

Cuckoo chicks evicting their nest mates: coincidental observations by Edward Jenner in England and Antoine Joseph Lottinger in France

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ABSTRACT: For centuries, naturalists were aware that soon after hatching the common cuckoo (*Cuculus canorus*) chick became the sole occupant of the fosterer's nest. Most naturalists thought the adult cuckoo returned to the nest and removed or ate the fosterer's eggs and young, or the cuckoo chick crowded its nest mates out of the nest. Edward Jenner published the first description of cuckoo chicks evicting eggs and young over the side of the nest. Jenner's observations, made in England in 1786 and 1787, were published by the Royal Society of London in 1788. Four years before Jenner's observations, in 1782, Antoine Joseph Lottinger recorded eviction behaviour in France and published his observations in *Histoire du coucou d'Europe*, in 1795. The importance of Lottinger's and Jenner's observations is considered together.

KEY WORDS: brood parasitism – *Cuculus canorus* – eviction behaviour – field experiments – Jean Hermann – Jemima Blackburn.

RÉSUMÉ: Pendant des siècles, les naturalistes étaient conscients qu'au cours de quelques jours après l'éclosion, le coucou gris (*Cuculus canorus*) devenait le seul occupant du nid de l'hôte. La majorité des naturalistes croyaient que le coucou adulte retournait au nid et enlevait ou mangeait les œufs et les oisillons de l'hôte, ou que l'oisillon coucou encombra et forçait les autres oisillons hors du nid. Edward Jenner a publié la première description des oisillons coucous expulsant les œufs et les oisillons de l'hôte du nid. Les observations de Jenner, faites en Angleterre en 1786 et 1787, ont été publiées par la Société Royale de Londres (Royal Society of London) en 1788. Quatre ans avant les observations de Jenner, en 1782, Antoine Joseph Lottinger a documenté le comportement d'expulsion en France et a publié ses observations dans l'*Histoire du coucou d'Europe*, en 1795. L'importance des observations de Lottinger et de Jenner est prise en considération.

INTRODUCTION

It was widely known by the late eighteenth century that the European or common cuckoo (*Cuculus canorus*) laid its eggs in the nests of other species of birds and entrusted its young to the care of the foster parents.¹ Most of the details of the cuckoo's nesting biology and the fosterer's reaction to the cuckoo's imposition had not been determined, and interpretations of many observations of this parasitism were confusing and in some cases were controversial (Schulze-Hagen *et al.* 2009). Naturalists thought the adult cuckoo returned to the nest after its chick had hatched and removed (Frisch 1743; Baldamus 1892) or ate (Pernau 1720)² the fosterer's eggs and young, or the cuckoo crowded its nest mates out of the nest (Naumann 1826), leaving the cuckoo as the sole occupant to be reared unwittingly by the foster parents. Observations eventually revealed that within a few hours of hatching, the cuckoo chick lifts



Figure 1. Common cuckoo evicting an egg of the great reed warbler (*Acrocephalus arundinaceus*), Natural Reserve of the Valli di Mortuzzuolo, Modena, Italy, 22 May 2005 (© by courtesy of Daniela Campobello).³

and pushes the fosterer's eggs and young over the side of the nest (Figure 1), thus securing the full attention of its "parents".

Edward Jenner (1749–1823), the English surgeon and naturalist, is given credit for publishing the first descriptions of cuckoo chicks evicting their fosterers' eggs and nestlings, as well as other cuckoo chicks.⁴ Four years earlier, a French physician and naturalist, Antoine Joseph Lottinger (1725–1793)⁵, had recorded eviction behaviour while studying the reactions of fosterers to foreign eggs placed in their nests. These observations were published in Lottinger's second book on cuckoos, *Histoire du coucou d'Europe* (1795) (Figure 2)⁶, about seven years after Jenner's paper appeared. Here we place Lottinger's observations of eviction alongside Jenner's observations and discuss their importance, giving them their appropriate place in the history of acquisition of knowledge of avian brood parasitism.

