

Samuel Pepys's hand-coloured copy of John Ray's 'The Ornithology of Francis Willughby' (1678)

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Abstract We describe a unique, hand-coloured copy of Ray's (1678) *The Ornithology of Francis Willughby* that was apparently presented to Samuel Pepys between 1684 and 1686 during his presidency of the Royal Society. Somehow, this volume was not catalogued as part of Pepys's famous library, and fell into private hands until, in 1924, it was purchased for the McGill University Library in Montreal. More than 90% of the original engravings of birds in this volume are hand-coloured, making this a unique attempt to depict a large proportion of the known birds of the world in colour, and providing interesting insights into knowledge of bird colouration in the seventeenth century. The colouring of the 332 bird species on 76 hand-coloured plates is generally quite accurate—in the instances where the colouring is incorrect, it usually matches the description in Ray's text almost exactly.

Keywords Francis Willughby · John Ray · History · Plumage colour

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Introduction

John Ray's ornithological encyclopedia, published first in Latin in 1676 as *Ornithologiae libri tres* and then in English in 1678 as *The Ornithology of Francis Willughby*, is generally regarded as the most significant publication in the history of ornithology (Newton 1896; Raven 1950; Stresemann 1975; Birkhead 2008). This book was conceived by Ray and Francis Willughby in the 1660s, but the writing and compiling of illustrations were begun by Ray only after Willughby's early death in 1672. *Willughby's Ornithology*, as it is called, provides the first "sensible" arrangement or classification of birds, clustering together species that Ray thought belonged together based on morphology (Raven 1950), and providing detailed descriptions so that the reader could properly identify species encountered in the field.¹ Presumably to enhance these descriptions, both the Latin (1676) and English (1678) editions were illustrated by an identical set of 78 plates at the end of the book; black and white engravings derived from a variety of published sources (e.g. Gessner 1555; Belon 1555; Aldrovandi 1599–1603; Olina 1622; Jonston 1650), paintings, information from various explorers, and the observations that Willughby and Ray themselves made on their travels around Europe, both in nature and in private collections (Raven 1950; see also Charmantier and Birkhead 2008). Some of the representations of birds on these engravings are both aesthetically pleasing and scientifically accurate, such as those derived from Olina (1622), while others, like some of those copied from Marcgrave (1648), tend to be rather poor, especially as some of these are fanciful 'species'. Ray

¹ "...that the Reader might be sure of our meaning and upon comparing any bird with our description not fail of discerning whether it be the described or no." (Ray 1678, Preface p. 4).

considered the overall quality of the engravings to be disappointing and laid the blame largely on the difficulties of communicating from a distance with the London engravers (Ray 1678, Preface p. 6).

In this paper, we describe a unique² hand-coloured volume of *The Ornithology of Francis Willughby* that was originally owned by Samuel Pepys (1633–1703), an English Member of Parliament and naval administrator who is now most famous for his personal diary (Tomalin 2002; Le Gallienne 2003) and library (Latham 1978–1991). This hand-coloured volume of *Willughby's Ornithology* is now housed in the Blacker-Wood Collection in the library at McGill University, Montreal, Canada. It is mentioned in Casey Wood's (1931) *An Introduction to the Literature of Vertebrate Zoology* but, apart from brief mentions in Jackson (1985, p. 49) and Allen (1951, p. 424), we have found no other accounts of this book. Our aim here is to provide a brief description of Pepys's hand-coloured volume of *Willughby's Ornithology*, in part because of its unique position in the history of ornithology, representing one of the first books to depict a wide range of bird species from around the world in colour. *Willughby's Ornithology* is especially significant because it represents the first attempt (1) to define what a bird is, (2) to group species based on external morphology (for which he provided detailed descriptions), including plumage colour, identifying what he called their 'characteristic marks', and (3) to distinguish confirmed species from the mystical and imaginary birds described by previous authors, thereby trying to ground the study of birds in known fact. Ray was concerned about characteristic marks because he was confident that slight variations were irrelevant to defining species,³ in concert with his belief that all known species were made at creation (Cain 1996).

