

## ON THE PROJECT OF A UNIVERSAL CHARACTER

### I

During the last thirty years or so the practice has grown up among logicians of attributing the project of a universal character to Leibniz alone among seventeenth century thinkers. This attribution is to be found, for instance, in L. S. Stebbing's *Modern Introduction to Logic*,<sup>1</sup> in Cohen and Nagel's *Introduction to Logic and Scientific Method*,<sup>2</sup> in M. Black's *Nature of Mathematics*,<sup>3</sup> in J. H. Woodger's *Axiomatic Method in Biology*,<sup>4</sup> and in O. Neurath's introductory article in the *International Encyclopaedia of Unified Science*.<sup>5</sup> And it dates, I suspect, from the publication of C. I. Lewis's *Survey of Symbolic Logic* in 1918. Lewis mentioned that Leibniz acknowledged a debt in this connexion to Raymond Lully, Athanasius Kircher, George Dalgarno and John Wilkins. But he considered their writings contained "little which is directly to the point".<sup>6</sup> In this Lewis was obviously right with regard to Leibniz's conception of a calculus of reasoning, but wrong, as I shall try to show, with regard to the project of a universal character, which seems in fact to have been an intellectual commonplace in seventeenth century Western Europe. This somewhat neglected by-way of philosophical history is worth a brief review, I think, not only in order to fix more precisely the respect in which Leibniz was the only seventeenth century precursor of modern symbolic logicians, but also because it draws attention to an early widespread philosophical muddle about the construction of artificial languages.

Lewis's summary of Leibniz's own ideas, based on L. Couturat's *La Logique de Leibniz*, is quite sufficient to show how much Leibniz's project

had in common with those of previous thinkers on the subject. His universal character, in which he was enthusiastically interested from the age of eighteen (1664), was to fill three main roles. It would be what modern linguists call an "international auxiliary language", enabling men of different nations to communicate with one another. It would provide what Lewis calls a "logistic" treatment of science in general, a simplified system of symbolism for the exact expression of all actual and possible knowledge. And it would serve as an instrument of discovery and demonstration. The first two purposes could be achieved on Leibniz's view by devising a notation in which each single or basic symbol represented a simple concept and complex notions were expressed by combining the appropriate symbols in one way or another. The number of fundamental symbols would thus be as small as the number of primitive concepts in human thought, so that the notation, together with its vocalisation, could be learnt in a few weeks. Moreover, throughout the world science would be developed in the form of a single, unified encyclopaedia, scientists would be able to attain the same degree of rigour in metaphysics and morals as in geometry and analytics, and nothing chimerical would ever be written down. However, Leibniz never did much himself to develop this system of symbolism though he was constantly urging others to do so. He elaborated only a few of the many analyses of complex notions which would be required in order to establish which concepts should be regarded as primitive. And he learnt enough about two systems of notation to see that they would not serve his purpose. The earlier of these was based on the division of concepts into classes in accordance with their degree of complexity. Any concept could then be symbolised by a fraction of which the denominator indicated the number of the class and the numerator the number of the concept in that class. Later Leibniz considered symbolising primitive concepts by prime numbers and complex concepts by the appropriate product, so that logical synthesis would be represented by arithmetical multiplication and logical analysis by resolution into prime factors.

But besides being an international and scientific language Leibniz's universal character was also to serve as an instrument of discovery and demonstration by exhibiting the implications of what was already known. It was to see into the "inner nature" of things like a "new telescope", and guide our reasonings like an "Ariadne's thread". Leibniz attempted to devise a calculus which would operate on the formulae of his character to this end. It is these fragments of a calculus, expressed in a notation of concept variables and logical constants, and not at all restricted in possible application to Leibniz's own character, which justify the claim that Leibniz anticipated Boole. I shall try to show that, apart from some mi-

nor details, it is only this conception of a logical calculus as an ancillary to his universal character which distinguishes Leibniz's thought on the subject from that of some of his contemporaries and predecessors. Several of these projected, and some completed, a universal character which they hoped would fill the same three roles as Leibniz had in mind, constituting at once a medium of international communication, a simplified notation for science, and a method of discovery and demonstration.

## II

The need for an international auxiliary language was widely felt in seventeenth century Europe for several reasons. The learned were increasingly using their own several vernaculars instead of Latin, merchants faced an immense linguistic problem on the new trade-routes, and missionaries were confronted with the same difficulties. Consequently the recent discovery that written Chinese was used in the Far East as a means of intercommunication by peoples whose spoken languages differed greatly from one another was of great interest. Indeed, it set the pattern for almost all seventeenth-century speculation on these matters, and was referred to by almost all who discussed them. The ideal was not a new spoken language which could also be written (like *Lingua Franca* or *Pidgin-English*) by a system of phonograms, but a written language constituted by a new system of ideograms which could also be spoken. As such it was intended to be something quite different from the ciphering of words or letters practised by cryptographers even in the ancient world. The programme for its construction was first enunciated by Francis Bacon in *The Advancement of Learning*<sup>7</sup> in 1605, where he speaks of the project as "the mint of knowledge" since "words are the tokens current and accepted for conceits, as moneys are for values". What he seeks is a system of "real characters" which, as in China, would "express neither letters nor words in gross, but things or notions" and would be "as many, I suppose, as radical words".

