

Chapter XVII

THE ART OF MEMORY AND THE GROWTH OF SCIENTIFIC METHOD

IT HAS been the purpose of this book to show the place of the art of memory at the great nerve centres of the European tradition. In the Middle Ages it was central, with its theory formulated by the scholastics and its practice connected with mediaeval imagery in art and architecture as a whole and with great literary monuments such as Dante's *Divine Comedy*. At the Renaissance its importance dwindled in the purely humanist tradition but grew to vast proportions in the Hermetic tradition. Now that we are already in the seventeenth century in the course of our history will it finally disappear, or survive only marginally and not at the centre ? Robert Fludd is a last outpost of the full Renaissance Hermetic tradition. He is in conflict with representatives of the new scientific movement, with Kepler and Mersenne. Is his Hermetic memory system, based on the Shakespearean Globe Theatre, also a last outpost of the art of memory itself, a signal that the ancient art of Simonides is about to be put aside as an anachronism in the seventeenth century advance ?

It is a curious and significant fact that the art of memory is known and discussed in the seventeenth century not only, as we should expect, by a writer like Robert Fludd who is still following the Renaissance tradition, but also by the thinkers who are turning in the new directions, by Francis Bacon, by Descartes, by Leibniz. For in this century the art of memory underwent yet another of its transformations, turning from a method of memorising the

encyclopaedia of knowledge, of reflecting the world in memory, to an aid for investigating the encyclopaedia and the world with the object of discovering new knowledge. It is fascinating to watch how, in the trends of the new century, the art of memory survives as a factor in the growth of scientific method.

In this concluding chapter, which comes as a postscript to the main part of the book, I can only briefly indicate the importance of the art of memory in this new role. Insufficient though it is, this chapter must be attempted because in the seventeenth century the art of memory is still in a significant position in a major European development. Our history which began with Simonides must not end before Leibniz.

The word 'method' was popularised by Ramus. We saw in an earlier chapter¹ that there is a close connection between Ramism and the art of memory and that this alone might suggest a connection between the history of memory and the history of method. But the word was also used of Lullism and Cabalism which flourished in the Renaissance in close association with memory. To give one example out of the many which might be cited, there is the 'circular method' for knowing everything described by Cornelius Gemma in his *De arte cyclognomica*² which is a compound of Lullism, Hermetism, Cabalism, and the art of memory. This work may have influenced Bruno who also calls his procedures a 'method',³ and the use of this word for modes of thinking which would seem to have little connection with the new mathematical method was widely prevalent in the seventeenth century as the following anecdote will illustrate.

When the members of a small private academy in Paris assembled for their first meeting, about the year 1632, the subject of their deliberations was 'method'. The conference began with a highly abbreviated reference to the 'method of the Cabbalists' who from the archetypal world descend to the intellectual world and thence to the elemental world; the members then passed to an equally rapid characterisation of the 'method of Ramon Lull', based on divine attributes; and thence to what they described as 'the method of ordinary philosophy'. In the published account of

¹ See above, pp. 231 ff.

² Cornelius Gemma, *De arte cyclognomica*, Antwerp, 1569.

³ See above, p. 294.

their transactions these efforts are summed up under the title 'De la méthode'.⁴ The very few pages in which these large subjects are dismissed are unworthy of attention save as an indication of how little surprise would have been aroused by the title *Discours de la méthode* of the book published five years later by Descartes.

Amongst the numerous 'methods' circulating in the early seventeenth century, the art of memory was prominent and so also was the art of Ramon Lull. These two great mediaeval arts, which the Renaissance had tried to combine, turn into methods in the seventeenth century and play their part in the methodological revolution.⁵

Francis Bacon had a very full knowledge of the art of memory and himself used it.⁶ There is indeed in Aubrey's life of Bacon one of the few evidences of the actual design of a building for use in 'local memory'. Aubrey says that in one of the galleries in Bacon's house, Gorhambury, there were painted glass windows 'and every pane with severall figures of beast, bird and flower: perhaps his Lordship might use them as topiques for locall use'.⁷ The importance which Bacon attached to the art of memory is shown by the fact that it figures quite prominently in the *Advancement of Learning* as one of the arts and sciences which are in need of reform, both in their methods and in the ends for which they are

⁴ *Recueil général des questions traitées és Conférences du Bureau d'Adresse*, Lyons, 1633-66, I, pp. 7 ff. On this academy at the 'Bureau d'Adresse', run by Theophraste Renaudot, see my *French Academies of the Sixteenth Century*, p. 296.

⁵ The useful book by Neal W. Gilbert, *Renaissance Concepts of Method* (Columbia, 1960) discusses the classical sources of the word and contains valuable pages on 'art' and 'method'. The 'Renaissance concepts of method' discussed are, however, chiefly Ramist and Aristotelian. The 'methods' with which this next chapter is concerned are not mentioned.

I would think that Ong is probably right (*Ramus, Method and the Decay of Dialogue*, Cambridge, Mass., 1958, pp. 231 ff.) in stressing the importance of the revival of Hermogenes in drawing attention to the word 'method'. This revival was fostered by Giulio Camillo (see above, p. 168, note 19, p. 238).

⁶ On Bacon and the art of memory, see K. R. Wallace, *Francis Bacon on Communication and Rhetoric*, North Carolina, 1943> pp. 156, 214; W. S. Howell, *Logic and Rhetoric in England*, Princeton, 1956, p. 206; Paolo Rossi, *Francesco Bacone*, Bari, 1957, pp. 480 ff., and *Clavis universalis*, 1960, pp. 142 ff.