Materials

The copies of *Willughby's Ornithology* that we describe here are all in the Blacker-Wood Rare Books Collection. In 1920, Casey Wood established the Emma Shearer Wood

² As this manuscript was going to press, we discovered a completely hand-coloured volume of the Latin edition of *Willughby's Ornithology* (Ray 1676) for sale on-line at Anitquariaat Junk B. V. (Amsterdam, Netherlands; http://www.ilab.org/db/book1093_7587.html). The advertisement for this volume claims that the colouring is "contemporary" (seventeenth century) and that it is "outstanding and prepared by a professional illuminator". This may be the hand-coloured copy mentioned in Mullens and Swann (1917) as being in the (long gone) Westfield Place Library.

³ "...Nature doth not in all Individuals, (perhaps not in any two) observe exactly the same spots or strokes..." (Ray 1678, Preface p. 3).

Library of Ornithology at McGill then contributed significantly to its expansion until his death in 1942, though he rarely visited Montreal (Frost 1980). Wood was a prodigious note-maker and pasted some of these notes into the endpapers of *Willughby's Ornithology* (e.g. Electronic Supplementary Material, ESM: Fig. 1); some of these are quoted below. We also searched Wood's hand- and type-written notes for further information, and interviewed the librarians about Wood and his work on behalf of the library.

There is another copy of *Willughby's Ornithology* in the Blacker-Wood Rare Books Collection with some hand-coloured plates (see also Allen 1951, p. 424), but in that volume the engravings were undoubtedly coloured by the book's owner—or an artist that she employed—during the mid- to late eighteenth century. A handwritten note on the endpapers in that volume indicates that it was originally given to Jane Girgove (or Girgon) by her father in 1746. It was later inscribed by Jane Reeve (presumably her married name) in 1788. In all, 99 of the birds in this Reeve volume are watercoloured, and all of the colouring matches almost exactly the colours in Edwards (1743–1751). We do not discuss this Reeve volume further, but mention it merely to avoid any confusion over the two hand-coloured copies in the Blacker-Wood Collection.

Provenance

Inside Pepys's hand-coloured volume of *Willughby's Ornithology*, a loose typewritten note by Wood says "Formerly owned by Samuel Pepys, 1633–1703, this is the only known hand-coloured copy in existence. The copy was presented to him in thanks for the Royal Society, of which he was President, funding the publication" (see also ESM: Fig. 1). The cover of this volume bears Pepys's coat of arms, and his bookplate is pasted inside (see below), but the details of its presentation to Pepys are otherwise unknown. Pepys was well known to be a bibliophile and lover of nature (Le Gallienne 2003), and of birds in particular (Tomalin 2002), so this would have been an appropriate gift. Moreover, Pepys personally paid £50 towards the production of 50 plates of engravings for Ray's (1686) *Historia Piscium* (e.g. Fig. 3d) for which Ray was no doubt grateful, as he dedicated that later book to Pepys (Kusukawa 2000).

Pepys bequeathed his library of 3,000 volumes to Magdalene College, Cambridge, upon his death in 1703, though it was not transferred there until 1725 after the death of his nephew and heir, John Jackson, in 1723. The modern catalogue of Pepys's Library at Magdalene College (Latham 1978–1991) lists one uncoloured copy of *Willughby's Ornithology* (Pepys number 2607) which is still in

the library, but there is no record in that catalogue of any other copy of this book. Thus, it is not known why this hand-coloured volume was not included in Pepys's library when it was catalogued by Pepys and Jackson. Pepys's goal was to create a library of 3,000 volumes, which he realized, but he did not keep duplicate volumes, on occasion replacing existing volumes with ones that he considered to be of finer quality (Latham 1978–1991). We can only speculate that Pepys may not have considered this hand-coloured volume to be representative of the published book, which he had already catalogued, and thus may have given it to a friend or relative, possibly even to Jackson.

With reference to the hand-coloured volume, Wood notes that, “The book was purchased by the previous owner from a family named Hallowes. We know that Brabazon Hallowes married Anne Jackson, the daughter of Pepys' heir” (ESM: Fig. 1). Anne was indeed the daughter of John Jackson, and married Hallowes in 1742. Her own daughter, Anne Hallowes, died in 1806 and could have been the book's owner if it had passed down through her family from John Jackson. John was born in 1673 and would have been 12–14 years old when Pepys was president of the Royal Society. Thus, Jackson would have been old enough then to have been interested in the book. He was clearly a friend and favourite of Pepys, who made Jackson the executor of his estate and the keeper of his library (Latham 1978–1991).

