2 Gessner's history of nature

Conrad Gessner's *Historia animalium* ('History of Animals', 1551–8) is one of the best-known publications in Renaissance natural history. It is a good example of how a study of nature for a relatively new audience drew on a wide range of cultural resources of the period – humanism, printing, collecting and commerce. As a form of knowledge practised by the ancients, natural history required for its revival proficiency in the classical languages (Hebrew, Greek and Latin), philology, historical sensitivity and source criticism.[1] Gessner possessed all these skills and was furthermore able to draw on the vibrant culture of printed books of his time. He was a voracious reader of books, as well as editor and author of more than seventy titles. In 1545, he published *Bibliotheca universalis* ('Comprehensive Library'), a list of all the books that had ever been written by authors since ancient times. Together with information, drawings and objects gathered from his correspondents and by himself, knowledge garnered from books constituted the foundation of his study of natural history.[2] His *Historia animalium* was published in four volumes (addressing viviparous quadrupeds, oviparous quadrupeds, birds, and fish and aquatic animals) and ran to a total of more than 3,300 folio pages with woodcut illustrations. It included animals mentioned by classical authors (Cicero's 'alces', for example), those well known to Europeans (cats, dogs, cows, horses, etc.), recently discovered exotic animals (armadillo, guinea pig, turkey, etc.), as well as unicorns and sea monsters. It would be misleading to charge Gessner with credulity or gauge him by modern standards of zoology, since his project was expansive, covering everything that was written about an animal, including its uses in fables, poetry, proverbs and emblematic literature.[3] In order to understand what kind of knowledge Gessner's *Historia animalium* embodied, this chapter will discuss how this work differed from the study of animals at universities, what kind of knowledge it encapsulated, and what was involved in bringing together such a knowledge.

Study of animals at universities

The development of Renaissance natural history depended on highly educated scholars, and yet it was a field that developed largely outside academia, since universities did not recognise it as a distinct branch of knowledge.[4] By the sixteenth century, it was well established that the Aristotelian scheme of knowledge differentiated between the causal investigation of 'philosophia' (tackling the 'why') and a descriptive and comprehensive field of 'historia' (tackling the 'what') that provided the basis of philosophy. Natural history as such was not taught at universities, either as preparatory to natural philosophy or as a distinct subject. Aristotle's books on animals were known throughout the Middle Ages, but if they were read at all in the arts curriculum, it was towards the end of the arts course, and they attracted academic commentaries only sporadically.[5]

This is not to say that animals were not part of the study of natural philosophy. They were included, for example, in natural philosophical textbooks that emerged in the first half of the sixteenth century, which summarised Aristotelian concepts and topics instead of commenting on Aristotle's argument line by line. One such textbook, Gregor Reisch's popular *Margarita philosophica* ('Philosophical Pearl', 1503) described minerals, plants and animals as 'mixtures' made out of the four elements (air, water, earth and fire). Animals were divided (as they were in the Bible) into flying, swimming or crawling creatures, with discussion of their manner of generation, but without any extended discussion of different species and their distinguishing characteristics.[6] Morphological variety of plants, for example, was noted as evidence of the Creator's munificence, but not something to spell out in detail. This was indicative of the limited scope for discussing variation or morphological differences within Aristotelian philosophy, because external features such as the colour of plumes or the shape of hooves that could be shared with other species could not constitute an essential definition of a species.[7]

The variety of animals, plants and minerals were studied more closely in medical faculties as part of therapeutics, as they constituted naturally occurring medicines, *materia medica.*[8] In medieval universities, the medicinal effects of substances were commonly studied through compilations from Dioscorides, Galen and Aristotle, such as Avicenna's *Canon*, which included sections on medicinal materials and how to combine them, Serapion's *De simplicibus* ('On Medicinal Simples'), which grouped plants by the strength of their primary qualities, or Sextus Placitus's *De medicamentis ex animalibus* ('On Medicines Made from Animals'), which listed ailments each animal could cure. Such studies were rarely a focal point of the training of learned physicians, partly because of their emphasis on theoretical

matters, and partly because of the increasing reliance of physicians on apothecaries, as discussed by Pugliano in Chapter 3, this volume.