⁷ John Aubrey, *Brief Lives*, ed. O. L. Dick, London, 1960, p. 14.

used. The extant art of memory could be improved, says Bacon, and it should be used, not for empty ostentation, but for useful purposes. The general trend of the *Advancement* towards improving the arts and sciences and turning them to useful ends is brought to bear on memory, of which, says Bacon, there is an art extant 'but it seemeth to me that there are better precepts than that art, and better practices of that art than those received'. As now used the art may be 'raised to points of ostentation prodigious' but it is barren, and not used for serious 'business and occasions'. He defines the art as based on 'prenotions' and 'emblems', the Baconian version of places and images:

This art of memory is but built upon two intentions; the one prenotation, the other emblem. Prenotation dischargeth the indefinite seeking of that we would remember, and directeth us to seek in a narrow compass, that is, somewhat that hath congruity with our place of memory. Emblem reduceth conceits intellectual to images sensible, which strike the memory more; out of which axioms may be drawn better practise than that in use . . .⁸

Places are further defined in the *Novum Organum* as the

order or distribution of Common Places in the artificial memory, which may be either Places in the proper sense of the word, as a door, a corner, a window, and the like; or familiar and well known persons; or anything we choose (provided they are arranged in a certain order), as animals, herbs; also words, letters, characters, historical personages . . .⁹

Such a definition as this of different types of places comes straight out of the mnemonic text-books.

The definition of images as 'emblems' is expanded in the *De augmentis scientiarum*:

Emblems bring down intellectual to sensible things; for what is sensible always strikes the memory stronger, and sooner impresses itself than the intellectual. . . And therefore it is easier to retain the image of a sportsman hunting the hare, of an apothecary ranging his boxes, an orator making a speech, a boy repeating verses, or a player acting his part, than the corresponding notions of invention, disposition, elocution, memory, action.¹⁰

⁸ F. Bacon, *Advancement of Learning*, II, xv, 2; in *Works*; ed. Spedding, III, pp. 398-9.

⁹ *Novum Organum*, II, xxvi; Spedding, I, p. 275.

¹⁰ *De augmentis scientiarum*, V, v; Spedding, I, p. 649.

Which shows that Bacon fully subscribed to the ancient view that the active image impresses itself best on memory, and to the Thomist view that intellectual things are best remembered through sensible things. Incidentally, this acceptance of images in memory shows that Bacon, though influenced by Ramism, was not a Ramist.

It was therefore roughly speaking the normal art of memory using places and images which Bacon accepted and practised. How he proposed to improve it is not clear. But amongst the new uses to which it was to be put was the memorising of matters in order so as to hold them in the mind for investigation. This would help scientific enquiry, for by drawing particulars out of the mass of natural history, and ranging them in order, the judgment could be more easily brought to bear upon them.¹¹ Here the art of memory is being used for the investigation of natural science, and its principles of order and arrangement are turning into something like classification.

The art of memory has here indeed been reformed from 'ostentatious' uses by rhetoricians bent on impressing by their wonderful memories and turned to serious business. And amongst the ostentatious uses which are to be abolished in the reformed use of the art Bacon certainly has in mind the occult memories of the Magi. 'The ancient opinion that man was a microcosmus, an abstract or model of the world, hath been fantastically strained by Paracelsus and the alchemists', he says in the *Advancement*.¹² It was on that opinion that 'Metrodorian' memory systems such as that of Fludd were based. To Bacon such schemes might well have seemed 'enchanted glasses' full of distorting 'idola', and far from that humble approach to nature in observation and experiment which he advocated.

Nevertheless though I would agree with Rossi that the Baconian reform of the art of memory would on the whole preclude occult memory, yet Bacon is an elusive character and there is a passage in the *Sylva Sylvarum* in which he introduces the art of memory in a context of the use of the 'force of the imagination'. He tells a story of a card trick which was worked by the force of the imagination of the juggler, by which he 'bound the spirits' of the onlooker

¹¹ *Partis Instaurationis Secundae Delineatio et Argumentum*; Spedding, III, p. 552. Cf. Rossi, *Clavis*, pp. 489 ff.

¹² *Advancement*, II, x, 2; Spedding, III, p. 370.

to ask for a certain card. As a commentary on this card trick through 'force of imagination' comes the following:

We find in the art of memory, that images visible work better than other conceits: as if you would remember the word *philosophy*, you shall more surely do it by imagining that such a man (for men are best places) is reading upon Aristotle's Physics; than if you should imagine him to say, *I'll go study philosophy*. And therefore this observation would be translated to the subject we now speak of (the card trick): for the more lustrous the imagination is, it filleth and fixeth better.¹³

Though he is exploring the subject scientifically, Bacon is profoundly imbued with the classical belief that the mnemonic image has power through stirring the imagination, and he connects this with 'force of imagination' tricks. This fine of thought was one of the ways through which the art of memory became an adjunct of the magician in the Renaissance. Bacon is evidently still seeing such connections.

Descartes also exercised his great mind on the art of memory and how it might be reformed, and the mnemonic author who gave rise to his reflections was none other than Lambert Schenkel. In the *Cogitationes privatae* there is the following remark:

On reading through Schenkel's profitable trifles (in the book *De arte memoria*) I thought of an easy way of making myself master of all I discovered through the imagination. This would be done through the reduction of things to their causes. Since all can be reduced to one it is obviously not necessary to remember all the sciences. When one understands the causes all vanished images can easily be found again in the brain through the impression of the cause. This is the true art of memory and it is plain contrary to his (Schenkel's) nebulous notions. Not that his (art) is without effect, but it occupies the whole space with too many things and not in the right order. The right order is that the images should be formed in dependence on one another. He (Schenkel) omits this which is the key to the whole mystery.

I have thought of another way; that out of unconnected images should be composed new images common to them all, or that one image should be made which should have reference not only to the one nearest to it but to them all—so that the fifth should refer to the

¹³ *Sylva sylvarum*, Century X, 956; Spedding, II, p. 659.