Casey Wood purchased the hand-coloured volume for the McGill Library in 1924 (ESM: Fig. 1) for £72 from the British natural history bookdealer Wheldon and Wesley (E. MacLean, personal communication). Wood visited Magdalene College (Cambridge) in November of that year and offered them this hand-coloured volume but his offer was declined, possibly because Pepys had stipulated that no volumes be added to or taken from his library (Latham 1978–1991). The hand-coloured volume has remained in the Blacker-Wood Rare Books Collection ever since.

The book

This hand-coloured volume of *Willughby's Ornithology* is bound in calf leather (ESM: Fig. 2) and appears to be from the same printing and binding as the original engraved version of 1678, with the paper of both volumes having the same watermark and being of similar quality. In the hand-coloured volume, however, all of the pages are bordered with hand-drawn red lines (ESM: Fig. 3), and the engraved plates appear to have been polished before the application of watercolours, presumably to minimise the absorbency of the paper. There is no handwriting on any of the pages in this hand-coloured volume, but Pepys rarely wrote in his books (Latham 1978–1991). The back cover is gilded with

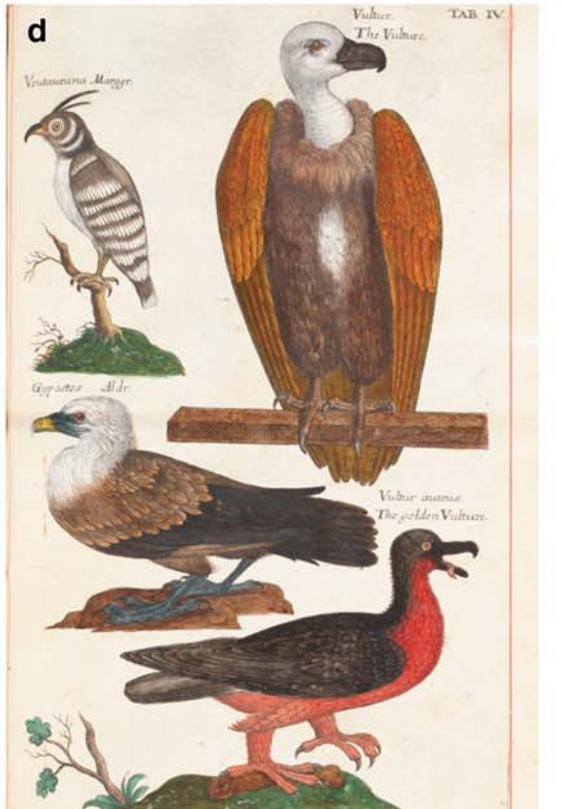
Pepys's coat of arms (ESM: Fig. 2b). The front cover pastedown is plain with both a bookplate and accession information from the McGill Library pasted to it; the back cover pastedown is plain, with a small typewritten note by Wood about Pepys pasted to it. The front endpapers are also plain but have a long typewritten note from Wood about the volume pasted to the first page (ESM: Fig. 1). The back of the title page has Pepys's bookplate showing his portrait (ESM: Fig. 3), and the back of the final plate has a smaller bookplate showing Pepys's initials and two anchors (ESM: Fig. 4). The copy in the Pepys Library at Magdalene College has the same bookplates and gilt coat-of-arms (Latham 1978–1991).

The plates

The English edition of *Willughby's Ornithology* (1678) had 80 engraved (intaglio) plates, 78 of birds at the back of the volume, and two inside—both new to the English edition—on methods of catching birds [redrawn from Olina (1622) who copied them from Valli da Todi (1601)]. Ray was not particularly happy with the engravings,⁴ possibly because they were not as accurate nor as life-like as some of the original drawings and engravings that were copied for this book. Also, these engravings are in the main not nearly as fine and detailed as they could have been at the time. Ray's subsequent volume on fishes (Ray 1686), for example, has exquisitely etched engravings (compare, for example, the engravings in Fig. 2a–d with that in Fig. 3d).

All but two of the plates (Tab. LXXV and Tab. LXXVI) are hand-coloured in the present volume. Both of these uncoloured plates are on paper of slightly different appearance (more worn and not as white) from the others and may have been added to the volume at a later date, possibly to replace damaged plates. The remaining 76 bird plates, as well the two interior plates showing methods of bird catching, are painted with water colours (Fig. 1; ESM: Figs, 5–8; see also Birkhead 2008, pp. 33 and 123 for colour reproductions of plate Tab. LVI and the first interior plate, respectively) in a manner similar to that of other hand-coloured volumes and maps from seventeenth century England, sometimes with the colouring completely obscuring the underlying engraving (e.g. compare Figs. 1 and 2). Almost all (94%) of the 354 bird 'species' depicted on these plates are hand-coloured, the main exceptions being fanciful species [e.g. from Marcgrave (1648) and

⁴ “The Gravers we employed, though they were very good Workmen, yet in many Sculptts they have not satisfied me...they as often neglected my instructions, or mistook my meaning” (Ray 1678, Preface p. 6).



