tions to Wallis' ideas.[16] As well-informed commentators on the work of scientists the virtuosi are easily underrated. This was the function of men like Sir John Hoskyns, a close friend of Hooke and a very active Fellow (and sometime President and Secretary) of the Royal Society. References in Hooke's *Diary* and the Society's minutes reveal Hoskyns' fertility in constructive suggestions, though he hardly carried out any scientific work himself (his main output was of sets of 'Enquiryes'). Occasionally he came up with really ingenious ideas that might have influenced scientific work, while Hooke thought his notion for linguistic reform 'very good most simple'.[17] He can be paralleled by the schoolmaster Ralph Johnson, a zoological expert respected by Ray, who claimed him as the source of the fruitful suggestion that his catalogue of British plants be arranged in natural rather than alphabetical order.[18]

The overlap between 'real' and 'amateur' science is further illustrated by the links between the Royal Society's 'repository' and the virtuoso 'cabinets' of which London was full. These are often written off as miscellaneous and trivial, and in retrospect this seems an accurate judgement on many of their oddities uncritically treasured in a manner typical of the dilettante virtuoso movement. Such is the predominant impression left by the surviving records of the objects bought and sold by the broker and collector, William Courten, and by reports of the fossils and exotic creatures in the collection of one Captain Hicks, who made his living by furnishing ladies' closets with different kinds of shells.[19] But serious scientists like Ray and Lister nevertheless expressed great interest in these museums and the objects they contained (Courten's collection was later bought by Sloane for his) while the Royal Society paid £100 for one of the most famous such cabinets, that of Robert Hubert, of which a catalogue had been published.[20] Hubert's rarities formed the basis of the Society's repository, which sounds miscellaneous enough from the highlights in it itemised by the Italian visitor, Lorenzo Magalotti, including 'an

[16] See Jessop's letters of 1673–5 in Oldenburg,[121] x, passim, and his papers in EL I.1, fols. 165–6; Deacon,[182] pp. 102f; *Phil. Trans.*, 5 (1670), 2061–8.

[17] Cl. P. XIX, fols. 1, 3, 32; Hooke,[165] p. 393 and passim; 'Espinasse,[136] pp. 108, 126; Hunter,[143] ch. 2; Birch,[118] I, 155–6 and passim; Aubrey 12, fols. 187–231.

[18] Raven,[135] p. 249. See also ibid. p. 319.

[19] Sloane 3961–2, 3988; Lodge to Lister, 6 Feb. 1674, n.d., Lister 34, fol. 151, Lister 3, fol. 169. For a general account of such cabinets see Candill,[147] chs. 4–5.

[20] Raven,[135] p. 229; Ray to Lhwyd, 7 May 1690, Ray,[125] p. 207; Lodge to Lister, n.d., Lister 3, fol. 169; Birch,[118] II, 64; Rober Hubert [alias Forges], *A Catalogue of the Many Natural Rarities* (London, 1664).

ostrich, whose young were always born alive; a herb which grew in the stomach of a thrush; and the skin of a moor, tanned, with the beard and hair white'. Yet in 1681 a lavish and scholarly catalogue of the extended collection was published by Nehemiah Grew on the Society's behalf, a clear expression of the scientific value attached to it. Such a collection made it easy 'to find likenesse and unlikenesse of things upon a suddaine' (in Sir John Hoskyns's words), while Oldenburg stressed how even private museums 'will at length make up such a Store-house, as our Society designeth for an Universal History of Nature'.[21]

There were some contrasts between the Society's cabinet and its virtuoso forebears. Grew's catalogue is a reminder that an institutional collection could be permanent, unlike private ones, and those solicited to present objects to the Royal Society were urged that their gifts would be carefully preserved for posterity 'probably much better and safer, than in their own private Cabinets'. This was equally true of the Ashmolean Museum at Oxford, which was based on a similar collection, and John Aubrey retrieved objects that he had deposited with friends to assure their survival there.[22] Approaches to such facilities also differed, as is shown by Robert Hooke's view that 'the use of such a Collection is not for Divertisement, and Wonder, and Gazing, as 'tis for the most part thought and esteemed, and like Pictures for Children to admire and be pleased with, but for the most serious and diligent study of the most able Proficient in Natural Philosophy'.[23]

Indeed the values of at least some virtuosi were antipathetic to the pursuit of serious science. Bacon had criticised their tendency to trivial curiosity and their stress on the social esteem of knowledge, though paradoxically his call for collaboration frequently authorised what he disapproved.[24] This unconstructive mentality is illustrated by many of John Evelyn's comments in his *Diary* on proceedings at the Royal Society: he often noted curiosities that struck him as 'rare' and 'wonderful', and tended to ignore more serious aspects of the Society's business; Pepys was similarly preoccupied with gadgets and the like. In fact there was a certain tension even within

[21] Magalotti, *Travels of Cosmo III, Grand Duke of Tuscany, through England (1669)* (London, 1821), p. 188; Grew, *Musæum Regalis Societatis* (London, 1681); Hoskyns to Aubrey, 25 Mar. 1674, Aubrey 12, fol. 214; Oldenburg to Lister, 21 Oct. 1671, Oldenburg,[121] VIII, 307.