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first through a spear thrown on the ground, the middle one through a ladder on which they descend, the second one through an arrow thrown at it, and similarly the third should be connected in some way either real or fictitious.¹⁴

Curiously enough, Descartes's suggested reform of memory is nearer to 'occult' principles than Bacon's, for occult memory does reduce all things to their supposed causes whose images when impressed on memory are believed to organise the subsidiary images. Had Descartes consulted Paepp on 'detecting' Schenkel¹⁵ he would have known of this. The phrase about the 'impression of the cause' through which all vanished images can be found might easily be that of an occult memory artist. Of course Descartes is certainly not thinking on such lines but his brilliant new idea of organising memory on causes sounds curiously like a rationalisation of occult memory. His other notions about forming connected images are far from new and can be found in some form in nearly every text-book.

It seems unlikely that Descartes made much use of local memory which, according to quotations in Baillet's *Life*, he neglected to practise much in his retreat and which he regarded as 'corporeal memory' and 'outside of us' as compared with 'intellectual memory' which is within and incapable of increase or decrease.¹⁶ This singularly crude idea is in keeping with Descartes's lack of interest in the imagination and its functioning. Rossi suggests, however, that the memory principles of order and arrangement influenced Descartes, as they did Bacon.

Both Bacon and Descartes knew of the art of Lull to which they both refer in very derogatory terms. Discussing false methods in the *Advancement*, Bacon says:

There hath been also laboured and put into practice a method, which is not a lawful method, but a method of imposture; which is, to deliver knowledges in such a manner, as men may speedily come to make a show of learning who have it not. Such was the travail of Raymundus Lullus in making that art which bears his name . . . "

¹⁴ Descartes, *Cogitationes privatae* (1619-1621); in *CEuvres*, ed. Adam and Tannery, X, p. 230. Cf. Rossi, *Clavis*, pp. 154-5.

¹⁵ See above, p. 301.

¹⁶ Descartes, *CEuvres*, ed. cit., X, pp. 200, 201 (fragments from the *Studium bonae mentis*, circa 1620, preserved in quotation in Baillet's *Life*).

¹⁷ *Advancement*, II, xvii, 14; Spedding, III, p. 408.

And Descartes in the *Discours de la méthode* is equally severe on the Lullian art which serves but to enable one 'to speak without judgment of those things of which one is ignorant'.¹⁸

Thus neither the discoverer of the inductive method, which was not to lead to scientifically valuable results, nor the discoverer of the method of analytical geometry, which was to revolutionise the world as the first systematic application of mathematics to the investigation of nature, have anything good to say of the method of Ramon Lull. Why indeed should they? What possible connection can there be between the 'emergence of modern science' and that mediaeval art, so frantically revived and 'occultised' in the Renaissance, with its combinatory systems based on Divine Names or attributes. Nevertheless the Art of Ramon Lull had this in common with the aims of Bacon and Descartes. It promised to provide a universal art or method which, because based on reality, could be applied for the solution of all problems. Moreover it was a kind of geometrical logic, with its squares and triangles and its revolving combinatory wheels; and it used a notation of letters to express the concepts with which it was dealing.

When outlining his new method to Beeckman, in a letter of March 1619, Descartes said that what he was meditating was not an *ars brevis* of Lull, but a new science which would be able to solve all questions concerning quantity.¹⁹ The operative word is, of course, 'quantity', marking the great change from qualitative and symbolic use of number. The mathematical method was hit upon at last, but in order to realise the atmosphere in which it was found we should know something of those frenzied pre-occupations with arts of memory, combinatory arts, Cabalist arts, which the Renaissance bequeathed to the seventeenth century. The occultist tide was receding and in the changed atmosphere the search turns in the direction of rational method.

In the transference of Renaissance modes of thinking and procedures to the seventeenth century a considerable part was played by the German, Johann-Heinrich Alsted (1588-1638), encyclopaedist, Lullist, Cabalist, Ramist, and the author of the *Systema*

¹⁸ *Discours de la méthode*, part II; *CEuvres*, ed. cit., VI, p. 17.

¹⁹ (*Euvres*, ed. cit., X, pp. 156-7. Cf. my article, 'The Art of Ramon Lull, *Journal of the Warburg and Courtauld Institutes*, XVII (1954), P-155-

mnemonicum,²⁰ a vast repertoire on the art of memory. Like Bruno and the Renaissance Lullists, Alsted believed that the pseudo-Lullian *De auditu kabbalistico* was a genuine Lullian work,²¹ which facilitated his assimilation of Lullism to Cabalism. Alsted describes Lull as a 'mathematician and Cabalist'.²² He defines method as the mnemonic instrument which proceeds from generals to specials (a definition of course, also influenced by Ramism) and he calls the Lullian circles places corresponding to the places of the art of memory. Alsted is a Renaissance encyclopaedist, and a man of the Renaissance, too, in his efforts to fuse every kind of method in the search for a universal key.²³

Yet he, too, is affected by the reaction against Renaissance occultism. He wished to free Lullism from the idle dreams and fancies with which it had been contaminated and to return to the purer doctrine as taught by Lavinheta. In the preface, dated 1609, to his *Clavis artis Lullianae* he inveighs against commentators who have defaced the divine art with their falsehoods and obscurities, mentioning by name Agrippa and Bruno.²⁴ Yet Alsted published one of Bruno's manuscripts (not, it is true, a Lullian one) after his death.²⁵ There seems to be a movement going on in the Alstedian circle, in which Bruno is remembered, towards a reformed version of those procedures which Bruno had so extravagantly stimulated on a wildly Hermetic plane. A full study of Alsted might reveal that the seeds which Bruno had sown during his travels in Germany had germinated but were bringing forth fruits more suited to

²⁰ J.-H. Alsted, *Sy sterna mnemonicum duplex.. in quo artis memorativae praecepta plene et methodice traduntur*, Frankfort, 1610.