◀ **Fig. 1** Examples of the hand-coloured engravings in the Ray (1678) volume of *Willughby's Ornithology* in the Blacker-Wood Rare Books Collection at McGill University: **a** Tab. XV showing Sulphur-crested Cockatoo (*Cacatua galerita*) and Scarlet Macaw (*Ara macao*), **b** Tab. XX showing European Roller (*Coracias garrulus*), Waxwing (*Bombycilla garrulus*), Nutcracker (*Nucifraga caryocatactes*), and a 'composite' toucan (see text), **c** Tab. XLIII showing Hawfinch (*Coccothraustes coccothraustes*), Northern Cardinal (*Cardinalis cardinalis*), Greenfinch (*Carduelis chloris*), Bullfinch (*Pyrrhula pyrrhula*), Crossbill (*Loxia curvirostra*), and House Sparrow (*Passer domesticus*), and **d** Tab. IV showing Ornate Hawk-eagle (*Spizaetus ornatus*), Griffon Vulture (*Gyps fulvus*), 'Gypaetos' and Bearded Vulture (*Gypaetus barbatus*); all bird species are listed here from left to right, and top to bottom. Originals in the Blacker-Wood Collection, Rare Books and Special Collections, McGill University Library, Montreal, Canada; used with permission

Aldrovandi (1599–1603)] for which Ray had no material evidence.

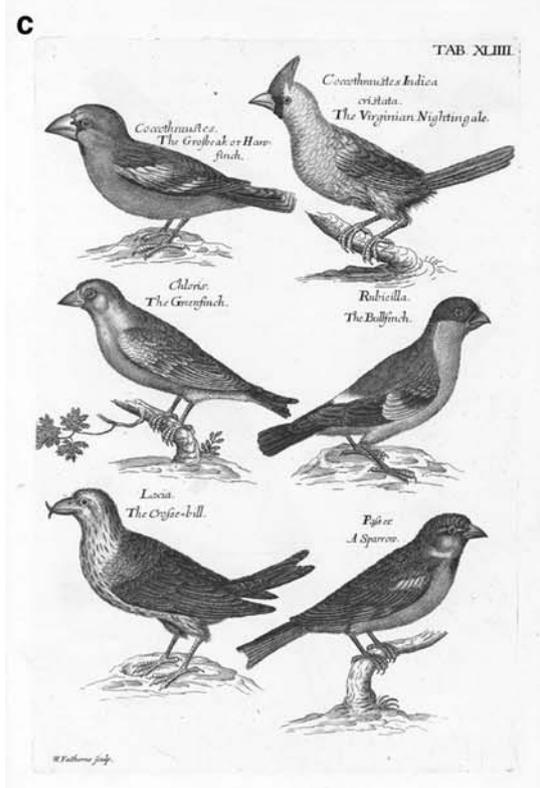
Today, the colouring in this volume remains vivid (Fig. 1; ESM: Figs. 5–8; see also Birkhead 2008, p. 33 and 123), and for most species, the hues are remarkably accurate, matching closely the hues of the actual birds when compared to a standard guide to animal colours (Smithe 1975). While the hues are generally accurate, the pattern of colouring on many of the birds is in error, despite the fact that some of the source material had both the colours and the patterns correctly described or depicted.

