale suggests that the learned may likewise be deceived if distracted by spectacle.⁴⁴

Compelled to rely on data acquired through observation rather than on assumptions accrued from long-ago personal experience or imbibed from the surrounding culture over decades, the youngsters focus on the present. They take the fish's every movement into account and do not foreclose possible explanations until multiple potential causes have been discussed. The children are naturally inclined to entertain an array of hypotheses. In the spirit of Lavoisier's aforementioned suggestion (from the work treasured by her scientist correspondent Davy), Edgeworth seems to imply that adults would do well to approach scientific experiment in the open-minded manner of children. Once again, Edgeworth guides readers to take an interest in certain uncharismatic characters despite their lack of prominence in society or status within the household, encouraging an admiration of the children's restrained way of channelling their fascination with the bourgeois trappings of home into engagement with the scientific process.

The empirical mode of thought opens a way for the brokering of alliances, however momentary, between individuals with varying capacities for reason: children and adults, human beings and goldfish, men and women (Lady Delacour's young daughter, rather than either of the Percival sons, is later awarded a prize offered to the children for delivering the best account of the fish experiments).⁴⁵ Dr X—— does not condescend to his young companions, in accordance with the narrator's earlier observation that "the elder and younger part of the family were not separated ... the children were treated neither as slaves nor as playthings, but as reasonable creatures" (215).⁴⁶ Instead, he finds a shared language

⁴⁴ See John Beale, "Two Instances of Something Remarkable in Shining Flesh, from Dr. J. Beal in Somersetshire, in a Letter to the Publisher," *Philosophical Transactions* 11 (1676): 601.

⁴⁵ Twelve-year-old Helena Delacour tells her mother that "Lady Anne Percival one day asked us all ... Charles, and Edward, and me, to give her an account of some experiments on the hearing of fishes, which Dr X—— had told to us" (172).

⁴⁶ The phrase is used three other times in the novel, to describe Belinda (71, 72) and Hervey (134). The children's mother, Lady Anne, is described as a "reasonable woman" (358). Edgeworth adopts the now-familiar phrase from Mary Wollstonecraft: "I wish to see women neither heroines nor brutes; but reasonable creatures." Wollstonecraft, *A Vindication of the Rights of Woman*, ed. Anne K. Mellor and Noelle Chao (1792; New York: Longman, 2006), 101.

in scientific discourse, likening their questions to those of the renowned Abbé.⁴⁷ The children, for their part, offer similar generosity to the fish, which are considered with respect and interest, down to the miniscule details of their forms. One of the boys almost anthropomorphizes the tiny creatures when he speculates as to whether the fish possess senses akin to his human powers of hearing, “seeing,” and “feeling” (99).⁴⁸

Having secured the children's attention, Dr X— proceeds to inform the children about “Ives's account of the elephants in India” (100). The reference is fitting, for in the pertinent section from *A Voyage from England to India* (1773), Edward Ives, who was himself a medical doctor, reports that the pachyderms are “half-reasoning creatures ... susceptible of affection, fondness, gratitude and modesty.”⁴⁹ In casual experiments, he has found that “there is nothing but they may be taught,” noting the animals' “ingenuity” (58).⁵⁰ The allusion enhances Edgeworth's

⁴⁷ In an earlier collection of short stories, Edgeworth portrays children as capable of vying with adults in reasoning ability. Marilyn Butler notes that in *The Parent's Assistant* (1796), the tales invariably focus on a plucky young protagonist who is “tested through taking on a task which is near the limit of his or her capacity. What is required of him is not a priggish conformity to adult norms of behavior, but courage and determination to act on his own, often in defiance of the children and adults around him.” Butler, *Maria Edgeworth; A Literary Biography* (Oxford: Oxford University, 1972), 161–62.

⁴⁸ While not overtly sensual, the novel indicates that sensory attunement— especially keen visual observation, but also aural observation, as when Belinda eavesdrops on Hervey (16)—is vital to the operation of reason. The Enlightenment encompassed the rise of the French philosophical tradition known as “sensationism,” in which “the very experience of the body in seeing, hearing, smelling, tasting, and touching ... led to the establishment of a new authority, the authority of experience,” as John C. O'Neal explains. O'Neal, *The Authority of Experience: Sensationist Theory in the French Enlightenment* (Pennsylvania: Pennsylvania State University Press, 1996), 1–2, cited in Karen Harvey, *Reading Sex in the Eighteenth Century: Bodies and Gender in English Erotic Culture* (Cambridge: Cambridge University Press, 2004), 199. Harvey, building on O'Neal's work, notes that British philosophers, such as Locke and Hume, similarly “argued for the pre-eminence of sense-knowledge, thereby challenging Descartes's assertion that intellectual judgment or reason alone was enough to support a belief in an individual's existence” (Harvey, 199–200). In *Belinda*, however, such hierarchies are implicitly refuted, since the evidence of the senses is used in the service of “intellectual judgment.”

⁴⁹ Edward Ives, *A Voyage from England to India in the Year MDCCLIV* (London: Edward and Charles Dilly, 1773), 58. References are to this edition.

⁵⁰ Ives recalls speculation about the frequency of elephant motifs in Indian “places of worship”: “Some imagine, that they place the *elephant* here as an emblem of *God's* omniscience; while others rather think they pay adoration to

suggestion that the scientific method can detect latent abilities in underestimated beings. Equally importantly, the entire household benefits when the scientist—and his method—are ushered from the distant reaches of the research field or laboratory to the inner sanctum of the domestic realm.

Such an expansive sense of fellow-feeling is a completely different effect from that anticipated by the novel's contrivers of phosphorescent spectacle. Such characters use science to mystify, to inspire awe or to instil fear, and to set themselves apart from their fellows. Edgeworth assures the reader that such schemes come to naught. By contrast, characters prosper when they respond to mystifying situations by using empirical strategies. When their findings contradict prevailing superstitions or prejudices, the empiricists among the characters are amenable to revising their views. This readiness is liberating: such characters are furloughed not only from fear, but also from the traditional boundaries accorded to them by society, which fosters expectations about individuals and their capacities for reason based on readily apparent attributes such as race, gender, and age. In the world of Edgeworth's novel, the reprieve offered by the scientific method has its limits, for the opportunities for empirical activity still constrain participants to keep their accustomed positions in the domestic sphere; individual characters do not attain status in the outside world by dint of their newfound empirical orientation. Such opportunities do, however, foster a general openness to evidence-based inquiry within the space of the home, as household harmony is strengthened by the scientific education occurring within its walls.



Nicole M. Wright is a Provost's Career Enhancement Post-doctoral Scholar at the University of Chicago. She received her PhD from Yale University in 2011; her dissertation is entitled "A Contractile Power': Boundaries of Character in the British Novel, 1740–1830." In addition to the development of the novel, her interests include literary portrayals of the history of science, law in literature, and African-American poetry.

him, as being endowed with greater sagacity than themselves, and therefore pray to him for a portion of his wisdom" (59–60).