JENNER'S OBSERVATIONS

Jenner, best known for his discovery of smallpox vaccination, was also passionate about birds.⁷ His descriptions of newly hatched cuckoos evicting nest mates were based on careful observations and an experiment conducted near Berkeley, Gloucestershire. He determined that the cuckoo chick, alone and unaided, positioned the eggs and young, one by one, into a depression on its back and hoisted each over the edge of the nest until only the cuckoo remained. In June 1786, Jenner found an obscured "hedge sparrow" (dunnock; *Prunella modularis*) nest containing a cuckoo chick; a dead nestling dunnock was on the ground under

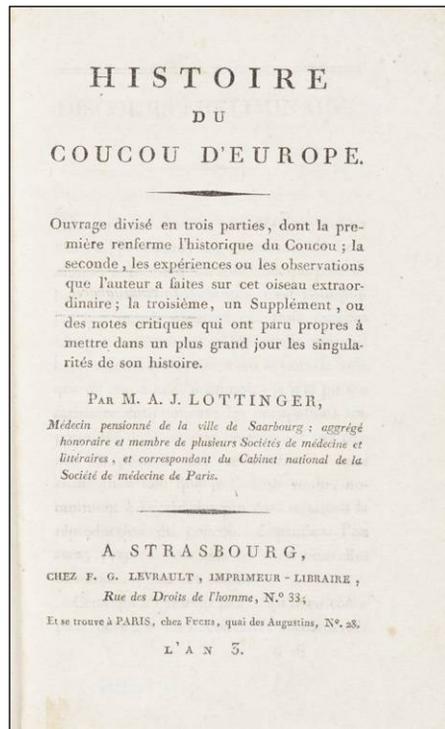


Figure 2. Title-page of Antoine Joseph Lottinger's *Histoire du coucou d'Europe* (1795) (actual size 195 × 114 mm). (© Reproduced with permission from a copy (QL 696, C83 L67) in Blacker Wood Rare Books and Special Collections, McGill University, Montréal.)

the nest and a cracked egg, with a live embryo, had become entangled on the outer side of the nest. Jenner placed the egg back into the nest but discovered a few minutes later that it had been thrown out, again becoming entangled. Jenner removed the cuckoo and replaced the egg; in less than an hour the dunnock had hatched and its parents were feeding it. He replaced the cuckoo and the dunnock was soon evicted. Jenner repeated this with the same result, but he was not absolutely sure what he had seen, and he did not believe that a newly hatched cuckoo could empty the nest. He supposed the evictions were carried out by the adult fosterers. The following year, on 18 June 1787, Jenner (1788: 225–226) observed a cuckoo chick evict its nest mate, this time at a visible dunnock's nest.

The little animal, with the assistance of its rump and wings, contrived to get the bird upon its back, and making a lodgement for the burden by elevating its elbows, clambered backward with it up the side of the nest till it reached the top, where resting for a moment, it threw off its load with a jerk, and quite disengaged it from the nest . . . I afterwards put in an egg, and this, by a similar process, was conveyed to the edge of the nest, and thrown out. These experiments I have since repeated several times in different nests, and have always found the young Cuckoo disposed to act in the same manner . . . the work is resumed, and goes on almost incessantly till it is effected . . . But this disposition for turning out its companions begins to decline from the time it is two or three till it is about twelve days old, when, as far as I have hitherto seen, it ceases . . . The singularity of its shape is well adapted to these purposes; for, different from other newly-hatched birds, its back from the *scapulae* downwards is very broad, with a considerable depression in the middle. This depression seems formed by nature for the design of giving a more secure lodgement to the egg of the Hedge-Sparrow, or its young one,

when the young Cuckoo is employed in removing either of them from the nest. When it is about twelve days old, this cavity is quite filled up, and then the back assumes the shape of nestling birds in general.⁸

At two other nests in 1787, Jenner (1788: 229) observed a cuckoo chick evicting another cuckoo chick. Details recorded at the first nest confirmed the similarity of the cuckoo's behaviour, whether evicting a fosterer's egg or young, or another cuckoo:

June 27 . . . Two Cuckoos and a Hedge-Sparrow were hatched in the same nest this morning; one Hedge-Sparrow's egg remained unhatched. In a few hours after, a contest began between the Cuckoos for the possession of the nest, which continued undetermined till the next afternoon; when one of them, which was somewhat superior in size, turned out the other, together with the young Hedge-Sparrow and the unhatched egg. This contest was very remarkable . . . after various efforts, the strongest prevailed, and was afterwards brought up by the Hedge-Sparrows.

Jenner incorporated his observations into a letter read by John Hunter FRS (1728–1793), his former tutor, before the Royal Society on 29 March 1787, but members were sceptical of the observations, and it was returned to Jenner. New observations made in 1788 were incorporated into a revised manuscript that was read on 13 March 1788; the paper was published later that year in *Philosophical transactions*.⁹ Not everyone accepted Jenner's observations, for the idea that a newly hatched, naked bird could lift an egg or another nestling and push it over the side of a nest seemed preposterous, both to many in the medical profession and also to some naturalists. Jenner's credibility was shaken but he was a careful observer and his observations stood up to scrutiny (for example Drewitt 1931; Scott 1974; Bardell 1996; Davies 2000; Bircham 2007; Schulze-Hagen *et al.* 2009).

LOTTINGER'S OBSERVATIONS

Lottinger nurtured a long-standing fascination for natural history, especially for the cuckoo and its fosterers. As with many naturalists, he believed adult cuckoos removed fosterers' eggs and young, leaving their own egg in the nest. In 1772 and 1773, he recorded reactions of several species to foreign eggs in their nests in a forest near his birthplace, Blâmont, in eastern France (Lottinger 1775). Continuing his study, Lottinger found a robin's (*Erithacus rubecula*) nest containing at least one robin egg and two cuckoo eggs. On 3 July 1782, one cuckoo chick and a robin egg were in the nest, and a cuckoo egg was on the ground. Thinking that the adult cuckoo had ejected its own egg, Lottinger placed the egg back into the nest (Lottinger 1795: 18). He described the events as follows:

. . . et quoique je ne m'absentai guères qu'une demi-heure, à mon retour je trouvai l'oeuf du coucou sur le bord du nid. Je pris le parti de le rentrer, puis je me remis dans ma loge; mais à peine y étois-je, que je vis de nouveau le même oeuf sur le bord, et certainement c'étoit le petit coucou, puisqu'il étoit seul, qui en se remuant avoit fait sortir cet oeuf, lequel, étant clair et par cette raison très-léger, pouvait facilement être jeté. Je le remis dans le nid, et dans l'endroit le plus profond, où il resta.

[. . . even though I only left for half an hour, when I came back, I found the cuckoo egg on the nest rim. I placed it back into the nest, then I went back into my lodge. I was nearly there when I noticed the cuckoo egg was on the rim again, and certainly it was the young cuckoo, since it was alone, and by moving around it pushed the egg onto the nest rim, which was clear, therefore, being very light, it could easily be thrown out. I placed the cuckoo egg back into the nest, and in the deepest area, where it stayed.]¹⁰

Lottinger had recorded eviction of a cuckoo egg by a cuckoo chick but because he had not witnessed the cuckoo pushing the other cuckoo out of the nest, he was not sure how it got there. He believed two cuckoo eggs laid in the same nest was a coincidence, a matter on which Jean Hermann (1738–1800)¹¹, a naturalist in Strasbourg, commented in a copy of

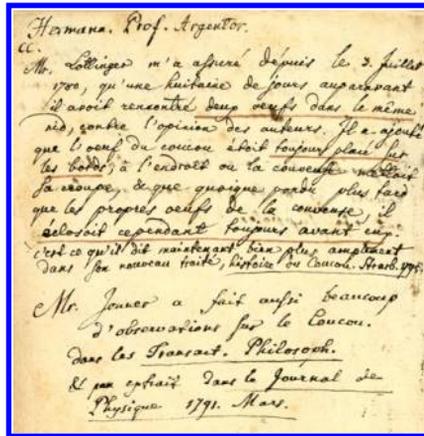


Figure 3. Jean Hermann's reference (transcribed and translated below) to multiple parasitism and Edward Jenner's paper, inscribed in Lottinger's 1775 book. (© Reproduced from Hermann's copy (H 126.719) with permission of Bibliothèque de Université de Louis-Pasteur, Strasbourg).