Bacon mentioned this project again in *De Augmentis Scientiarum*<sup>8</sup> in 1623, where he added that "any book written in characters of this kind can be read off by each nation in their own language". But he was not enthusiastic over its utility, apparently because of the inconveniently large number of characters he thought it would require. Descartes thought he could circumvent this difficulty when Mersenne informed him in 1629 of a similar project, formulated apparently by a Mr. Hardy.<sup>9</sup> As soon as "the true philosophy" was known, the "clear and simple ideas" which are the basis of good science could be discovered, enumerated and arranged. It would then be possible to devise a system for symbolising these so that the most complex notions could be as easily expressed

as the largest numbers, because an order would have been established among all possible human thoughts similar to that prevailing naturally among members, and the whole language could be learnt in a few days. Above all, this language would represent everything so clearly to the human judgement that error would be almost impossible and even peasants would be better able to assess the truth than can philosophers at present.

Leibniz actually took a copy of this passage,<sup>10</sup> and added to it the comment that "although this language depends on the true philosophy it does not depend on its perfection". It could be established while philosophy was yet imperfect and grow as knowledge grew. "Meanwhile it would be a wonderful help for preserving what we know, seeing what we lack, discovering the means of attaining this, and above all for settling controversies where the correctness of a chain of reasoning is at stake". But there were others before Leibniz who thought that the construction of a universal character on mathematicist principles need not wait for the scientific millennium. Indeed the project of a universal character of some sort became a commonplace from Descartes' time onwards, and the languages seem to have been designed as often on Baconian as on Cartesian lines. To the former type probably belonged the scheme drawn up by William Bedell, Bishop of Kilmore, in 1633, which he persuaded a Reverend Johnston to execute. The results of their work were unfortunately lost in the Irish rebellion of 1641.<sup>11</sup> Of this type too were the projects of the elder Vos and Herman Hugo,<sup>12</sup> and also those of Philip Labbe<sup>13</sup> and Edward Somerset, second Marquis of Worcester.<sup>14</sup> At Ipswich in 1657 Cave Beck published a grammar and dictionary of such a language, entitled *The Universal Character, By which all the nations in the world may understand one another's Conceptions, reading out of one Common writing their own Mother Tongues*. In his preface he remarked "This last century of years, much hath been the discourse and expectation of learned men, concerning the finding out of a universal character, which if happily contrived, so as to avoid all equivocal words, anomalous variations and superfluous synonymas . . . would much advantage mankind in their civil commerce, and be a singular means of propagating all sorts of learning and true religion in the world: such a character being to be learned in as few weeks as the Latin tongue usually requireth years to be perfect in." Similar works were published by J. J. Becher at Frankfurt in 1661 (*Character, pro notitia linguarum universali*), and by Athanasius Kircher at Rome in 1663 (*Polygraphia Nova et Universalis*), who provided dictionaries into and out of his language for Latin, Italian, French, Spanish and German. Beck, Becher and Kircher all make much use of numerals in their notation, which is mostly built up by num-

bering English or Latin words in their alphabetical order; and Becher and Kircher acknowledge a debt to the cryptographic researches of Johann Trithem, published early in the sixteenth century under the title of *Polygraphia*. The syntax, accident and word-order of their languages is, roughly, the highest common factor of Romance, Teutonic and Semitic grammars, and their dictionaries presuppose a one-one correspondence of meaning between the vocabularies of all ordinary languages. So that in effect their languages are systems for ciphering a limited group of languages on a unitary pattern. No Japanese, for instance, could read his vernacular directly out of their sentences, though he could no doubt learn to translate them. But each of these authors nevertheless claimed to be expounding a universal real character, in Bacon's sense (like the modern international code of nautical signals) and not a mere cipher of limited application.

Mersenne seems to have been the first to design a universal language of the Cartesian type, for he mentions this achievement in a letter of 1636 or 1637.<sup>15</sup> He was soon followed by F. Lodwick,<sup>16</sup> a London merchant, J. A. Comenius,<sup>17</sup> the Czech educationalist, and Sir Thomas Urquhart, the translator of Rabelais. Mersenne did not describe his system in detail, and there seems no evidence that Comenius ever worked out any details. But Lodwick wrote two books on the subject. The first of these was published in 1647 as *A Common Writing, whereby two, although not understanding one the other's language yet by the help thereof may communicate their minds one to another* and the second, which was largely a refinement of the first, appeared in 1652, as *The Groundwork, or foundation laid (or so intended) for the framing of a new perfect language and an universal or common writing*. Lodwick's characters are made up of signs for a large number of basic roots and of "distinctional marks" around each sign which signify the derivative form required. Some of these derivative forms, called "abbreviatives", consist of a small range of variations around each radical notion. Its contradictory, for instance, can be signified in this way. The other derivative forms arise from the inflexions necessary to produce a verb, noun, adjective and adverb, with a large range of moods, tenses, cases, etc., from each abbreviative. The resulting scheme is tidier and more systematic than, say, Beck's. And in 1653 Lodwick was clearly of the opinion that "the proper names of things to give them signification is the work, we suppose, of a sound philosopher, who from the knowledge of things and their order in nature, should give them names accordingly, describing that in them by their name, by which in the naming they may be known". Lodwick was convinced too that his character would "much assist the true knowledge of things which is at present much hindered" by verbal ambiguity and

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