The Renaissance enthusiasm for studying directly the original ideas and practices of antiquity led to publications of the Greek texts of Galen, Dioscorides and other medical authors, edited by humanist physicians who also offered Latin translations made afresh from the Greek texts. A greater awareness of a variety of classical authors and newly (re)discovered works by well-known authors generated philological debates about, and comparisons of, medicinal material discussed in different works, while an increasing appreciation of classical rhetorical and dialectical methods led the physician Leonhart Fuchs, for example, to use morphological features to identify the medicinal plants discussed by Dioscorides and Galen.[9]

Because of their familiarity with *materia medica*, university-educated physicians were well equipped to publish books on animals, minerals or plants by the middle of the sixteenth century.[10] Not all such publications were aimed at a medical audience, however: William Turner's *Avium præcipuarum, quarum apud Plinium et Aristotelem mentio est, brevis & succincta historia* ('A Short and Succinct History of the Principal Birds Noted by Pliny and Aristotle', 1544) collated the names of birds mentioned by Aristotle and by Pliny the Elder and provided English or German equivalents, without discussing any medicinal uses. Gessner himself said that he first came to the study of plants, animals and minerals as part of his medical training in therapeutics.[11] What he ended up producing, however, was neither natural philosophy nor medical knowledge as taught at universities.

The audience of *Historia animalium*

Gessner's *Historia animalium* did not represent an institutionalised academic discipline and was certainly not 'Aristotelian' in the strictest sense, because it showed no interest in preparing material for causal investigation. It did draw, however, on the Aristotelian sense of *historia* as a comprehensive form of knowledge, both in the animals to be discussed and the type of information about each animal to be included. Aristotle's study encompassed all living beings in terms of where they lived, their actions, habits, modes of reproduction, and appearance. Gessner too aimed for comprehensiveness (though his work on insects was published only posthumously) and grouped animals by where they lived and the manner of their reproduction. Yet it would not be helpful to categorise Gessner's work as a new, specialist knowledge of 'zoology', as he addressed explicitly a wider Latinate audience of 'philosophers, physicians, grammarians, philologists,

poets and all those studying languages'.[12] For Gessner, these constituted the 'well and freely educated' man who would take pleasure in the contemplation of animals.[13] Gessner was here probably drawing on a distinction made in the opening lines of *Parts of Animals*, where Aristotle discussed two types of proficiency: scientific knowledge (*episteme*) that understood matters in a demonstrative way and educated competence (*paideia*) that judged matters in a probable manner.[14] Like Aristotle, Gessner believed that a man who was educated well could judge what he saw and heard not in a demonstrative manner, but by relating each of those things to principles that he had grasped for himself from the repeated use of particulars.

If some of his audience thus had the capacity to judge matters only in a probable way, Gessner nevertheless claimed that knowledge (*scientia*) of animals, plants and metals was certain, or at least more certain than those concerning meteorology or more 'subtle' matters, because the former were closer and 'better known to us'.[15] This was another Aristotelian point: in contrast to divine and unperishable things, Aristotle argued that 'we have better means of information, however, concerning things that perish, that is to say, plants and animals, because we live among them; and anyone who will but take enough trouble can learn much concerning every one of their kinds'.[16] Though by no means a recognisable university discipline of natural philosophy or medicine, Gessner's project on animals was thus configured from several Aristotelian elements, rather than marking a clean break from them.

In the preface to the first volume of *Historia animalium*, Gessner presented his work as useful to many livelihoods.[17] It was of course helpful to medicine, since both medical knowledge and skill could be extended by the study of animals: cures found for animal diseases might be applied to human diseases, trials of new or dubious drugs should be carried out on beasts rather than humans, certain animals could be used to master basic dissection techniques, and parts of animals could be used for medicines. But Gessner pointed out that the book was also beneficial for others. Cooks could learn which parts of animals could be prepared for food and how, fishermen could identify fish to eat for themselves and to sell on, while cowherds and producers of cheese, butter and other things could learn how to cure their flock. An animal's hide, wool or hair could be used by tanners, furriers, curriers and shoemakers to make clothes, purses, saddles and other goods. Cows, oxen and horses could till the land, carry burden, help in construction, and take part in battle. Dogs could guard homes, protect cattle and love humans. Animals also taught moral lessons. Even if no immediate benefit or profit followed, Gessner emphasised that the study of animals would lead to an appreciation of their Creator: each history of an animal was a hymn to God.