Mr. Lottinger m'a assuré depuis le 3. juillet 1780¹², qu'une huitaine de jours auparavant il avoit rencontré deux œufs dans le même nid, contre l'opinion des auteurs. Il a ajouté que l'œuf du coucou étoit toujours placé sur les bords; à l'endroit où la couveuse mettoit la croupe; & que quoique pondu plus tard que les propres œufs de la couveuse, il éclosait cependant toujours avant eux. C'est ce qu'il dit maintenant bien plus amplement dans son nouveau traité, histoire du Coucou, Strasb. 1795.

Mr. Jenner a fait aussi beaucoup d'observations sur le Coucou. dans les Transact. Philosoph. & par extrait dans le Journal de Physique 1791. Mars.

[Mr Lottinger assured me as of 3 July 1780¹², that eight days previously he had encountered two eggs in the same nest, which is against the general consensus. He added that the cuckoo egg was always placed on the sides, the area where the incubator places its rump, and even though laid later than its own eggs, the cuckoo egg always hatched before the others. This is what he states now, even more in his new book, *Histoire du coucou*, Strasbourg. 1795.

Mr Jenner also made several observations on the cuckoo in the *Philosophical transactions* and in an excerpt in the *Journal de physique* 1791. March.]

Lottinger's 1775 book (Figure 3). The real coincidence was that both Jenner and Lottinger had recorded outcomes of struggles between two cuckoo chicks, as more than one cuckoo egg is seldom recorded in the same nest at most sites (Wyllie 1981; Davies 2000). As in the case of the fosterers' eggs or young, the first cuckoo that hatches likely gains the upper hand and evicts the other cuckoo (Davies 2000).

VALIDATION OF THE OBSERVATIONS

Lottinger's report on cuckoo eviction would have bolstered Jenner's description but his work received little attention beyond local publications (Leverkühn 1891). Jenner's observations, however, were eventually verified (Montagu 1802; Blackwall 1824) and accepted by other naturalists (for example Rennie 1831; Stanley 1835). Brewster (1830) highlighted Jenner's observation of cuckoo eviction as well as Lottinger's study of the cuckoo's selection of foster-species but not his observation of eviction.¹³ Acceptance of Jenner's description, now backed up by Jemima Blackburn's illustration (Figure 4), seemed complete when Darwin (1872) included cuckoo eviction as an example of innate behaviour in the sixth edition of *On the origin of species*.



Figure 4. Jemima Blackburn's illustration of a cuckoo chick evicting a meadow pipit. Illustration number 11 in *The pipits* (1872). (© Reproduced with permission from a copy (PZ8.3.P559x) in the McCain Library and Archives, The University of Southern Mississippi, Hattiesburg.)

Jemima Blackburn (1823–1909), a Scottish artist (Fairley 1988, 1993), produced the first illustration “from nature”, following careful and repeated observations, showing a cuckoo chick evicting a meadow pipit; her illustration appeared in a children’s book, *The pipits* (R. M. 1872: plate 11 facing p. 22).¹⁴ Twenty seven years after Blackburn’s illustration was published, photographs of cuckoo-eviction appeared in Japp’s *Our common cuckoo and other cuckoos and parasitical birds* (1899: facing p. 13) and Westell’s *The early life of the young cuckoo* (1902: facing 20).¹⁵ Almost two decades later, on 8 November 1921, Edgar Chance showed his cinematic footage of cuckoo chicks evicting meadow pipits to members of the Zoological Society of London and the following day to the British Ornithologists’ Union; one photograph was published in *The cuckoo’s secret* (1922: facing p. 214). Lancum (1930) exhibited photographs of eviction at a meeting of the Linnean Society of London in 1929, and also published photographs that year (Lancum 1929). Confirmation that the nestling cuckoo evicts the fosterers’ eggs and young was a milestone in the accumulation of knowledge of the cuckoo.