²¹ *Systema mnemonicum*, p. 5; quoted by Rossi, *Clavis*, p. 182. The influential *De auditu kabbalistico* (on which see above, pp. 189, 197, 209) may have helped to propagate the word 'method' which is used in its preface (*De auditu kabbalistico* in R. Lull, *Opera*, Strasburg, 1598, p. 45).

²² See T. and J. Carreras y Artau, *Filosofia Cristiana de los siglos XIII al XV*, Madrid, 1943, II, p. 244.

²³ One of his works is entitled *Methodus admirandorum mathematicorum novem libris exhibens universam mathesim*, Herborn, 1623. See Carreras y Artau, II, p. 239.

²⁴ J.-H. Alsted, *Clavis artis Lullianae*, Strasburg, 1633, preface; See Carreras y Artau, II, p. 241; Rossi, *Clavis*, p. 180.

²⁵ *The Artificium perorandi*, written by Bruno at Wittenberg in 1587, was published by Alsted at Frankfort in 1612. See Salvestrini-Firpo, *Bibliografia di Giordano Bruno*, Florence, 1958, numbers 213, 285.

the new age. But it would require a whole book to investigate the vast output of Alsted.

Another interesting example of the emergence of a more rational method from Renaissance occultism is afforded by the *Orbis pictus* of Comenius (first edition in 1658).²⁶ This was a primer for teaching children languages, such as Latin, German, Italian, and French, by means of pictures. The pictures are arranged in the order of the world, pictures of the heavens, the stars and celestial phenomena, of animals, birds, stones and so on, of man and all his activities. Looking at the picture of the sun, the child learned the word for sun in all the different languages; or looking at the picture of a theatre,²⁷ the word for a theatre in all the languages. This may seem ordinary enough now that the market is saturated with children's picture books, but it was an astonishingly original pedagogic method in those times and must have made language-learning enjoyable for many a seventeenth-century child as compared with the dull drudgery accompanied by frequent beatings of traditional education. It is said that the boys of Leipzig in the time of Leibniz were brought up on 'the picture book of Comenius' and Luther's catechism.²⁸

Now there can be no doubt that the *Orbis pictus* came straight out of Campanella's *City of the Sun*,²⁹ that Utopia of astral magic in which the round central Sun temple, painted with the images of the stars, was surrounded by the concentric circles of the walls of the city on which the whole world of the creation and of man and his activities was represented in images dependent on the central causal images. As has been said earlier, the *City of the Sun* could be used as an occult memory system through which everything could be quickly learned, using the world 'as a book' and as 'local memory'.³⁰ The children of the Sun City were instructed by the Solarian priests who took them round the City to look at the

²⁶ *Orbis sensualium pictus*, Nuremberg, 1658. This is not the same work as Comenius's earlier language primer, the *Janua linguarum*. Comenius was a pupil of Alsted.

²⁷ Reproduced in Allardyce Nicoll, *Stuart Masques and the Renaissance Stage*, London, 1937, fig. 113.

²⁸ See R. Latta, introduction to Leibniz's *Monadology*, Oxford, 1898, p. 1.

²⁹ See Rossi, *Clavis*, p. 186.

³⁰ See above, p. 298.

pictures, whereby they learned the alphabets of all languages and everything else through the images on the walls. The pedagogic method of the highly occult Solarians, and the whole plan of their City and its images, was a form of local memory, with its places and images. Translated into the *Orbis pictus*, the Solarian magic memory system becomes a perfectly rational, and extremely original and valuable, language primer. It may be added that the Utopian city described by Johann Valentin Andreae—that mystery man whom rumour connected with the manifestos of the Rosicrucians—is also decorated all over with pictures which are used for instructing youth.³¹ However, Andreae's *Christianopolis* was also influenced by the *City of the Sun*, which was thus probably the ultimate source of the new visual education.

One of the pre-occupations of the seventeenth century was the search for a universal language. Stimulated by Bacon's demand for 'real characters' for expressing notions³²—characters or signs which should be really in contact with the notions they expressed—Comenius worked in this direction and through his influence a whole group of writers—Bisterfield, Dalgarno, Wilkins and others—laboured to found universal languages on 'real characters'. As Rossi has shown, these efforts come straight out of the memory tradition with its search for signs and symbols to use as memory images.³³ The universal languages are thought of as aids to memory and in many cases their authors are obviously drawing on the memory treatises. And it may be added that the search for 'real characters' comes out of the memory tradition on its occult side. The seventeenth-century universal language enthusiasts are translating into rational terms efforts such as those of Giordano Bruno to found universal memory systems on magic images which he thought of as directly in contact with reality.

Thus Renaissance methods and aims merge into seventeenth-century methods and aims and the seventeenth-century reader did not distinguish the modern aspects of the age so sharply as we do.

³¹ J. V. Andreae, *Reipublicae Christianopolitanae Descriptio*, Strasburg, 1619; English translation by F. E. Held, *Christianopolis, an Ideal State of the Seventeenth Century*, New York and Oxford, 1916, p. 202. On Andreae and Campanella, see *G.B. and H.T.*, pp. 413-14.

³² In *The Advancement of Learning*, II, xvi, 3; Spedding, III, pp. 399-400. Cf. Rossi, *Clavis*, pp. 201 ff.

³³ See Rossi's valuable survey of the 'universal language' movement in its relation to the art of memory in *Clavis*, chapter VII, pp. 201 ff.

For him, the methods of Bacon or of Descartes were just two more of such things. The monumental *Pharus Scientiarum*³⁴ published in 1659 by the Spanish Jesuit, Sebastian Izquierdo, is an interesting example of this.