[22] *Phil. Trans.*, 1 (1666), 321; Hunter,[143] p. 43 n. 5 (cf. Aubrey 2, fol. 26; Aubrey,[161] II, 166).

[23] Hooke,[65] p. 338.

[24] Houghton,[146] pp. 55n, 56, 72.

the virtuoso movement between a Baconian impulse to instructiveness and utility and a proneness to inconclusive and frivolous curiosity which writers on the subject deprecated, stressing the need for judgement and practical knowledge.[25] Lesser men were frequently glad to collect information but reluctant to systematise it. 'Meere compiling will content mee', was Hoskyns's statement of this attitude, so that their contribution to the advancement of learning often had severe limitations.[26]

But serious scientists could not escape their association with the virtuosi even if they wanted to (and there is little evidence that they did). Besides their role as Baconian collectors and arbiters, the virtuosi provided the staple attendance and finance on which a formal body like the Royal Society depended. The Society's organisers showed their awareness of this when trying to rationalise the membership by expulsions in the 1670s and 1680s, arguing the need to retain a membership larger than that of active 'scientists'. The virtuosi also made themselves useful to the Society by serving as officers.[27] Minor claims can thus be made for the virtuosi as patrons of scientific investigation, while they also provided a significant market for scientific books and equipment.

As for scientific instruments, and not least for those newly introduced in the seventeenth century like the telescope, the microscope, the barometer and the thermometer, the demand from the virtuosi was sizeable and not uncritical. Typical in his high standards was Sir George Croke, High Sheriff of Oxfordshire, who insisted on employing 'the best Workman' to get a telescope that was 'one of the most Exact for its length in England', and many virtuosi could boast outstanding equipment for which they were prepared to pay handsomely.[28] A handful of scientists could never have provided enough custom to support manufacturers whose expertise soon outstripped the abilities either of ordinary lens-makers and glass-blowers or of scientists who prepared their own equipment. The larger 'virtuoso' market, on the other hand, enabled a few craftsmen

[25] Evelyn,[164] III–IV, passim; Nicolson,[148] ch. 1; Caudill,[147] esp. ch. 1, though he fails adequately to bring out this tension, which I shall explore in my forthcoming study of John Evelyn.

[26] Hoskyns to Aubrey, 16 Mar. 1678, Aubrey 12, fol. 220.

[27] Hunter,[107] pp. 16–21 and passim.

[28] Croke to Oldenburg, 23 Feb. 1674, Oldenburg,[121] X, 484–5; cf. Croke to Oldenburg, 2 Feb. 1674, ibid, X, 461, and e.g., Robinson to Power, 4 Mar. 1660, Sloane 1326, fol. 101v.

to specialise and so refine the devices that they supplied to a few innovating scientists at home and abroad: the names of workmen like Richard Reeves, Christopher Cocks, John Yarwell and John Melling, familiar from the tributes of active researchers, also recur in the correspondence of the virtuosi.[29]

Equally important, virtuosi could contribute to the costs of producing books. Publication by subscription was beginning to become normal at this time, looking forward to the immense extension of the practice in the eighteenth century. It was seen as a way to get into circulation worthwhile books which it was widely held the Stationers' Company (which held the monopoly of printing) was too mercenary to publish, and the role of subscribers was really valuable, as contemporaries saw. Numerous enterprises were similarly organised in seventeenth-century England, and it is not entirely fanciful to compare the virtuosi with the investors in Joint Stock companies who played a critical role in economic life.[30] Complaints about the Stationers were widespread: 'the Booksellers at London are wholly bent upon present gain', Martin Lister felt, 'I confesse that the greatest part of Natural Historie has been starved and abused by the Avarice of Stationers who have beat down the Artist'.[31] Subscribers offered an alternative, particularly with expensive illustrated books which were vital to science. Works published thus included Grew's *Musæum Regalis Societatis* (1681) and his *Anatomy of Plants* (1682), the first volume of Ray's *Historia Plantarum* (1686) and Edward Lhwyd's *Lithophylacii Britannici Ichnographia* (1699). When Willughby's *Historia Piscium* came out with the Royal Society's encouragement and with plates paid for by various virtuosi in 1686, Ray confessed that 'I did before despair of any Booksellers medling with it unless encouraged by subscriptions.'[32]

To analyse the composition of the whole scientific community, therefore, one has to move away from the elite of scientists with European reputations and predominantly professional status to a

[29] I have developed this theme at greater length in an unpublished paper given at a symposium on scientific instruments held by the British Society for the History of Science and the National Maritime Museum at Greenwich in August 1977.

[30] S. L. C. Clapp, 'The beginnings of subscription publication in the seventeenth century', *Modern philology*, 29 (1931), 199–224; F. J. G. Robinson and P. J. Wallis, *Book subscription lists: a revised guide* (Newcastle upon Tyne, 1975).

[31] Lister to Aston, 1 Feb. 1682, LBO VIII, fol. 261.

[32] Robinson and Wallis, *Book subscription lists*, pp. 1–2; Bluhm,[108] p. 102; Ray to Robinson, 13 Mar. 1685, Ray,[125] p. 142; see above, p. 42.