

## CASSIANO AND THE ART OF NATURAL HISTORY

David Freedberg

In the last few years a whole series of books and exhibitions has been devoted to the history of collecting. Scholars are turning their attention not just to the collecting of paintings and drawings, which has been examined often enough, but also to plants, animals, fossils, gems, exotic objects from other lands, monstrosities and prodigies of nature, scientific instruments, mechanical curiosities, automata and all those many natural and artificial objects that went into the making of the encyclopedic cabinets of curiosity, as they came to be called. Kings, potentates, magnates and artists sought to assemble them. The obsessive Habsburg emperor Rudolf II (*reg.* 1576-1612) had one of the most famous; so did Rembrandt (1606-1669). But absent from almost all of these discussions has been the collection of Cassiano dal Pozzo, which could in many senses be said to have been the most encyclopedic of all. Certainly Cassiano *wrote* about its contents in a more informed way than the owners of many a grander collection. Almost none of these writings was ever published - unlike those of a small number of his Italian predecessors and followers, such as Ferrante Imperato (1556-1621) and Athanasius Kircher (1601-1680) - but no one corresponded more assiduously about the kinds of objects he collected, whether natural objects or artistic ones. Cassiano wrote letters to scientists, antiquarians, poets and scholars all over Europe, and they wrote back to him. They corresponded about a range of artistic and scientific subjects that would today seem beyond the competence of individuals; and they did so with a familiarity that is both enviable and awe-inspiring. Besides a voracious appetite for detail, they had theories to explain everything, from the largest to the smallest phenomena. This, after all, was the age that saw the breakdown of the old Ptolemaic views of the universe and the development of the telescope and the microscope. When Cassiano's letters are finally published they will provide testimony to one of the most inquiring intelligences ever to straddle the boundaries of what we now call the arts and the sciences, but in those days were often comprised under the single name of art.

What distinguishes Cassiano's collections, like his letters, is his belief in the importance of visual documentation and reproduction as the best and most effective way of making both sense and order of what seemed - but only seemed - to be the great and apparently random chaos of nature. In this, he had his predecessors, but their commitment was much vaguer and less fully developed.

Only one other figure had a similar sense of the importance of drawing in the study of nature: Federico Cesi, Prince of Acquasparta (1585-1630), who deserves equal status with Cassiano in this section of the exhibition. To introduce him is to gain the full measure not just of the importance of Cassiano's collection, but of its role in one of the

From: [Cat. Exhib.] The Paper Museum of Cassiano dal Pozzo, London: The British Museum, 1993  
(Quaderni Puteani 4 Milan: Olivetti, 1993).

most moving and revolutionary chapters in the history of science.

Had it not been for Cassiano, the achievements of one of the great heroes of modern science would have been obscured. In 1603, against fierce paternal opposition, the 18-year-old Prince Federico founded what has rightly come to be recognized as the first modern scientific academy. He called it the Accademia dei Lincei (Academy of Lynxes), naming it after the small, wily and intensely sharp-eyed animal that could still occasionally be found in the hills around his home in Acquasparta, near Terni in Umbria. It was an appropriate emblem for a group that would thereafter devote itself to the exploration of the minutiae of nature, whether on the earth or in the heavens. The initial group of Lynxes was very small indeed; it consisted of Cesi and three friends, all under the age of 30: his devoted friend Francesco Stelluti (1577-1653), who outlived them all and was more responsible than anyone besides Cassiano for the preservation of the Lincean heritage; a young nobleman from Terni, Anastasio de Filiis (1577-1608); and a slightly obsessive Dutch Catholic called Johannes Eck (1576 - after 1616), who pursued the naturalistic studies advocated by Cesi more diligently, more intensely and more widely than any of the others. They called each other by Arabic or Latin names, evocative, moving and emblematic in themselves: Cesi was the *Caelivagus* or *Sammavius* (the "wanderer of the heavens"); Eck (or Heckius), the *Illuminatus*; Stelluti, lovingly, the *Tardigradus* (or "slow-paced"); and de Filiis, appropriately in the light of his astronomical interests, *Eclipsatus* (the "eclipsed"). They explored the Umbrian hills around Acquasparta or met for their scientific deliberations in Rome, chiefly at the Cesi family palace in the Via Maschera d'Oro. Within a year, however, Eck was expelled from Italy, on a trumped-up charge inspired by the enmity of Cesi's father, who suspected his influence on his son, and de Filiis died less than four years after that. But the venture did not fold; far from it.

Cesi and Stelluti continued their botanical and geological studies in the field and then, in 1610, took the bold step of inviting one of the most famous scientists of all Europe to join them, the Neapolitan doctor Giovanni Battista Della Porta (1535-1615). He was 75 years old, more a representative of the old science than the new, a prolific writer of treatises on magic, ciphers, distillation, chemistry, meteorology, physiognomy and the now almost wholly forgotten science of phytognomy, in which the medicinal powers of plants are seen to be directly related to the way they look.