Izquierdo makes a survey of those who have worked towards the founding of a universal art. He gives considerable space to the 'circular method' or *Cyclognomica* of Cornelius Gemma (if anyone ever tries to understand the Cyclognomic Art which may be historically important, Izquierdo might help); thence he passes to the *Novum Organum* of Francis Bacon, to the art of Ramon Lull, and the art of memory. Paolo Rossi has written valuable pages on Izquierdo³⁵ in which he points out the importance of the Jesuit's insistence on the need for a universal science to be applied to all the sciences of the encyclopaedia; for a logic which should include memory; and for an exact procedure in metaphysics to be modelled on the mathematical sciences. There may be an influence of Descartes on the last-named project, but it is also apparent that Izquierdo is thinking on Lullian lines and along the lines of the old efforts to combine Lullism with the art of memory. He insists that Lullism must be 'mathematicised' and in fact he gives pages and pages in which, for the Lullian combinations of letters, combinations of numbers have been substituted. Rossi suggests that this is a presage of Leibniz's use of the principles of the *combinatoria* as a calculus. Athanasius Kircher, a more famous Jesuit, also urged the 'mathematicising' of Lullism.³⁶

When one sees in the pages of Izquierdo influences from Bacon, and perhaps from Descartes, working side by side with Lullism and the art of memory, and how the mathematical trend of the century is working amongst the older arts, it becomes more and more apparent that the emergence of seventeenth-century methods should be studied in the context of the continuing influence of the arts.

But it is Leibniz who affords by far the most remarkable example of the survival of influences from the art of memory and from Lullism in the mind of a great seventeenth-century figure. It

³⁴ Sebastian Izquierdo, *Pharus Scientiarum ubi quidquid ad cognitionem humanam humanitatis acquisibilem pertinet*, Leyden, 1659.

³⁵ Rossi, *Clavis*, pp. 194-5.

³⁶ A. Kircher, *Ars magna sciendi in XII libros digesta*, Amsterdam, 1669. Cf. Rossi, *Clavis*, p. 196.

is, of course, generally known that Leibniz was interested in Lullism and wrote a work *De arte combinatoria* based on adaptations of Lullism.³⁷ What is not so well known, though it has been pointed out by Paolo Rossi, is that Leibniz was also very familiar with the traditions of the classical art of memory. In fact, Leibniz's efforts at inventing a universal calculus using combinations of significant signs or characters can undoubtedly be seen as descending historically from those Renaissance efforts to combine Lullism with the art of memory of which Giordano Bruno was such an outstanding example. But the significant signs or characters of Leibniz's 'characteristica' were mathematical symbols, and their logical combinations were to produce the invention of the infinitesimal calculus.

Amongst Leibniz's unpublished manuscripts at Hanover there are references to the art of memory, mentioning in particular Lambert Schenkel on the subject (this is the memory writer also mentioned by Descartes) and another well-known memory treatise, the *Simonides Redivivus* of Adam Bruxius published at Leipzig in 1610. Following indications given by Couturat, Paolo Rossi has drawn attention to this evidence from the manuscripts that Leibniz was interested in the art of memory.³⁸ There is also plenty of evidence of this in the published works. The *Nova methodus discendae docendaeque jurisprudentia* (1667) contains long discussions of memory and the art of memory.³⁹ *Mnemonica*, says Leibniz, provides the matter of an argument; *Methodologia* gives it form; and *Logica* is the application of the matter to the form. He then defines *Mnemonica* as the joining of the image of some sensible thing to the thing to be remembered, and this image he calls a *nota*. The 'sensible' *nota* must have some connection with the thing to be remembered, either because it is like it, or unlike it, or connected with it. In this way words can be remembered, though this is very difficult, and also things. Here the mind of the great Leibniz is moving on lines which take us straight back to *Ad*

³⁷ See L. Couturat, *La logique de Leibniz*, Paris, 1901, pp. 36 ff.; and below, pp. 381-3.

³⁸ See L. Couturat, *Opusculs et fragments intdits de Leibniz*, Hildesheim, 1961, p. 37; Rossi, *Clavis*, pp. 250-3. These references to mnemonics are found in Phil. VI.19 and Phil. VILB.III.7 (unpublished Leibniz manuscripts at Hanover).

³⁹ Leibniz, *Philosophische schriften*, ed. P. Ritter) I (1930), pp. 277-9.

Herennium, on images for things, and the harder images for words; he is also recalling the three Aristotelian laws of association so intimately bound up with the memory tradition by the scholastics. He then mentions that things seen are better remembered than things heard, which is why we use *notae* in memory, and adds that the hieroglyphs of the Egyptians and the Chinese are in the nature of memory images. He indicates 'rules for places' in the remark that the distribution of things in cells or places is helpful for memory and names as mnemonic authors to be consulted about this, Alsted and Frey.⁴⁰

This passage is a little memory treatise by Leibniz. I am inclined to think that the figure on which a number of visual emblems are disposed on the title-page of the *Disputatio de casibus in jure* (1666)⁴¹ is intended to be used as a local memory system for remembering law suits (a thoroughly classical use of the art of memory) and many other indications of Leibniz's knowledge of the tricks of the memory trade could no doubt be unearthed. One which I have noticed is the remark (in a work of 1678) that the *Ars memoriae* suggests a way of remembering a series of ideas by attaching them to a series of personages, such as patriarchs, apostles, or emperors⁴²—which takes us back to one of the most characteristic and time-honoured of the memory practices which had grown up around the classical rules.

Thus Leibniz knew the memory tradition extremely well; he had studied the memory treatises and had picked up, not only the main lines of the classical rules, but also complications which had grown up around these in the memory tradition. And he was interested in the principles on which the classical art was based.

Of Leibniz and Lullism much has been written, and ample evidence of the influence upon him of the Lullist tradition is afforded by the *Dissertatio de arte combinatoria* (1666). The opening diagram in this work,⁴³ in which the square of the four elements is associated with the logical square of opposition, shows his grasp of Lullism as a natural logic.⁴⁴ In the prefatory pages he mentions modern Lullists, among them Agrippa, Alsted, Kircher, and not

⁴⁰ J. C. Frey, *Opera*, Paris, 1645-6 contains a section on memory.