As *Historia animalium* was to offer such varied information for each animal, it was ordered alphabetically so that it could be used like a dictionary, though this of course meant that discussion of taxonomy was limited. Different types of information on animals were grouped under alphabetical headings: its name in various languages (A), where it lived and how it differed according to where it lived (B), its manner of living and habits (C), its character, sympathies and antipathies (D), its use other than for food or medicine (E), its use as food (F), as medicine (G), and its literary uses, for example in poems, pictures, proverbs or metaphors (H). As noted by Ashworth, the last section on literary and philological uses was often the longest, reflecting the historical and contemporary interest in the symbolic meanings of animals.[18] These subdivisions guided readers with different interests to locate the piece of information they were looking for promptly.

Although Gessner claimed that his *Historia animalium* could benefit anybody who used animals for their living or was interested in them, the work is unlikely to have been bought by cowherds or cobblers - the four-volume set would have cost just under seven florins, and a coloured set was priced at nineteen florins. Gessner's own annual income from his teaching and medical practice was 142 florins in 1554, so an uncoloured set was about a twentieth of his annual income, and a coloured set was equivalent to a month and a half's salary.[19] This was, rather, a lexical work for a general, Latinate, well-educated audience of some affluence.

The making of *Historia animalium*

What did it entail to create such an all-compassing study of animals in the middle of the sixteenth century? Gessner was in a good position to gather everything that was ever written about animals because of the work he had done for his *Bibliotheca universalis*. In the first volume of his *Historia animalium*, Gessner listed 251 extant and 18 no longer extant titles on animals.[20] Of the 251 extant books, 3 were written in Hebrew, 68 in Greek, 164 in Latin (by classical and contemporary authors, as well as translations of Arabic authors), 8 titles in German, 5 in French and 3 in Italian. About 70 per cent of these works were asterisked, which signalled that Gessner had used all of their descriptions of animals. These were authors who had specifically dealt with animals or intended to convey specific information on animals in part of their work. The works of Aristotle and Albertus Magnus on animals were asterisked, but those by Avicenna or Averroes were not, because the knowledge of the latter two was derived from Aristotle, and whatever additions they offered had been picked up by Albertus. Gessner also explained that he had not excerpted every mention of an animal by historians, poets or others, unless it related to some knowledge

about the animal itself. He cited extensively and verbatim from works he deemed reliable, as was the case with the names, descriptions as well as woodcuts from Guillaume Rondelet's *De piscibus marinis* ('On Marine Fishes'). Such borrowings were meticulously acknowledged each time. The extent of copying was such that the title page of the fourth volume of *Historia animalium* on fishes indicated that it contained the works of Rondelet and Belon.[21] Gessner thus worked with all known studies on animals. These were prioritised for content, parsed for relevant information, and cited under the appropriate headings. In effect, this added a historical dimension to the study of animals.

Gessner's ambition for comprehensiveness meant not just gathering historical descriptions of animals from books written since antiquity, but also finding information about new or exotic species by actively cultivating and managing correspondents. He effectively used material prefaced to his publications to elicit contributions, and suggested that letters be sent to him through the mercantile networks at the market cities of Antwerp, Venice, Lyon and Frankfurt.[22] Interest in natural objects was not the exclusive domain of university-educated physicians – princes, merchants, apothecaries and others were keen to collect rare or exotic natural objects of various kinds. The wider cultural network of trading such objects is reflected in *Historia animalium* when Gessner mentions prices: a good-quality hide of a leopard was worth six to seven French gold coins; the bird of paradise was valued at 800 thalers; and a 'horn' of a unicorn was priceless.[23]