If Della Porta's acceptance of the invitation to join the now minuscule and apparently faltering academy was testimony to the seriousness with which he regarded the young men's researches into the natural world, then the acceptance of their next invitation was even more significant. It changed their world - and ours - forever. In the following year Galileo (1564-1642) became the sixth member of the Accademia dei Lincei. It is an indication of his pride in their society that from then onwards the frontispieces of his works would carry the emblem of the lynx and he himself added the proud ascription "Lyncaeus" or "Linco" to his name, even before his other titles: Florentine nobleman, Philosopher and First Mathematician to the Grand Duke of Tuscany.

Galileo's inscription into the Academy followed hard on the heels of his triumphant visit to Rome in 1610, when he lectured on his new discoveries in the heavens - the flawed and cratered surface of the moon, the satellites that revolved round Jupiter and the multitude of hitherto unseen stars - and demonstrated the use of the telescope, the still-new instrument that had enabled him to make these discoveries. On a famous eve-

ning that year he had ascended the hills behind the Vatican in the company of Federico Cesi and a small group of Roman noblemen, mathematicians and Jesuit priests. Together they looked at the heavens with the telescope and trained it, as another demonstration of its efficacy, on the inscription on the façade of S. Giovanni in Laterano on the other side of Rome. In an excited letter to Stelluti in Fabriano, Cesi noted that "every clear evening we see new things in the heavens, a truly Lincean task: [we see] Jupiter with his four [planets], the mountainous, cavernous, undulating, watery moon; of the fixed stars I shall say no more..."; and then he added, with a hesitancy that only belies his awareness of the significance of the Galilean discoveries: "but there is no small difficulty if the world is the centre of the universe".

From then onwards the Academy rapidly expanded its membership and its activities. Two Germans, both experts in botany, who had been present at Galileo's demonstration of his telescope were also elected into the Academy in 1611. One, Johannes Schreck (1576-1630) had to resign a few years later when, contrary to the rules forbidding members to join a religious order, he became a Jesuit; but even after being sent as a missionary to China, Schreck continued to send back the results of his researches into the flora and fauna of Asia. The other was a doctor from Bamberg, Johannes Faber (1574-1629) who had cured Rubens of a grave illness when the Flemish artist was in Rome five years earlier. Faber was professor of medicine at the University of Rome and superintendent of the papal gardens. His correspondence and collaborations with Cesi reveal his skills in both botany and zoology, as well as his full awareness of the importance of Galileo's progressive dismantling of the old Ptolemaic cosmology. But it was to a third German, Marcus Welser (1558-1614) of Augsburg (who became a Lynx in 1612), that Galileo addressed his *Letter on the Sunspots* of 1613. This was the work in which he proved that the sun was no perfect orb of light, but flawed too, like the other celestial bodies, and that it was a fixed star, like all the others. The battle-lines were drawn, and the Jesuits, who initially had received Galileo with a striking mixture of enthusiasm and caution, thereafter yielded some of his most hostile opponents.

No one could fail to detect the ironies in the story that unfolded. Among Galileo's most fervent supporters was the eloquent young Roman nobleman Virgilio Cesarini (1595-1624), elected to the Academy in 1618. The more Cesarini campaigned on behalf of Galileo, the closer he drew to the Jesuit Order. His campaign came to a head between 1620 and 1623, when he, his friend and fellow Lincean Giovanni Ciampoli (c. 1590-1645), also a high official of the papal court, Faber and Cassiano dal Pozzo worked on the preparation and edition of one of the greatest of all Galileo's works, the *Assayer* of 1623. It is at this point that Cassiano appears for the first time in his role as scientific enabler, for it was he who bound the small group of four editors together and he, probably, who determined the complex strategy of publication of a work that finally proved that the earth, like the other planets, revolved around the sun. Lacking the scientific skills of Faber, and less eloquent than Cesarini or Ciampoli, Cassiano ensured the unity of the group that worked so assiduously - and by then so riskily - on behalf of a dispirited Galileo.

In 1622 Cassiano was himself rewarded with election to the Academy. In August of the following year Maffeo Barberini (1568-1644) became Pope Urban VIII. In 1612 Barberini had befriended Galileo in Florence, where they had discussed topics such as the problem of tides and the behaviour of frozen bodies in water. The same year as Urban's

elevation to the papacy, his nephew, the newly elected Cardinal Francesco Barberini (1597-1679) also became a Lynx, not only because of his interests in botany and zoology, but because the other Lynxes hoped for his patronage - which, for a while, they enjoyed. From then onwards things moved ahead with speed that could probably have been foreseen.

In 1625-6 Francesco Barberini was sent by Urban VIII on a diplomatic mission to France and Spain. With him he took a glittering entourage, which included Cassiano, who everywhere noted down matters of botanical, ornithological, zoological, geological, archaeological and artistic interest. When the group went to Spain, Cassiano ensured the copying of some of the most important manuscripts ever written about the fauna and flora of the Americas, manuscripts that were worked over in later years by Faber, Schreck and others. On his return, Cassiano moved into the house on the Via dei Chiavari in Rome where he lived for the rest of his life; and there he set up his museum. It was at this time, if not before, that he must have decided to supplement the actual objects in his collections with his famous Paper Museum, in which he sought to assemble visual documentation of both the surviving remains of Classical antiquity and the world of nature.