⁴¹ *Philosophische schriften*, ed. Ritter, I, p. 367.

⁴² Couturat, *Opuscles*, p. 281.

⁴³ *Philosophische schriften*, ed. Ritter, I, p. 166.

⁴⁴ See above, p. 178.

omitting 'Jordanus Brunus'. Bruno, says Leibniz, called the Lullian Art a 'combinatorial—the word which Leibniz himself is using of his new Lullism. He (Leibniz) is interpreting Lullism with arithmetic and with the 'inventive logic' which Francis Bacon wanted to improve. There is already here the idea of using the 'combinatoria' with mathematics which, as we have seen, had been developing in Alsted, Izquierdo, and Kircher.

In this new mathematical-Lullist art, says Leibniz, *notae* will be used as an alphabet. These *notae* are to be as 'natural' as possible, a universal writing. They may be like geometrical figures, or like the 'pictures' used by the Egyptians and the Chinese, though the new Leibnizian *notae* will be better for 'memory' than these.⁴⁵ In the other context in which we have already met the Leibnizian *notae* these were quite definitely connected with the memory tradition, and were something like the images demanded by the classical art. And here, too, they are connected with memory. It is perfectly clear that Leibniz is emerging out of a Renaissance tradition—out of those unending efforts to combine Lullism with the classical art of memory.

The *Dissertatio de arte combinatoria* is an early work of Leibniz's, written before his sojourn in Paris (1672-6) during which he perfected his mathematical studies, learning from Huyghens and others of all the recent advances in the higher mathematics. It was from this work that he was to make his own advances, and into that history belongs the emergence of the infinitesimal calculus, which Leibniz arrived at apparently quite independently of Isaac Newton who was working on similar lines at the same time. About Newton, I have nothing to say, but the context in which the infinitesimal calculus emerges in Leibniz belongs into the history traced in this book. Leibniz himself said that the germ of his later thinking was in the *Dissertatio de arte combinatoria*.

As is well known, Leibniz formed a project known as the 'characteristica'.⁴⁷ Lists were to be drawn up of all the essential notions of thought, and to these notions were to be assigned symbols or 'characters'. The influence of the age-long search since

⁴⁵ *Philosophische schriften*, ed. Ritter, I, p. 194. Leibniz refers to the preface of Bruno's *De Specierum scrutinio*, Prague, 1588 (Bruno, *Op. lat.*, II 0i)» P- 333)-

⁴⁶ *Philosophische schriften*, ed. Ritter, I, p. 302. Cf. Rossi, *Clavis*, p. 242.

⁴⁷ Couturat, *Logique de Leibniz*, pp. 51 ff.; Rossi, *Clavis*, pp. 201 ff.

Simonides, for 'images for things' on such a scheme is obvious. Leibniz knew of the aspirations so widely current in the time for the formation of a universal language of signs or symbols⁴⁸ (the schemes of Bisterfield and others) but such schemes, as has already been mentioned, were themselves influenced by the mnemonic tradition. And the 'characteristica' of Leibniz was to be more than a universal language; it was to be a 'calculus'. The 'characters' were to be used in logical combinations to form a universal art or calculus for the solution of all problems. The mature Leibniz, the supreme mathematician and logician, is obviously still emerging straight out of Renaissance efforts for conflating the classical art of memory with Lullism by using the images of the classical art on the Lullian combinatory wheels.

Allied to the 'characteristica' or calculus in Leibniz's mind was the project for an encyclopaedia which was to bring together all the arts and sciences known to man. When all knowledge was systematised in the encyclopaedia, 'characters' could be assigned to all notions, and the universal calculus would eventually be established for the solution of all problems. Leibniz envisaged the application of the calculus to all departments of thought and activity. Even religious difficulties would be removed by it.⁴⁹ Those in disagreement, for example, about the Council of Trent would no longer go to war but would sit down together saying, 'Let us calculate.'

Ramon Lull believed that his Art, with its letter notations and revolving geometrical figures, could be applied to all the subjects of the encyclopaedia, and that it could convince Jews and Mohammedans of the truths of Christianity. Giulio Camillo had formed a Memory Theatre in which all knowledge was to be synthesised through images. Giordano Bruno, putting the images in movement on the Lullian combinatory wheels, had travelled all over Europe with his fantastic arts of memory. Leibniz is the seventeenth-century heir to this tradition.

Leibniz tried to interest various potentates and academies in his projects but without success. The encyclopaedia was never drawn up; the assignment of the 'characters' to the notions was never completed; the universal calculus was never established. We are reminded of Giulio Camillo who was never able to complete the

⁴⁸ Couturat, *Logique de Leibniz*, pp. 51 ff.; Rossi, *Clavis*, pp. 201 ff.

⁴⁹ Couturat, *Logique*, p. 98, and cf. the article Leibniz in *Enciclopedia Filosofica* (Venice, 1957)-

stupendous Memory Theatre which met with only partial and insufficient support from the King of France. Or of Giordano Bruno, feverishly trying memory scheme after memory scheme, until he met his death at the stake.

Yet Leibniz was able to bring some parts of his total scheme to fruition. He believed that the advances that he had made in mathematics were fundamentally due to his having succeeded in finding symbols for representing quantities and their relations. 'And indeed', says Couturat, 'there is no doubt that his most famous invention, that of the infinitesimal calculus, arose from his constant search for new and more general symbolisms, and that, inversely, this invention confirmed him in his opinion of the capital importance for the deductive sciences of a good characteristic'.⁵⁰ Leibniz's profound originality, continues Couturat, consisted in representing by appropriate signs, notions and operations for which no notation had hitherto existed.⁵¹ In short, it was through his invention of new 'characters' that he was able to operate the infinitesimal calculus, which was but a fragment, or a specimen, of the never completed 'universal characteristic'.