To illustrate many of the points made above, we focus first on the Scarlet Macaw (*Ara macao*) depicted on Tab. XV (Fig. 1a; ESM: Fig. 5), redrawn from an engraving (Fig. 3a) in Aldrovandi (1599–1603). The hand-coloured plate in the Pepys volume shows the wing primaries to be scarlet and the central tail feathers to be blue, but the real bird is just the opposite. In the text, Ray (1678, p. 111) describes two species of macaw, and says this about the one ("The other Macaw or Macao, of Aldrovandus") depicted in Tab. XV (Fig. 1a; ESM: Fig. 5): "The Back, beginning of the Wings, Throat, Breast, Belly, Thighs, and finally the whole Tail above, are beautified with a most lovely Scarlet or red colour, as is also the inner side of the flag-feathers of the Wings." For the other species ("Aldrovandus his greatest blue and yellow MacCaw"), Ray (1678, p. 110) says "The Neck above, Back, wings, and upper side of the Tail of a very pleasant blue or azure", and the colourist may well have used that description when painting the wings and tail. In many cases, the errors made with respect to colour pattern are due to a misreading of the text, as they are for this macaw, but in other cases, the colourist(s) seems to have simply tried to replicate the descriptions in the text. In contrast, many of the birds are more accurately coloured with respect to both hue and pattern than would be possible if only the descriptions had been used as reference.

Tab. XX (Fig. 1b; ESM: Fig. 6), for example, shows a European Roller (*Coracias garrulus*) that is remarkably accurate in both colour and pattern, faithful to the description in the text and closer to both the hue and pattern of the real bird than could be determined from the text alone. The Waxwing (*Bombycilla garrulus*), however, is poorly coloured, and it is easy to see how the colourist(s) mistook Ray's (1678, p. 133) description, particularly with respect to the spotting on the wings: "The outer Wing-feathers are marked with spots very pleasant to behold...their appendices being red like to Cinnabar or Vermilion.... To these succeed other feathers adorned in like manner with spots, but of a pale yellow, resembling in some measure the figure of the letter L: Which are so disposed that in some feathers appear seven, in some six, and in some but five only. Again, the shaft feathers have white spots...the last feathers have white spots... The covert feathers are also tipped with white." In this description, Ray is referring to the small, red, waxy extensions at the tips of the secondaries and the small bright yellow markings on the leading edge of the tips of the primaries. While Ray's description is accurate, it is easy to see how a colourist, who did not know the bird or have a coloured picture available, would cover the wings with white and yellow spots. The colourist also missed the conspicuous chestnut under tail coverts in this species, which were clearly described by Ray (1678, p. 133): "Near the vent are some other feathers of a Chestnut-colour, making as it were another Tail, but far less."

On this same plate (Tab. XX), the toucan ('Pica Brasilensis Toucan'; Fig. 1b; ESM: Fig. 6) almost perfectly matches Ray's (1678, pp 128–129) description, but neither the engraving nor the colouring resemble any known species (del Hoyo et al. 2002). Instead, the engraving and Ray's description appear to have been copied (see Smith 2007) from a composite originally in Gessner (1555), comprising a bill (probably from a Toco Toucan, *Ramphastos toco*) sent to Gessner by one of his correspondents, and the rest of the bird from the engraving and description in Thevet (1558). The engraving in *Willughby's Ornithology* (1676) closely resembles and was probably copied from the engravings in Aldrovandi (1599–1603) or Jonston (1650)—both of whom copied Gessner (1555). Finally, the Nutcracker (*Nucifraga caryocatactes*), depicted on Tab. XX as a dead bird hanging from a string and nail, is quite accurately painted, if maybe a little too reddish, matching Ray's (1678, p. 132) description of the plumage as "dusky red". On the other hand, the small white band between bill and eye is painted correctly, even though it is not shown on the engraving and is not so clearly described by Ray (1678, p. 132) who says simply that "Between the Eyes and Bill it is white".

In contrast, all six birds hand-coloured on Tab. XLIII (Fig. 1c; ESM: Fig. 7), for example, are remarkably



◀ **Fig. 2** Examples of the original engravings from *Willughby's Ornithology* that are shown as hand-coloured in Fig. 1a–d, respectively. These engravings are all from Ray (1676) but are identical to those in Ray (1678). The pages in this book measure 352 × 228 mm. Original owned by SUB Göttingen; used with permission of the Goettingen State and University Library

accurately painted except in very minor details. Curiously, the Bullfinch (*Pyrrhula pyrrhula*), Crossbill (*Loxia curvirostra*) and House Sparrow (*Passer domesticus*) are incorrectly shown with reddish eye-rings, but the Hawfinch (*Coccothraustes coccothraustes*), is correctly shown with a greenish iris. None of these minute details were mentioned by Ray (1678, pp 247–249), and thus must have been determined by the artist. However, all three species would have been relatively common cage birds in the seventeenth century, and would have been familiar to most people (Birkhead and van Balen 2008). The Bullfinch is also shown with a bright red innermost primary which Ray (1678) does describe,⁵ though this colour is best characterized as rosy-pink (Cramp and Perrins 1994, p. 815), and is almost invisible when the bird is perched. Thus, in this case, the artist appears to have relied upon Ray's description. These are minor details and the largely correct plumage hues chosen when colouring all of the birds on this plate match almost exactly those of the real birds, suggesting that the colourist(s) must have had some knowledge of these species.