By 1630 Galileo's old friend Maffeo Barberini had begun to turn against him. In that year Cesi died, only 45 years old, worn out by his labours and the constant opposition to his efforts, which had never really ceased since the days of his father's resentment at the squandering of a good nobleman's life. Cassiano, encouraged above all by Stelluti and realizing the value of Cesi's laboratory and library (which contained not only his own scientific manuscripts, but also a huge corpus of natural historical drawings), entered into negotiations with Cesi's widow for their purchase. The sale came through in 1633, the very year of Galileo's trial and the year after the publication of his most systematic and compelling work, the *Dialogue on the Two Great World Systems*, in which he finally put an end to the old Aristotelian and Ptolemaic views of things. Cesarini and Faber were dead and Ciampoli sent into a retirement of disgrace. Francesco Barberini, obliged to take up a hostile position towards Galileo, substantially withdrew from the domain of the scientific endeavours initiated by the Lynxes, which he had so often and so generously sponsored. Things were subsequently in the hands of Cassiano (and, to a lesser extent, in those of the less resourceful, but ever-devoted Stelluti).

From the very beginning, Cesi and his friends realized the importance of illustration for their researches. Theories of the cosmos could be developed without illustration (though not always, it is true, without the aid of diagrams); but natural history and the external world could not be studied without reproducing its contents in an accurate and communicable visual form. Nor was it enough just to copy the illustrations of others. Like their sixteenth-century predecessors in the field of botany, they realized that the study of plants ought no longer to be based on the purely verbal authority of Aristotle and Theophrastus, the great biologists of antiquity. That authority was undermined both by the inability of verbal description ever to match the precision of visual reproduction and, above all, by the abundance of plants from the New World that were then flooding into the Old, and for which, naturally enough, there could hardly, if ever, be found an equivalent in the ancient writers. If someone wanted to know exactly what a particular plant was or to be sure that he and his colleague in another place were indeed talking about the same one, there had to be a picture of it, and preferably a picture of its

parts as well as details. If the specimen could be shown in colour, so much the better. All this applied equally to the animal and mineral worlds. It is due to Cassiano that one of Cesi's most important theoretical manuscripts and at least some of the only remaining portion of the visual material assembled by the early Lincei were preserved, annotated, expanded, and partially published. This is the material that is now being presented to the public for the first time.

The story behind it is much less well known than that surrounding the discoveries of Galileo, no doubt because it has always been considered the less glamorous side of the so-called scientific revolution of the seventeenth century. That revolution has been seen to be predicated on the development of abstract theories of physics, rather than on the kind of careful observation of the sensible world found in the descriptions and drawings of Cesi and Cassiano. While Cesi and his colleagues left the working out of grand cosmological and physical theory to Galileo - quite rightly, given his talents - they realized that the basis of any science was first-hand observation and experiment. They saw themselves, first and foremost, as labourers in the field and went out and observed the world around them. They collected plants, insects, fossils, fungi, animals, birds and fish, and also sought to understand natural aberrations, prodigies and monstrosities. When actual specimens could not be acquired, they had to rely first on reports and then, most preferably, on illustrations. They had the objects of their own investigations drawn with unprecedented attention to detail and encouraged their correspondents to send them similar drawings. And so the investigations of Cesi and the early Lynxes extended far beyond the flora and fauna of the hills around Acquasparta. Eck's studies and illustrations of the snakes, birds, flowers and butterflies of the countries he visited have been preserved, as have the reports of Cassiano from France and Spain in 1625-6.

But it was the natural history of the New World that first presented the Lynxes with the possibility of breaking with the old paradigms and of lessening the hold of ancient authority. After all, how could Aristotle continue to be seen as the ultimate authority when he knew nothing of America? One of their earliest projects concerned the flora and fauna of Mexico. The fruits of this project were published long after the death of Cesi, thanks directly to the efforts of Cassiano, but its genesis dates back to the earliest years of the Academy. Already in 1608 Eck had examined the manuscripts and illustrations made in Mexico between 1571 and 1577 for Francisco Hernandez (*c.* 1517-1587), the personal doctor of Philip II of Spain (*reg.* 1556-1598), which were preserved in the Spanish royal collections in the Escorial. In an attempt to emulate the great Italian herbalist Pier Andrea Mattioli (1501-1577), Hernandez described over 1,000 plants and animals previously unknown in the Old World. He gathered illustrations from every possible source, including, for example, those made a century previously for the Aztec king Nezahualcoyotl; there were also drawings of several plants still living in the garden of the Aztec royal hospital at Huaxtepec and a remarkable herbal painted specifically for Philip II's chief envoy in the Indies by a converted Nahuatl Indian.