If, as has been suggested, Leibniz's 'characteristica' as a whole comes straight out of the memory tradition, it would follow that the search for 'images for things', when transferred to mathematical symbolism, resulted in the discovery of new and better mathematical or logico-mathematical, notations, making possible new types of calculation.

It was always a principle with Leibniz in his search for 'characters' that these should represent as nearly as possible reality, or the real nature of things, and there are several passages in his works which throw an illuminating light on the background of his search. For example, in the *Fundamenta calculi ratiocinatoris*, he defines 'characters' as signs which are either written, or delineated, or sculptured. A sign is the more useful the closer it is to the thing signified. But Leibniz says that the characters of the chemist or of the astronomers, such as John Dee put forward in his *Monas*

⁵⁰ Couturat, *Logique*, p. 84.

⁵¹ *Ibid.*, p. 85. Cf. also Couturat's note in *Opuscles*, p. 97: 'Quelle que soit la valeur de cet essai d'une caractéristique nouvelle, il faut, pour le juger équitablement, se rappeler que c'est de cette recherche de signes appropriés qu'est né l'algorithme infinitesimal usité universellement aujourd'hui'.

hieroglyphica, are not of use, nor the figures of the Chinese and the Egyptians. The language of Adam, by which he named the creatures, must have been close to reality, but we do not know it. The words of ordinary languages are imprecise and their use leads to error. What alone are best for accurate enquiry and calculation are the *notae* of the arithmeticians and algebraists.⁵²

The passage, and there are others similar to it, shows Leibniz conducting his search, moving meditatively in the world of the past amongst the magic 'characters', the signs of the alchemists, the images of the astrologers, of Dee's monas formed of the characters of the seven planets, of the rumoured Adamic language, magically in contact with reality, of the Egyptian hieroglyphs in which truth was hidden. Out of all this he emerges, like his century emerging from the occultism of the Renaissance, finding the true *notae*, the characters nearest to reality in the symbols of mathematics.

Yet Leibniz knew that past very well, and was perhaps even guarding against suspicions that his 'universal characteristic' might be too closely connected with it when he speaks of his project as an 'innocent magia' or a 'true Cabala'.⁵³ At other times he will present it very much in the language of the past, as a great secret, a universal key. The introduction to the 'arcana' of his encyclopaedia states that here will be found a general science, a new logic, a new method, an *Ars reminiscendi* or Mnemonica, an *Ars Characteristica* or Symbolica, an *Ars Combinatoria* or Lulliana, a Cabala of the Wise, a Magia Naturalis, in short all sciences will here be contained as in an Ocean.⁵⁴

We might be reading the lengthy title-page of Bruno's *Seals*,⁵⁵ or the address in which he introduced the doctors of Oxford to those mad magic memory systems, which led up to the revelation of the new religion of Love, Art, Magic, and Mathesis. Who would guess from these clouds of old style bombast that Leibniz really

⁵² Leibniz, *Opera philosophica* ed. J. E. Erdman, Berlin, 1840, pp. 92-3. There is a very similar text in *Philosophische schriften*, ed. C. J. Gerhardt, Berlin, 1880, VII, pp. 204-5.

On Leibniz's interest in the 'lingua Adamaica', the magical language used by Adam in naming the creatures, see Couturat, *Logique*, p. 77.

⁵³ Leibniz, *Samtliche Schriften und Briefe*, ed. Ritter, Series I, Vol. II, Darmstadt, 1927, pp. 167-9; quoted by Rossi, *Clavis*, p. 255.

⁵⁴ *Introductio ad Encyclopaediam arcanam*, in Couturat, *Opuscles*, pp. 511-12. Cf. Rossi, *Clavis*, p. 255.

⁵⁵ See above, p. 201.

had found a Great Key ? The true Clavis, he says, in an essay on the 'characteristica', has hitherto not been known, hence the ineptitudes of magic with which books are full.⁵⁶ The light of truth has been lacking which only mathematical discipline can bring."

Let us turn back now and gaze once more at that strange diagram (Pl. II) which we excavated from Bruno's *Shadows*, where the magic images of the stars revolving on the central wheel control the images on other wheels of the contents of the elemental world and the images on the outer wheel representing all the activities of man. Or let us remember *Seals* where every conceivable memory method known to the ex-Dominican memory expert is tirelessly tried in combinations the efficacy of which rests on the memory image conceived of as containing magical force. Let us read again the passage at the end of *Seals* (which can be paralleled from all Bruno's other memory books) in which the occult memory artist lists the kinds of images which may be used on the Lullian combinatory wheels, amongst which figure prominently signs, *notae*, characters, seals.⁵⁷ Or let us contemplate the spectacle of the statues of gods and goddesses, assimilated to the stars, revolving, both as magic images of reality and as memory images comprehending all possible notions, on the wheel in *Statues*. Or think of the inextricable maze of memory rooms in *Images*, full of images of all things in the elemental world, controlled by the significant images of the Olympian gods.

This madness had a very complex method in it, and what was its object? To arrive at universal knowledge through combining significant images of reality. Always we had the sense that there was a fierce scientific impulse in those efforts, a striving, on the Hermetic plane, after some method of the future, half-glimpsed, half-dreamed of, prophetically foreshadowed in those infinitely intricate gropings after a calculus of memory images, after arrangements of memory orders in which the Lullian principle of movement should somehow be combined with a magicised mnemonics using characters of reality.

'Enfin Leibniz vient', we may say, paraphrasing Boileau. And

⁵⁶ Leibniz, *Philosophische schriften*, ed. C. J. Gerhardt, Berlin, 1890, VII, p. 184.

⁵⁷ *Ibid.*, p. 67 (*Initio et specimena scientiae novae generalis*).