As a final example, the beautiful colouring of the birds on Tab. IV (Fig. 1d; ESM: Fig. 8) illustrates an interesting mix of approaches, in some cases following Ray's (1678) descriptions, but in others demonstrating some knowledge of the real birds not found in those descriptions. It is reasonably clear from Ray's descriptions, and other sources (e.g. Cuvier 1831), that 'The Vulture' and the 'Gypaetos' on this plate are coloured as Griffon Vultures (*Gyps fulvus*), that the 'Urutaurana' is an Ornate Hawk-eagle (*Spizaetus ornatus*), and that 'The golden Vulture' is a Bearded Vulture (*Gypaetus barbatus*). The 'Urutaurana' engraving and description were copied from Marcgrave (1648) and the colourist has followed Ray's (1678, p. 63) text accurately, though the figure does not look much like the real bird, in part due to the engraving itself.

'The golden Vulture' engraving (Fig. 2d, bottom) is copied from Aldrovandi (1599–1603; see Fig. 3b). The colourist incorrectly shows this bird as having a black nape, as depicted in Aldrovandi's engraving (Fig. 3b), and a black head and face, which Aldrovandi correctly shows to be the same colour as the breast and throat. Aldrovandi's engraving (Fig. 3b) also nicely depicts the distinctive black

eyestripe of the Bearded Vulture, which the colourist has obscured. Bearded Vultures have a white head and front, but older birds, in particular, stain these feathers a rusty red (Negro et al. 1999), but not crimson as shown in Ray's coloured plate.

The 'Gypaetos' is described four times by Ray (1678, pp. 64–65), two of these taken from Aldrovandi (1599–1603), one from Gessner (1555), and the fourth based on Ray's own observations of a wild bird in Venice (Ray 1678, p. 65). All four of these accounts reasonably accurately describe the Griffon Vulture, and the colourist has so accurately reproduced the real plumage and soft part colours of the Griffon Vulture that a painting or taxidermic mount must have been available as a model. The engraving, however, copied from Aldrovandi (1599–1603), more closely resembles a Bearded Vulture, including the beard on the original (Fig. 3c) which was not copied by Ray's engravers (Fig. 2d, second from bottom). On the other hand, the engraving of 'The Vulture' on Tab. IV (Fig. 2d, top right) actually looks like a Griffon Vulture, and the head and body are quite accurately coloured (Fig. 1d, top right). The wings and tail, however, are too rufous—though some individuals of this species are quite rusty brown—and the primaries and rectrices of the real bird are black (Cramp and Simmons 1980, plate 7), as shown by the colourist's rendition of the Gypaetos. Ray (1678, p. 67) says that this bird resembles the 'Chestnut-coloured' Vulture' that he describes on pp. 66–67, following Belon (1555). Ray correctly describes this species as having black primaries and rectrices, which the colourist appears to have missed.