Many of the Hernandez manuscripts had, in fact, already been copied at the end of the sixteenth century by a Neapolitan doctor, Nardo Antonio Recchi (*d.* 1595), and it was these copies that Cesi decided to publish, along with appropriate scientific commentary, when he first saw them on a trip to Naples in 1610. The so-called *Tesoro Messicano* thereafter became a major preoccupation of the Lynxes. (Thus at the very time Cesi and

Faber were discussing the new theories of Galileo and planning ways of supporting him, they were also engaged in intense discussions about the fossils around Acquasparta and the plants and animals of Mexico.) Schreck was the natural candidate to provide the commentary on the botanical section of the *Tesoro Messicano*, while the Neapolitan doctor Fabio Colonna (1567-1640) provided the scientific addenda and notes; and Faber, expert enough in botany himself, was assigned the task of commenting on the Mexican animals. Their work was supplemented by the material sent back by Cassiano from Madrid in 1626, when he had further transcripts and copies made from the Hernandez material in the Escorial (fortunately so, since it was all lost in the great fire of the Escorial of 1671). Some of the material was published in 1628, notably Faber's section on the animals, with the help of a large subvention from Francesco Barberini; but work came to an almost complete halt in 1630, with the death of Cesi, the disgrace of Galileo, and the consequent estrangement of the papal family from all Lincean activities. The great compendium of Mexican material was able to be published only in 1649-51, with the aid of funds obtained from the Spanish ambassador to Rome by Cassiano, who was not rich enough to support it himself.

The book is hugely informative, of course, about the flora and fauna of the Americas, but it also offers extraordinary testimony to the activities of the early Lincei and the contents of the gardens and the zoological and geological collections of the time, ranging from those of the King of France to Francesco Barberini and Cassiano himself. It provides more information than any other early source about the development of the telescope and microscope by Galileo and his colleagues (not to mention the excitement that attended their early use). To judge from such passages, as well as those describing the dissections of the chameleon and the civet-cat carried out in Cassiano's own museum laboratory, or Cesarini's examination of the breathing apparatus of the turtle, it seems that nothing under the sun remained beyond the curiosity, or ambition, of these young men. The very attention to detail - to microscopic detail, for the first time in the history of science - adds a powerful dimension of meaning to the phrase they used to describe their researches, undertaken, they would say, "with the eye of a lynx".

Paradoxically, however, the one serious shortcoming of the *Tesoro Messicano* was the poor and rather rudimentary quality of its many hundreds of woodcut illustrations. They were commissioned at the very beginning of the project, even before Cassiano came on to the scene; and when he did, he took care to ensure that research would never again be impeded by the defects or lack of visual information. Indeed, as is not surprising from someone whose love of painting is made clear by his great collection of paintings by Poussin, he seems to have taken special care not only over the accuracy but also the aesthetic quality of the illustrations of the natural specimens he soon started commissioning. In Cassiano the so-called boundaries between art and scientific illustration are not easily distinguished, as is also clear from his own enthusiastic descriptions of plants, animals and minerals. Of the iris of the bearded vulture, he noted that "its circumference is of the most lovely colour, tinged at its extremity with the finest lead red, or the colour of the flowers of the pomegranate, and then becoming the kind of yellow that resembles that of the skins of the chamois...". Even his most technical discussions of minerals and precious stones are marked by an unparalleled attention to the subtleties, variations and nuances of their colour.

This, then, is the immediate context for the drawings of animals in the exhibition. The civet (No. 91), for example, is the subject of a long discussion by Faber, in the course of an extraordinarily thorough analysis of sources of different types of musk. (Other drawings not included in the exhibition show details of the civet more pertinent to Faber's discussion, notably its anal region.) The two drawings of the porcupine (Nos. 89-90) are altogether typical of the kind of attention to both whole and parts characteristic of the best natural historical drawings commissioned by Cassiano. The drawings of a monstrous chick (No. 141) parallel Faber's account of the embryonic growth of a chicken in the *Tesoro Messicano*, while the illustration of an oryx (No. 92), although not discussed by Faber, was actually the subject of a long correspondence between Cassiano and the famous French antiquarian, known also for his friendship with Rubens, Nicolas-Claude Fabri de Peiresc (1580-1637). Peiresc had sent one type of oryx, called an *alzaron*, to Francesco Barberini in the early 1630s, while another, called a *dafasa*, was sent from Egypt to Paris as a gift to Louis XIII (*reg.* 1610-1643). It is characteristic of Cassiano that he should have been eager to have information on both these closely related animals, that he commissioned drawings of them (and of details) and corresponded at length about their habits, habitat and taxonomy and that his opinion should have been sought on all these matters. These were the types of problems for which Cassiano, evidently, felt a special affinity. His taxonomic preoccupations derive from his sixteenth-century predecessors and point forward to Linnaeus (1707-1778), but his interest in ecological matters reveal him as an environmentalist well *avant la lettre*.