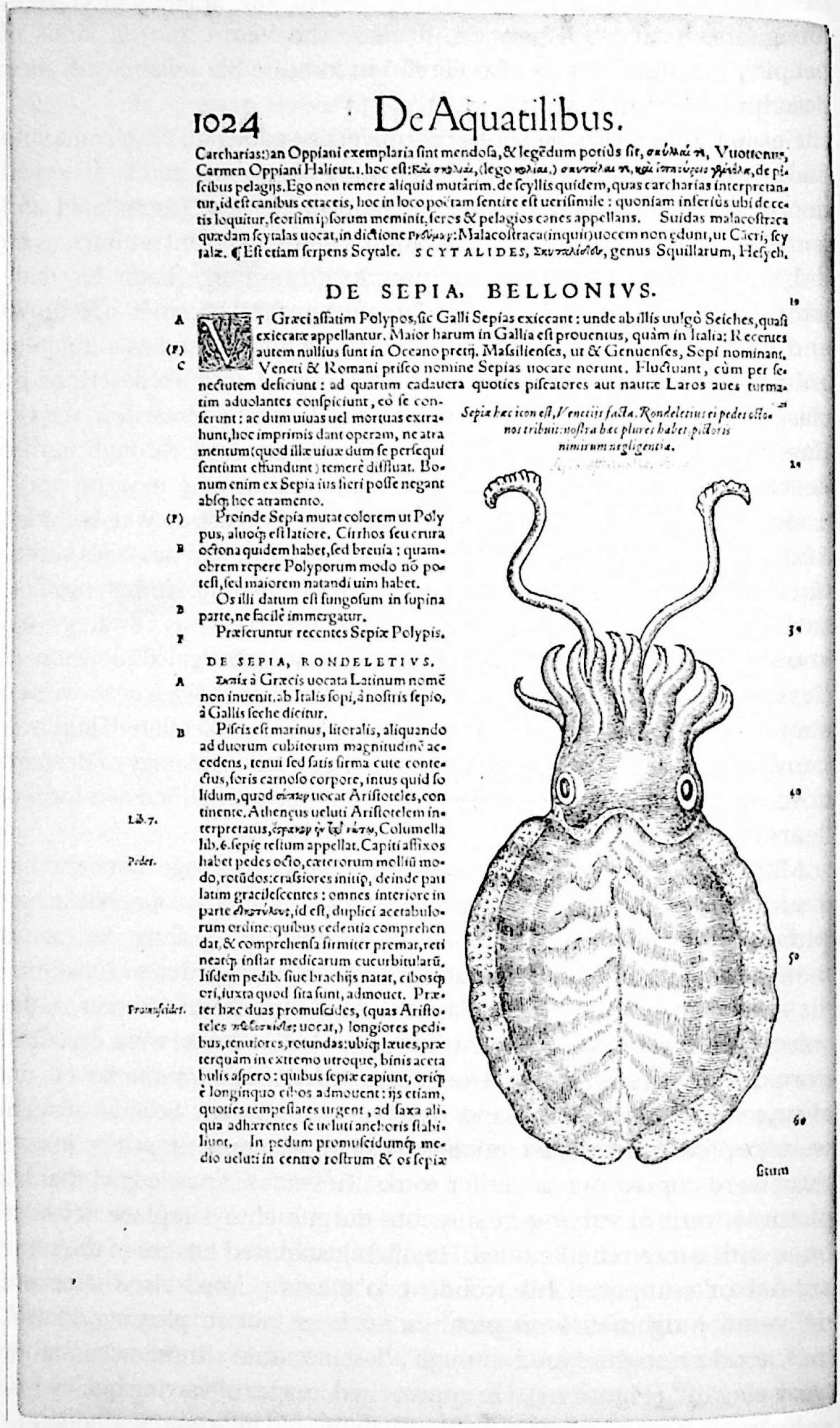
Contributors to Gessner's *Historia animalium* were listed at the beginning of each volume and also credited in the text. Many of them were physicians; some were theologians, jurists or humanist scholars; a few were apothecaries, politicians, printers, merchants or surgeons. In the text, Gessner noted assiduously their profession or other qualifications: for example, Ulisse Aldrovandi was described on one occasion as 'a very excellent man in medical matters as well as in the history of plants'.[24] This was not just an elaborate public acknowledgement to induce others to write to Gessner, but also an indication that the source of information was reliable.[25] Albrecht Dürer, 'that very excellent painter whose books on picturing are extant', whose print of the rhinoceros Gessner reproduced, and Lucas Schan, 'the most attentive painter and fowler in Strasbourg', whose pictures of birds Gessner took on trust, were the only two artists named and deemed reliable. In contrast, the picture of an elk that was sent in by an unnamed painter was specified as having been certified as true by several eyewitnesses.[26] Not everybody was named, but Gessner still offered some indication of their reliability by describing them, for example, as 'my erudite friend' or 'my nobleman friend'. He also noted that he learnt from some 'trustworthy' country-folk about the hibernating habit of dormice. This suggests that