⁵⁸ Bruno, *Op. lat.*, II (ii), pp. 204 ff.

looking back now from the vantage point of Leibniz we may see Giordano Bruno as a Renaissance prophet, on the Hermetic plane, of scientific method, and a prophet who shows us the importance of the classical art of memory, combined with Lullism, in preparing the way for the finding of a Great Key.

But the matter does not end here. We have always hinted or guessed that there was a secret side to Bruno's memory systems, that they were a mode of transmitting a religion, or an ethic, or some message of universal import. And there was a message of universal love and brotherhood, of religious toleration, of charity and benevolence implied in Leibniz's projects for his universal calculus or characteristic. Plans for the reunion of the churches, for the pacification of sectarian differences, for the foundation of an 'Order of Charity', form a basic part of his schemes. The progress of the sciences, Leibniz believed, would lead to an extended knowledge of the universe, and therefore to a wider knowledge of God, its creator, and thence to a wider extension of charity, the source of all virtues.⁵⁹ Mysticism and philanthropy are bound up with the encyclopaedia and the universal calculus. When we think of this side of Leibniz, the comparison with Bruno is again striking. The religion of Love, Art, Magic, and Mathesis was hidden in the Seals of Memory. A religion of love and general philanthropy is to be made manifest, or brought about, through the universal calculus. If we delete Magic, substitute genuine mathematics for Mathesis, understand Art as the calculus, and retain Love, the Leibnizian aspirations seem to approximate strikingly closely—though in a seventeenth-century transformation—to those of Bruno.

A 'Rosicrucian' aura clings to Leibniz, a suggestion often vaguely raised, and dismissed without examination or discussion of the many passages in Leibniz's works in which he mentions 'Christian Rosenkreuz', or Valentin Andrae, or refers, directly or indirectly, to the Rosicrucian manifestos.⁶⁰ It is impossible to

⁵⁹ Couturat, *Logique de Leibniz*, pp. 131-2, 135-8, etc.

⁶⁰ That Leibniz was a Rosicrucian is, however, firmly accepted by that excellent scholar, Couturat: 'On sait que Leibniz s'était affilié en 1666 à Nurnberg à la société secrète des Rose-Croix' (*Logique de Leibniz*, p. 131, note 3). Leibniz himself may hint that he was a Rosicrucian (*Philosophische Schriften*, ed. Ritter, Vol. I (1930), p. 276). The rules for his

investigate this problem here, but it is a possible hypothesis that the curious connections between Bruno and Leibniz—which undoubtedly exist—might be accounted for through the medium of a Hermetic society, founded by Bruno in Germany, and afterwards developing as Rosicrucianism. The 'Thirty Seals' which Bruno published in Germany.⁶¹ and their connections with the Latin poems published in Germany, would be the starting-point for such an investigation at the Bruno end. And the enquiry from the Leibniz end would have to await the full publication of Leibniz manuscripts and the clearing up of the present unsatisfactory situation concerning the edition of the works. We shall therefore no doubt have to wait a long time for the solution of this problem.

The standard histories of modern philosophy, which repeat after one another the idea that the term 'monad' was borrowed by Leibniz from Bruno, omit as quite outside their purview any mention of the Hermetic tradition from which Bruno and other Hermetic philosophers of the Renaissance took the word. Though Leibniz as a philosopher of the seventeenth century has moved into another atmosphere and a new world, the Leibnizian monadology bears upon it the obvious marks of the Hermetic tradition. The Leibnizian monads, when they are human souls having memory, have as their chief function the representation or reflection of the universe of which they are living mirrors⁶²—a conception with which the reader of this book will be thoroughly familiar.

A detailed comparison of Bruno with Leibniz, on entirely new lines, might be one of the best approaches to the study of the emergence of the seventeenth century out of the Renaissance Hermetic tradition. And such a study might demonstrate that all that was most noble in the religious and philanthropic aspirations of seventeenth-century science was already present, on the Hermetic plane, in Giordano Bruno, transmitted by him in the secret of his arts of memory.

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⁶¹ See above, p. 294.

⁶² Leibniz, *Monadology*, trans. R. Latta, Oxford, 1898, pp. 230, 253, 266 etc.

projected Order of Charity (Couturat, *Opuscles*, pp. 3-4) are a quotation from the Rosicrucian *Fama*. Other evidence from his works could be adduced, but the subject needs more than a fragmentary treatment.

THE ART OF MEMORY AND THE GROWTH OF SCIENTIFIC METHOD

I have chosen to end my history with Leibniz, because one must stop somewhere, and because it may be that here ends the influence of the art of memory as a factor in basic European developments. But there were many survivals in later centuries. Books on the art of memory continued to appear, still recognisably in the classical tradition, and it is unlikely that the traditions of occult memory were lost, or ceased to influence significant movements. Another book could probably be written carrying the subject on into later centuries.

Though this book has tried to give some account of the history of the art of memory in the periods covered, it should not be regarded as in any sense a complete or final history. I have used only a fraction of the material available, or which might be made available by further research, for the study of this vast subject. The serious investigation of this forgotten art may be said to have only just begun. Such subjects do not have behind them, as yet, an apparatus of organised modern scholarship; they do not belong into the normal curricula and so they are left out. The art of memory is a clear case of a marginal subject, not recognised as belonging to any of the normal disciplines, having been omitted because it was no one's business. And yet it has turned out to be, in a sense, everyone's business. The history of the organisation of memory touches at vital points on the history of religion and ethics, of philosophy and psychology, of art and literature, of scientific method. The artificial memory as a part of rhetoric belongs into the rhetoric tradition; memory as a power of the soul belongs with theology. When we reflect on these profound affiliations of our theme it begins to seem after all not so surprising that the pursuit of it should have opened up new views of some of the greatest manifestations of our culture.

I am conscious as I look back of how little I have understood of the significance for whole tracts of history of the art which Simonides was supposed to have invented after that legendary disastrous banquet.