The *Tesoro Messicano* also provides evidence for the greatest of Cesi's own projects. For all the years in which his colleagues were working on the commentaries and notes to the Hernandez manuscripts, he laboured ceaselessly on his *Theatrum totius naturae*, an extraordinary attempt not simply at the description of individual specimens, but at the systemization of the whole of nature, of the entirety of the natural world. Needless to say, it was never completed, but as an addendum to the *Tesoro Messicano*, Cassiano and Stelluti published Cesi's *Tabulae Phytosophicae* (by analogy, of course, with *philosophicae*), one of the greatest attempts ever made at systemization in tabular and diagrammatic form. The tables represent the botanical part of Cesi's researches and theories, and they provide the background to yet another set of drawings in the exhibition. Along with five volumes of drawings of plants (often with microscopic details of spores, buds and so on) preserved in the Institut de France, Paris, drawings such as Nos. 117-123 from Windsor document the botanical investigations of both Cesi and Cassiano. The illuminated herbal from which the drawing of tomatoes (No. 123) is taken was begun by Cesi - and possibly completed by Cassiano - as a kind of painted equivalent to that most complete of the Italian herbalists, Mattioli. Indeed, many of the pages refer to the equivalent plants in the copy of Mattioli in Cesi's library, while there is some evidence to suggest that one of Cassiano's own projects was the production of what Faber once referred to as an illuminated Mattioli. The inscription on the drawing of the tomatoes offers a further example of the continuing interest of both Cesi and Cassiano in the medicinal properties of plants; the pineapple (No. 115) is a particularly striking example of their drawings of exotic species (as opposed to the local flora represented by Nos. 117 and 122); the pear with the markings of a human face (No. 140) bears witness to their relentless scrutiny of what seemed to be the anthropomorphic aspects of nature; while the magnificent illustration of the deformed artichoke (No. 119) and a giant broccoli

(No. 120) reveal, yet again, their intense commitment to understand the place of the exceptional and the prodigious in the natural world.

Two more closely focused projects occupied Cesi at the same time as the gestation, or rather the management, of the Mexican project. The first, since it was never published, might easily have sunk into oblivion – or rather, would only have been known from his correspondence – but happily it survives, though in dispersed form, among the drawings purchased by Cassiano from the estate of Cesi. This was the work known as the *Icōnes Fungorum*, the illustrations of mushrooms and other fungi. In addition to the drawings preserved at Windsor and the two volumes at Kew (Nos. 124-8), three large volumes have recently been discovered in the Institut de France. Like the five volumes of plants and flowers also preserved there, they are important for their microscopic illustrations as well as for the ways in which they show the fungi growing *in situ* or on their host plants. Fungal growths especially interested Cesi because so often they seemed to teeter on the borderline between animal and vegetable (as, too, in the case of corals and sponges). It was just this problem of the boundary between natural kingdoms – and of hybrids in general – that seemed to both Cesi and Cassiano to hold the clue to some of the deepest secrets of nature.

The crucial domain for the examination of the borderline problem, however, was that of fossils. Were fossilized shells, such as the ammonites represented in No. 136, animal, mineral or both? And what of the case of the deposits of petrified wood that Cesi and his friends knew so well, and studied so hard, on their walks around his family domain in Acquasparta – were they vegetable or mineral? How, in any case, could the *origins* of such fossils be accounted for? At a time when it was still heretical to think of other worlds, it is hard to imagine a more contentious subject.

Cesi's letters are full of the problem, and it stands at the very beginning of the *Tabulae Phytosophae*. The lead-in, as it were, to the plants is provided by a brief overview of what precedes them, namely God, angels, man and animals. The latter are divided into what Cesi calls Phytozoa (animals with some plant-like characteristics), Zoophytes (plant-like animals) and Zoolithophytes (animals with the characteristics of both plants and stones, "discovered by myself" claimed Cesi). Then follows the plant kingdom, beginning with an analysis of the double and triple nature of the borderline cases. The most important of these were the lithophytes (plants whose nature approaches that of stone) and the group to which Cesi devoted particular attention, the metallophytes. Noting that they too stood on the borderline between minerals and plants, he claimed to have discovered them as well ("*anceps inter stirpes et metalla, a nobis inventum*", is the way he put it).

Inspired, above all, by the great lignite beds and other fossils found around Acquasparta and in other places in Umbria and Tuscany, Cesi never abandoned hope of publishing a book on the so-called metallophytes. In 1624, for example, he wrote to Cardinal Francesco, that "in my little spare time, I have been working on my physical observations ... especially on the new species of an intermediate nature between plants and minerals ... I have been particularly spurred on ... by the discovery of the mineralized wood, that is, pieces of wood reduced to metal or strangely altered...".