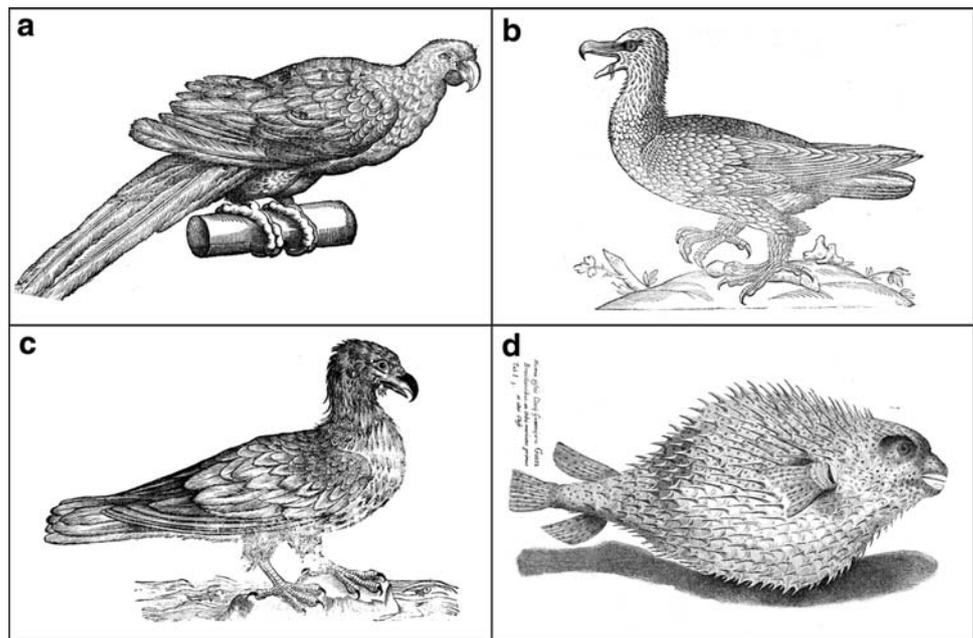
Most of the birds in this hand-coloured volume look quite similar to their actual colours and patterns. On the whole, the accuracy of the colouration is better than that of any other volume of birds coloured up to the end of the seventeenth century, being finally surpassed only by Edwards (1743–1751). This volume thus gives us an interesting window on the state of knowledge about bird colouration during the seventeenth century. Ray's descriptions of birds and engravings certainly defined a new approach to bird identification, focusing on details, and especially those that distinguished one species from another. We cannot know what might have been Ray's role in advising the colourist(s) of this volume, but the general fidelity of the colouring to Ray's descriptions show us that his descriptions with respect to colours were remarkably detailed and accurate.

Caveat

The absence of this hand-coloured volume from the Pepys Library (at Magdalene College) and catalogue (Latham 1978–1991; see also Raven 1950), and from mention in any

⁵ "The quill-feathers of the Wings are in number eighteen; the last or inmost of which on the outer half from the shaft is red, on the inner black and glossie." (Ray 1678, p 247).

Fig. 3 Engravings from: (a–c) Aldrovandi (1599–1603) that were redrawn for the engravings in *Willughby's Ornithology* (Ray 1676, 1678), a the Scarlet Macaw in Tab. XV (see Fig. 1a; ESM: Fig. 5), both b 'The golden Vulture' and c 'Gypaetos' in Tab. IV (see Figs 1d, 2d; ESM: Fig. 8). Also shown is d Ray (1686), a spot-fin porcupine fish (*Diodon histrix*), for comparison with plates (e.g. Fig. 2) in Ray (1676, 1678) with respect to shading and the quality of the engraving. Originals owned by SUB Göttingen; used with permission of the Goettingen State and University Library



of Pepys's and Ray's extensive writings (e.g. Le Gallienne 2003; Lankester 1848), raise the possibility that this volume is in fact a forgery—with bookplates and colouring added to increase its value—produced sometime around the turn of the twentieth century (R. Luckett, personal communication). Indeed, the hand-coloured plates would have been so unique, and so expensive to produce, in the seventeenth century, that it is difficult to believe that both Pepys and Ray would not have cherished this volume and made some mention of it in their many letters (e.g. Lankester 1848). While full resolution of this issue is beyond the scope of our present research, we offer four arguments against this volume being a relatively recent forgery.

First, it appears to us that the hand-coloured volume is an original English edition of *Willughby's Ornithology*, produced in 1678. The paper in this volume is identical in watermark and type to that of other copies of this work. Second, the crest on the outside cover and both interior bookplates are identical to those on other books in Pepys's Library (see Latham 1978–1991). While this does not mean that these were applied by Pepys himself, and forgeries are certainly possible, this would have been an expensive and difficult undertaking for a forger. Third, the hand-coloured plates themselves are so well done that they would have required a significant investment of time, effort and knowledge by a forger, and that might have made the profits to be made from such a forgery relatively meagre. As discussed above, the plates themselves show a remarkable pattern of colouring consistent with the knowledge of bird colours in the seventeenth century, matching the colours in previous volumes on birds in some cases, and being in error in other cases where reference

material is unlikely to have been available to the colourist(s). The errors in colouration, such as those we have described in this paper, are such a curious mix that it is difficult to believe that a forger did this, rather than simply copying coloured plates in a more recent volume of birds. Finally, Casey Wood, who purchased this volume for the McGill Library, was an extremely knowledgeable and savvy collector of books, not likely to be duped by a forgery nor to have paid a large sum for this book, as this was not his habit (E. MacLean, personal communication).

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