Gessner had indeed consulted 'the learned, the unlearned, citizens, foreigners, hunters, fishermen, fowlers, shepherds, and all kinds of people', but that he was also careful to indicate the reliability of their description or images

Gessner was one of a number of university-educated physicians who had a strong sense of history.[27] His study of animals had a 'historical depth' in its engagement with ancient authorities. He collated and compared usages of names of an animal among ancient authors, as he did with 'pardalis' (Greek for panther), 'pardum' (Latin for male panther), 'panthera' (Latin for female panther), 'namer' (Hebrew) and the more recent 'leopardus' (which he determined as a different animal). He sought to establish the identity of animals described by classical authors such as the beasts in the Hercinian forest described in Caesar's *On the Gallic War*; and he also combed through earlier descriptions to determine whether an animal was new or not – a monstrous monkfish discovered recently in Norway was included under the heading of Pliny's mermen.[28] Gessner cited passages verbatim from different authors, even when they were quite similar, because such repetition made statements more reliable; this was a strategy well known in civil history.[29] There was thus a historical dimension to Gessner's textual practice, in that anything that was ever written about living beings had to be gathered, parsed and collated, and new knowledge was to be gauged against a historical genealogy of descriptions of animals. This is a process that has been identified as a form of 'learned empiricism'.[30]

Many entries were accompanied by a woodcut image, conceived as a sort of 'paper menagerie', to which readers had permanent access without the effort or frightening prospect of visiting an actual menagerie.[31] In this sense, pictures were meant to function as substitutes for the objects they depicted, as discussed by Felfe in Chapter 11, this volume. For example, exotic birds Gessner had not seen were described from drawings (see Plate 1). The images in *Historia animalium* were not always drawn from first-hand observation, however. Several of them were copied from earlier publications, manuscripts or prints, just as texts were copied out of earlier works. Gessner acknowledged that his pictures were of varying quality, but did not always replace defective ones with more reliable ones. He often juxtaposed images of the same animal or compared his woodcut to others printed elsewhere, and delivered judgements on pictures, such as 'not so pleasing', 'false', 'not good enough', 'good enough', 'less accurate', 'more accurate' or 'very elegant' (Figure 2.1). He approached images of varying quality just as he worked with texts of variable reliability and informational content – they had to be collated, compared and evaluated.[32]

Images played an additional role in enabling Gessner to 'compile' a new animal. For instance, an image of a toucan was compiled out of



1024 De Aquatilibus.

Carcharias:) an Oppiani exemplaria ſint mendoſa, & legẽdum potiùs ſit, σκύλλαί τε, Vuottonus, Carmen Oppiani Halieut. 1. hoc eſt: Καὶ σκύλλαι, (lego σκύλλαι.) [illegible], de piſcibus pelagijs. Ego non temere aliquid mutârim. de ſcyllis quidem, quas carcharias interpretantur, id eſt canibus cetaceis, hoc in loco poëtam ſentire eſt uteriſimile: quoniam inferiùs ubi de cetis loquitur, ſeorſim ipſorum meminit, feros & pelagios canes appellans. Suidas malacoſtraca quædam ſcytalas uocat, in dictione [illegible]: Malacoſtraca (inquit) uocem non edunt, ut Cãcri, ſcytalæ. ¶ Eſt etiam ſerpens Scytale. SCYTALIDES, Σκυταλίδες, genus Squillarum, Heſych.

DE SEPIA, BELLONIVS.

A Vt Græci affatim Polypos, ſic Galli Sepias exiccant: unde ab illis uulgò Seiches, quaſi exiccatæ appellantur. Maior harum in Gallia eſt prouentus, quàm in Italia: Recentes (F) autem nullius ſunt in Oceano pretij. Maſsilienſes, ut & Genuenſes, Sepí nominant. C Veneti & Romani priſco nomine Sepias uocare norunt. Fluctuant, cùm per ſenectutem deficiunt: ad quarum cadauera quoties piſcatores aut nautæ Laros aues turmatim aduolantes conſpiciunt, eò ſe conferunt: ac dum uiuas uel mortuas extrahunt, hoc imprimis dant operam, ne atramentum (quod illæ uiuæ dum ſe perſequi ſentiunt effundunt) temerè diffluat. Bonum enim ex Sepia ius fieri poſſe negant abſq; hoc atramento.