In 1630 Stelluti wrote that Cesi's book on metallophytes was shortly to appear, but that was not to happen. It was left to Stelluti to publish a summary of a small portion of the ambitious work that Cesi had intended. This was the little treatise on fossilized wood of



1637 (No. 137). Although Stelluti was able to reproduce only a small portion of the illustrations Cesi had had made, almost all of the originals survive in the five volumes of fossils and minerals that Cassiano bought from Cesi's widow (e.g. No. 136). These volumes, which entered the British Royal Collection in 1763, were provided with indices to the specimens they illustrated by a scribe working for Cassiano, who also updated the captions to each illustration. He clearly felt the work was incomplete. Stelluti had provided an explanation for the origin of fossilized wood that was plainly unsatisfactory. As if to allay the fear that either he or Cesi were speculating about the possibility that fossils might be evidence of earlier stages of creation (to introduce the Darwinian notion of evolution here would be anachronistic), Stelluti suggested that the lignites came about as a result of some long process of metamorphosis and petrification of the earth itself.

No wonder that Cassiano could not let the matter rest! His correspondence in these years is full of discussions about minerals and fossils (the word "fossil" itself means "dug up", just like the antiquities that were his other great passion). Spurred on by Peiresc, he even organized an expedition to Sicily by the Frenchmen Claude Menestrier (*d.* 1639) and Jacques de La Ferrière, and asked them to examine both the antiquities and the fossils of the island. Then he sent La Ferrière to Acquasparta itself, in the hope that he might come up with some more adequate theory about the genesis of the "metallophytes". He wrote endlessly to Peiresc about the fossil evidence he was gathering, as well exchanging views on the problem with the famous French philosopher, scientist and freethinker Gabriel Naudé (1600-1653). In fact, already in 1635 Naudé had suggested a much more plausible explanation for the deposits at Acquasparta, writing to Cassiano that they were in all probability to be attributed to the fossilization of tree trunks long after their collapse in some ancient earthquake.

The fifth and last volume of "fossils" remaining at Windsor contains the most beautiful of the drawings and was probably prepared by artists working under Cassiano's own supervision. It illustrates an extraordinary variety of minerals, gems, corals, and semi-precious stones (e.g. Nos. 132-5). Like many other contemporary collections of fossils, notably the famous museum of Ferrante Imperato in Naples, it also contains material no longer normally associated with them, such as bezoars, nuts, dried legumes and mandrake roots, as well as a whole range of geological curiosities. Cassiano's correspondence, especially in the 1630s, is full of references to the specimens and objects he chose to have illustrated on these pages. He was fascinated by the phenomenon of phosphorescence, of geodes, of the properties of asbestos (and the discussions here range, characteristically, from its igneous qualities to the way in which asbestos filaments were woven into a set of table towels for Charles V) and the various characteristics of amber - yet another material that seemed, as Cassiano himself put it, to be "of a middle nature between plants and minerals". Even if they had no adequate theory concerning the origins of amber, Cassiano and his correspondents knew perfectly well of the importance of organic enclosures as evidence of the flora and fauna that existed at the time of its formation. Like the row of whale's teeth he owned (reminding one of the fossilized shark's tooth - a much discussed phenomenon - illustrated in No. 132), these were just the kinds of things Cassiano had in his own museum. And consistently he chose them for both their scientific and their aesthetic interest. Only someone who combined these interests could have written with such enthusiasm about *pietre dure*

and the varieties of marble or had so many varieties carefully illustrated on other pages in these volumes.

Could it have been just this combination of interests that prevented Cassiano from being a better scientist, in the modern sense of the word? Was he too distracted from the essence of things by their mutable qualities, such as their colour, shape and utilitarian possibilities? These, after all, lay as much with the cognition, the prejudices and the needs of the investigator as they did within the object of study itself. Certainly this difficulty (if it is that) appears in the one field in which Cassiano (and his brother Carlo Antonio) was regarded as *the* expert by his Lincean peers - ornithology - and in the one natural historical domain - the study of flowers and fruit - that he promoted more actively than any other. In both these areas Cassiano played an extraordinarily active role, and in both, for reasons still not entirely clear, he chose to suppress the evidence for his involvement almost completely.

When Cassiano was inducted into the Accademia dei Lincei in 1622, he submitted a book about birds, the *Uccelliera*, published the same year (see under No. 107), as proof of his scientific expertise. The author's name is given as Giovanni Pietro Olina (?1585-?1645), a lawyer friend of Cassiano's, but much of it is known to have been based on material written or assembled by Cassiano himself. Furthermore the etched illustrations of birds (e.g. No. 107) are taken from a series of beautiful watercolour drawings commissioned by Cassiano from Vincenzo Leonardi (*fl.* 1621 - *c.* 1646), one of the great masters of naturalistic illustration, whose name has emerged only with the recent resurgence of interest in Cassiano and his circle. Besides supplying Faber with information about birds and bird behaviour for the *Animalia Mexicana* and offering his opinions about a wide variety of ornithological matters to his correspondents, Cassiano also left among his papers a whole series of *discorsi*, or small treatises, about a wide variety of birds. The three surviving *discorsi* are about the bearded vulture; a pair of hummingbirds sent by a Jesuit from Canada to Rome; and the birds now known as the European and Dalmatian pelicans (called *Onocrotalus* by Cassiano). There is also a long exchange of letters with Peiresc about the *Phoenicopterus* or flamingo, in which they discuss everything from the distinction between male and female to the taste of its tongue, evidently an exceptional delicacy. The descriptions cover much more than the modern ornithologist might: from ways of sewing the bird skins together for utilitarian purposes, to details of their flight, their sounds and song, their seasonal behaviour and their habitat. However much apparently irrelevant matters such as the culinary and venational might come to the fore, Cassiano's descriptions were always firmly rooted in first-hand observation; and in this they differed very significantly from the earlier ornithological compendia that were at least as dependent on lore and on written authority as on first-hand empirical study. But perhaps the most striking - and probably the most tedious - aspect of everything Cassiano wrote about birds was his absolutely meticulous attention to details of form, appearance and, above all, colour. These verbal descriptions were so detailed that the next step could *only* be their representation in visual form, and in colour.