CONCLUSION

Jenner certainly deserves the credit he has received for his careful descriptions of eviction behaviour, but Lottinger’s observations also assure him of a share of this credit. Had

Lottinger's observations been more widely known, the road to acceptance of Jenner's observations may have been less rocky. Jenner was more confident in his observations, having replicated his experiment in another year. Lottinger seemed hesitant to look upon eviction as the usual way to get rid of the fosterer's eggs and nestlings. Not being aware of Jenner's observations and not having actually observed the act of eviction, Lottinger was appropriately cautious.

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NOTES

¹ More than 2,300 years ago, Aristotle noted that common cuckoos laid their eggs parasitically (Hett 1936: 241; also see Friedmann 1964; Davies 2000; Schulze-Hagen *et al.* 2009).

² Baron von Pernau acknowledged that most naturalists thought the adult cuckoo ate the fosterers' young, although he probably did not believe this because he had seen dead hatchlings outside the nest while the fosterer brooded a cuckoo chick (Schulze-Hagen *et al.* 2009).

³ At mid-morning on 22 May 2005, the nest contained five warbler eggs plus a cuckoo chick attempting to evict one of the eggs. By late afternoon, the cuckoo was photographed evicting one of the three remaining eggs (two young had hatched). The next day, only the cuckoo chick remained in the nest.

⁴ Montagu (1802: vii–viii) described evictions of a nestling barn swallow (*Hirundo rustica*) by a cuckoo chick that an anonymous observer had repeatedly placed in the nest. The observation apparently predated Jenner's and Lottinger's observations of this behaviour.

⁵ Antoine Joseph Lottinger was born on 11 February 1725, one of eleven children, in Blâmont, France (Boehm 2003). The year of his death has been recorded between 1793 and 1804 (Therret 1991), but most sources give it as 1793, which would have preceded publication of his second book.

⁶ The date of publication is given as L'an 3, which spanned 22 September 1794 to 22 September 1795 (French Republican Calendar). Without knowing the month of publication, authors have cited the year as 1795.

⁷ Jenner's studies of birds focused on brood parasitism of the cuckoo (Jenner 1788) and on migration (Jenner 1824; also see Kilham 1973).

⁸ The depression on the cuckoo chick's back disappears along with the instinct to evict the fosterer's eggs and young within a few days of hatching (for example Honza *et al.* 2007).

⁹ Jenner's paper was translated into German in 1789 and French and Italian in 1791 (LeFanu 1985).

¹⁰ All passages in French were translated by the second author.

¹¹ Jean Hermann was professor of medicine and natural history at the University of Strasbourg and an important figure among naturalists of the Alsace in the latter half of the eighteenth century (Leverkühn 1891; Lange 1995; Muller 2000).

¹² The correct date is 1782.

¹³ Alfred Newton, who edited volumes 1 and 2 of the posthumous fourth edition of William Yarrell's *History of British birds*, inserted this note acknowledging Lottinger's observations (Yarrell 1882: 395): "... in 1782 Lottinger himself had personal proof of the expulsion of an egg from the nest by a young Cuckoo."

¹⁴ Blackburn later described the observations on which her sketch was based in a letter to *Nature* (Blackburn 1872). The strength of her work has recently been placed in a historical context (for example Fairley 1988, 1993; Gates 1998; Mitchell 2000).

¹⁵ Japp (1899: ix, xi) acknowledged John Craig and J. Peat Millar, of Beith, Scotland, for securing the first photographs of a cuckoo chick evicting a nest mate.

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