(F) Proinde Sepia mutat colorem ut Polypus, aluoq; eſt latiore. Cirrhos ſeu crura B octona quidem habet, ſed breuia: quamobrem repere Polyporum modo nõ poteſt, ſed maiorem natandi uim habet.

D Os illi datum eſt fungoſum in ſupina parte, ne facilè immergatur.

F Præferuntur recentes Sepiæ Polypis.

Sepiæ hæc icon eſt, Venetijs facta. Rondeletius ei pedes octonos tribuit: noſtra hæc plures habet, pictoris nimirum negligentia.

DE SEPIA, RONDELETIVS.

A Σηπία à Græcis uocata Latinum nomẽ non inuenit. ab Italis ſepi, à noſtris ſepío, à Gallis ſeche dicitur.

B Piſcis eſt marinus, litoralis, aliquando ad duorum cubitorum magnitudinẽ accedens, tenui ſed ſatis firma cute contectus, foris carnoſo corpore, intus quid ſolidum, quod [illegible] uocat Ariſtoteles, continente. Athenęus ueluti Ariſtotelem in- *Lib. 7.* terpretatus, [illegible], Columella lib. 6. ſepię teſtum appellat. Capiti affixos *Pedes.* habet pedes octo, cæterorum molliũ modo, rotũdos: craſsiores initio, deinde paulatim graciléſcentes: omnes interiore in parte [illegible], id eſt, duplici acetabulorum ordine: quibus cedentia comprehendat, & comprehenſa firmiter premat, retineatq; inſtar medicarum cucurbitularũ. Iiſdem pedib. ſiue brachijs natat, ciboſq; ori, iuxta quod ſita ſunt, admouet. Præ- *Promuſcides.* ter hæc duas promuſcides, (quas Ariſtoteles [illegible] uocat,) longiores pedibus, tenuiores, rotundas: ubiq; læues, præterquàm in extremo utroque, binis acetabulis aſpero: quibus ſepiæ capiunt, oriq; è longinquo cibos admouent: ijs etiam, quoties tempeſtates urgent, ad ſaxa aliqua adhærentes ſe ueluti anchoris ſtabiliunt. In pedum promuſcidumq; medio ueluti in centro roſtrum & os ſepiæ

ſtum

Figure 2.1 'Sepia', C. Gessner, *Historia animalium*, vol. IV, p. 1024. Gessner remarked that in this image made in Venice, the cuttlefish had more legs than the eight that Rondelet had assigned to it, 'no doubt due to the negligence of the painter'. This is one of several examples where Gessner decided to include an image that was made for him which was less accurate than those found in other publications. Zentralbibliothek Zurich, NNN 48 | F.

a beak sent to him and a textual description in André Thevet's *Les singularitez de la France antarctique*.[33] Belon's image of the armadillo was corrected to show shorter feet in light of the animal's carapace, tail and claws that Gessner had received.[34] Objects from his own collection were also represented in order to supplement his discussion, though few of these objects have survived. Images thus helped to compile an animal where neither text, object nor drawing alone provided full information, and became an important part in the process of 'learned empiricism'.

Nature's shapes and colours

A history of animals for a well-educated audience thus required humanist proficiency and the ability to access books, drawings and objects through a network of correspondents and others. The work also required the willingness of a publisher to print not just the text but also invest in the making of woodcuts. The woodcuts generated for *Historia animalium* were recycled in what was essentially a pictorial album of animals, *Icones* ('Icons', 1553, 1555, 1560), which was a common way for printers to optimise their investment. In *Icones*, the woodcuts were rearranged into a grouping that was not alphabetical: the viviparous quadrupeds were divided first into two groups, tamed and wild; the tamed animals were divided further into those with horns and cloven hooves and those without horns and with uncloven hooves; the wild animals were grouped into horned animals; large animals without horns; medium-sized animals without horns; and, finally, small animals without horns, such as hares, rabbits and mice. *Icones* was thus a different kind of publication in that it grouped animals by their external features. Images could function as part of humanist compositional practice, but they could also acquire a life of their own, to be adapted and adopted in different contexts.