Happily, many of the best of these drawings have survived. They include the spectacular drawings of the pelican and its head and beak (Nos. 99-100), intended to accompany the treatise on this species, as well as one of the several rediscovered drawings of a flamingo sent by Peiresc to Cassiano. The drawing in the exhibition (No. 99) was accom-

panied by several others showing details of the bird, such as its webbed feet, its wings, its feathers, and, of course, both sides of its tongue. The kind of attention paid to parts of the body, seen also in the drawings of the snout, paws, claws, ears and quill of a porcupine, is evidenced here by the series of drawings of a white stork (Nos. 96-8). Considering Cassiano's interests in colour and matters such as the flight of birds, it is not surprising to discover that from the early 1630s he was actively engaged in a plan to gather and publish an edition of the manuscripts of Leonardo da Vinci.

From the beginning of the second half of the 1620s when he began to support the young French painter, Nicolas Poussin, whom he is reported to have engaged in the illustration of birds and who later copied antiquities and prepared illustrations for the planned edition of Leonardo's treatise on painting, he was involved in the support of one rather unexpected figure. This was the Jesuit professor of Hebrew, Giovanni Battista Ferrari (1582-1655), who had somehow become adviser to the Barberini on the gardens they were then building at the site of their new palace on the Quirinal. Ferrari had also become an expert on the subject of flowers and fruit. In 1633, the year in which Cassiano acquired Cesi's library and museum and Galileo was forced by the Barberini to abjure his most important theories, there appeared a book that was wholly subsidized by Francesco Barberini as a result of the agency and interest of Cassiano. This was Ferrari's *De Florum Cultura*, the first book ever to be devoted wholly to the cultivation and taxonomy of flowers. It contains the first microscopic illustration of a plant ever published, namely the two pages showing the seeds and seedpod of the hibiscus, or Chinese Rose, as it was then called.

But Cassiano's real support for Ferrari came in the course of the next decade, when he helped the Jesuit father assemble the material for the greatest book on citrus fruit ever written until that time and arranged the contract for its publication. Once again, his letters reveal his concern to gather together this material from correspondents all over Italy and France, and to comment on it. There even survives a dense compilation of notes and letters on *agrumi*, or citrus fruit, which was intended to form the basis of Ferrari's *Hesperides* of 1646 (No. 114). Once more Cassiano commissioned Vincenzo Leonardo to produce the illustrations as the basis for the botanical plates in the book (Nos. 108-112). These again reveal Cassiano's acute sense of the need to show not just the whole, but the parts of the species he examined, as aids to classification and taxonomy; his preoccupation with colouristic precision; and his interest in accounting for bizarre and deformed specimens (e.g. Nos. 108 and 112). But the importance of Ferrari's books lies not only in the botanical illustrations but also in the allegorical illustrations, conceived of as sweeteners of the more difficult scientific (or "philosophical") parts of the book. They were commissioned from the greatest Roman artists of the day, including Poussin and Guido Reni (1575-1642) (No. 113). This combination of the categories now called science and art - what Ferrari would have preferred to call philosophy and poetry - is the very hallmark of Cassiano's collection of drawings and, indeed, of the extraordinary collection he had brought together in his small *palazzo* on the Via dei Chiavari in Rome.

In addition to those scholars who needed to consult his volumes of drawings, many travellers to Rome went to see his collections of art, antiquities and natural objects. In 1644 John Evelyn (1620-1706) commented on the library, statues and antiquities, as well

as on a stone "which plainly had in it the quantity of half a spoonful of water of a yellow pebble colour, of the bigness of a walnut" and another "stone paler than amethyst, which yet he affirmed to be the true carbuncle, and harder than diamond". Philip Skippon (*d.* 1660), 19 years later, described the museum and the library, as well as "a book of birds", including those of "an onocrotalus, a phaenicopterus", and a white parrot, of which Cassiano also kept a live specimen in his house. Aside from the objects already mentioned here, Cassiano's collections also included anatomical specimens, skeletal remains, a reasonably well-supplied chemical laboratory and a range of scientific instruments, mechanical devices and small engines.