The printer Froschauer sold both the volumes of *Historia* and of *Icones* in coloured versions at a higher price. Colour production in printed books remained a technical challenge for centuries, and colouring was mostly done by hand. Gessner assured his readers that the colouring would be done after an exemplar in the printer's shop, though he privately expressed his misgivings over the sloppiness of the work done.[35] Colour was nonetheless an important element in Gessner's world of nature, and his text indicates that he wrote with a coloured copy in mind. He named one parrot '*Eryt[h]roxanthum*' because it had yellow ('*xanthos*' in Greek) plumage within a red ('*erythros*' in Greek) coat (see Plate 2), and another '*Erythrocyanum*' because it had some blue ('*cyanos*' in Greek) features on its wing in an otherwise red plumage.

The hand-coloured woodcut was close to what Gessner conceived as constitutive of morphology, with lines and colours.[36]

Animals were not the only things in nature that Gessner studied. He was also interested in plants and minerals, and hoped to publish on both topics, though he only managed to do so for the latter. For his unfinished history of plants, he left a large number of drawings, of plants that grew in his garden, of parts of plants that were sent to him from correspondents, and of dried plants that were kept in a separate herbarium. These were drawn in crisp outlines with watercolour. His annotations on these drawings indicate that he consulted many printed books on the topic, recorded the date and names of donors of the plants, and sometimes waited several years to get a picture of all parts of the plant.[37] He hoped to publish his history of plants without the philological section that made his *Historia animalium* voluminous, but the way Gessner approached plants was similar to the way he worked on animals.

This was also the case in his last book on minerals, gems and stones, *De rerum fossilium, lapidum et gemmarum maxime, figuris et similitudinibus liber* ('A Book on the Shapes and Similarities of Things Dug up, of Stones and especially Gems', 1565). Gessner again drew extensively on other publications on the topic as well as on objects that he received from correspondents. He grouped stones, gems and minerals by means of lines and shapes, and emphasised the need for the woodcuts to be coloured, because of the difficulty of distinguishing stones and minerals without colour. In the preface, he gave the strongest justification of why attending to the outward forms of natural objects mattered: the images and shapes of natural objects were like hieroglyphic marks, but truer than the pictograms made by the Egyptian priests because they had been impressed on them by nature. Indeed, he described some stones with images (we would call them fossils) as having been 'depicted by the wonderful skill of nature'.[38] Attention to external features was what united Gessner's study of animals, plants, minerals and fossils, as they were all part of God's creation.

Humanist skills, mastery of the classical tradition, conversance with contemporary scholarship and access to scholarly and mercantile networks were important elements in histories of nature by Pierre Belon, Hippolyto Salviani, Edward Wotton and Ulisse Aldrovandi, which addressed a wide audience that included, but was not confined to, university-educated physicians.[39] Gessner's work on animals typified the skills, resources and effort required for study in the period, and also set a model for others to follow and develop. Aldrovandi, for example, pursued further the idea of nature as painter or even an engraver in his work on fossils.[40] Assembling parts of an animal from a variety of sources became a common way to visualise an unknown

animal, including monsters. Gessner's images were copied and recopied in subsequent works of natural history, as attention to morphology became an important feature of knowing nature.

Further reading

Blair, A., *Too Much to Know: Managing Scholarly Information before the Modern Age* (New Haven, 2010).

Egmond, F., *Eye for Detail: Images of Plants and Animals in Art and Science, 1500–1630* (Chicago, 2016).

Kusukawa, S., 'The role of images in the development of Renaissance natural history', *Archives of Natural History*, 38 (2011), pp. 189–213.

Leu, U. B., *Conrad Gessner (1516–1565): Universalgelehrter und Naturforscher der Renaissance* (Zurich, 2016).

Pinon, L., 'Conrad Gessner and the historical depth of Renaissance natural history', in G. Pomata and N. Siraisi (eds.), *Historia: Empiricism and Erudition in Early Modern Europe*, (Cambridge, MA, 2005), pp. 241–67.