But was all this simply a haphazard and disordered collection of the kind described by Galileo, when he spoke of entering the cabinet of some small-time collector, an "*ometto curioso*", who had assembled a quantity of bric-a-brac, either because of age or rarity - "a petrified crayfish; a dried-up chameleon, a fly, and a spider embedded in a piece of amber, some Egyptian figurines and a few sketches by Bandinelli and Parmigianino", and so on? To dismiss Cassiano's museum in this way would be to overlook both its scientific and its historical significance. In speaking of the collection of the "*ometto curioso*", Galileo was likening it to the work of the poet Tasso, which was marked, he said, by a poverty of concepts and where the ideas had no clear connection with one another; this he opposed to the epic poetry of Ariosto, in which the concepts were large and generous and were linked to one another by a grandiose overall scheme. Certainly it would be difficult to say *this* of Cassiano, either of his collections or of his writings. They too seem rather haphazard and disorganized, too dependent on the subjective judgement of the senses to be capable of providing the kinds of objective and mathematical certainty that Galileo knew to be the foundation of true science. In a well-known passage in the *Assayer* of 1623, the very work that Cassiano had been instrumental in publishing, Galileo set all those qualities that pertained to the subjective perceptions of the human investigator in stark contrast to the objective mathematical realities of mass, space, extension and number:

"I say that whenever I conceive of any material or corporeal substance, I am compelled of necessity to think that it is limited and shaped in this or that fashion, that it is large or small in regard to other things, that it is in this or that place, at this or that time, that it moves or is immobile, that it touches or does not touch another body, that it is one, a few or many; nor can I by any stretch of the imagination separate it from these conditions. But that it is white or red, bitter or sweet, sounding or mute, of pleasant or unpleasant odour, I do not feel compelled in my mind to conceive it as necessarily accompanied by such conditions. On the contrary, if we were not assisted by our senses, reasoning and imagination would never apprehend these qualities. Therefore I think that tastes, odours, colours and so on ... are nothing but pure names, and reside only in the feeling body, so that if the animal is removed, all these qualities are taken away and annihilated."

But just as it would be too easy to dismiss Cassiano's collections as random, aleatory and unsystematic, so too it would be wrong to think of him simply as a brilliant enabler, a devoted friend, an energetic compiler who opened his vast documentary resources to those who would do the real thinking and the hard analyses. Certainly he was all of these things too; but his attentiveness to practical and ecological matters mark him out as extraordinarily prescient (only now, with the destruction of the rain forests, has the importance of the identification and preservation of rare and endangered species come

to be acknowledged by more than a restricted circle of botanists). In his laboratory he did not work on grandiose alchemical projects such as the transformation of metals, but rather on more humane medical projects, constantly seeking out new remedies and new antidotes against poisons (e.g. there exists among his papers a copy of a distinguished Arabic pharmacological treatise, as well as a compendium of one of the more ambitious homeopathic projects of Giovanni Battista Della Porta). The actual objects in his collections may seem - at this distance and in the absence of any hard evidence to the contrary - to be haphazard; but is it not much more likely that their very disorder was deliberate and intended to be taken as a faithful reflection of the ludic elements of nature, of the very *lusus naturae*, the "games of nature" (the phrase often recurs in his writings) that to Cassiano were precisely what bound together the sciences and the arts?

In 1664, Cassiano's biographer, Carlo Dati (1619-1676), went to extravagant lengths to deny that Cassiano was an atheist, but while there is much that is heterodox in his thought, there can be no doubt that for Cassiano the disorder and playfulness of nature was directed by an operative intelligence that could usefully be studied, on a microcosmic and highly simplified scale, for example, by considering the operation of the very mechanical models and machines of which he, like so many of his predecessors and friends, was so avid a collector and designer. Indeed, it is precisely when Dati speaks of the structure of nature, and of its divine organization, that he moves on to remind his readers of Cassiano's role in the great astronomical and terrestrial discoveries of Galileo (including the motion of the winds and the tides) and of Cassiano's industrious studies of geology, mineralogy, plants, quadrupeds, serpents, fish, birds and insects. When Dati speaks of the mechanics and the harmony uniting every small particle with the whole, one is reminded, once again, of Cassiano's insistence on the study of both. "With the true eye of a lynx", he says, recalling the work on the *Tesoro Messicano*, "Cassiano was not content with the simple description and history of nature, but went beyond, in order to study its very anatomy"; the evidence of this was provided by those "most precious books" containing the very drawings on display in the present exhibition. More than anyone else of his time Cassiano recognized the importance of accurate visual documentation, based on first-hand observation, as the true foundation of science. It was his achievement not only to have prepared the way for the great naturalists of the seventeenth century (like Ray and Jonston and Willughby) and of the eighteenth and nineteenth (like Linnaeus and Cuvier), but also to have foreseen precisely that element of subjectivity, randomness, and uncertainty that unites art with the most advanced science of the modern age. It will no longer be so easy to set aside the links between archaeology and anthropology, between philology and theory, and the creative processes that underlie both science and art.