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AMIROUCHE MOKTEFI

On the Social Utility of Symbolic Logic: Lewis Carroll against 'The Logicians'

ABSTRACT. Symbolic logic faced great difficulties in its early stage of development in order to acquire recognition of its utility for the needs of science and society. The aim of this paper is to discuss an early attempt by the British logician Lewis Carroll (1832–1898) to promote symbolic logic as a social good. This examination is achieved in three phases: first, Carroll's belief in the social utility of logic, broadly understood, is demonstrated by his numerous interventions to fight fallacious reasoning in public debates. Then, Carroll's attempts to promote symbolic logic, specifically, are revealed through his work on a treatise that would make the subject accessible to a wide and young audience. Finally, it is argued that Carroll's ideal of logic as a common good influenced the logical methods he invented and allowed him to tackle more efficiently some problems that resisted to early symbolic logicians.

KEY WORDS: Lewis Carroll, logic in society, symbolic logic, existential import, logic education

Introduction

Early symbolic logicians were not great salesmen. Indeed, they struggled to convince their colleagues of the utility of their methods. Algebraic logicians mainly tackled the problem of elimination where a conclusion is drawn from an indeterminate number of premises, but admitted that "we have seldom occasion to trouble ourselves with problems which would introduce" a high number of terms [Venn, 1894, p. 117]. Besides, opponents to symbolic logic considered these problems to be artificial and triv-

ial “in comparison with the serious business of logic proper” [Cook Wilson, 1926, p. 637]. The Logistic tradition was free from this objection, but its early promoters constrained their scope of exploration to mathematical reasoning and hardly investigated any social applications. Symbolic logician Arthur Shearman conceded that “Symbolic Logic cannot directly assist the individual in his scientific pursuits or in his daily affairs”, although it could provide valuable ‘indirect’ help [Shearman, 1906, p. 226]. Philosopher F.C.S. Schiller was more severe as he attacked the entire formal logic on the grounds of its incapacity to deal with actual thinking. Although he granted that formal logic might be investigated as a scientific by-product for mental training, Schiller viewed formal logic as a social problem that alienates human thought and social action [Schiller, 1912, pp. 374–409]. On the contrary, Polish philosopher Kazimierz Ajdukiewicz, who championed symbolic logic and anti-irrationalism, promoted the teaching of logic, which he considered necessary for social progress [Ajdukiewicz, 1951, 1955, 1959]. These examples attest to the difficulty that symbolic logic faced in its early stage of development in order to acquire recognition of its utility, both for the needs of science and society. The aim of this paper is to discuss an early attempt by the British logician Lewis Carroll, whose real name was Charles L. Dodgson (1832–1898), to promote symbolic logic as a social good. This examination will be achieved in three phases: first, Carroll’s belief in the social utility of logic, broadly understood, is demonstrated by his numerous interventions to fight fallacious reasoning in public debates. Then, Carroll’s attempts to promote symbolic logic, specifically, are revealed through his work on a treatise that would make the subject accessible to a wide and young audience. Finally, it will be argued that Carroll’s ideal of logic as a common good influenced the logical methods he invented and allowed him to tackle more efficiently some problems that troubled early symbolic logicians.

Logic in society

Although Carroll’s logical writings were published late in his life, his interest in logic was old and regular. This attention to logic can be traced

throughout his life in his writings, both literary and mathematical, but also through his public concerns. Indeed, Carroll believed that "Society would be much less liable to panics and other delusions, and *political* life, especially, would be a totally different thing, if even a majority of the arguments, that are scattered broadcast over the world, were correct! But it is all the other way" [Carroll, 1887, p. 32]. Hence, he often decided himself to intervene in public debates that he considered to be damaged by bad logic. His biographers record him frequently engaging in disputes and writing to periodicals in order to refute claims and arguments that he considered to be fallacious. These pieces cover a wide range of topics such as University issues, politics and election procedures, religious affairs, child-actors, vivisection and many others. Although logic is broadly understood at present, it will be seen further in this paper that this conviction in the importance of logic in society led Carroll to work on the popularisation of symbolic logic, specifically, as an instrument to clear ideas and prevent fallacious reasoning in both science and everyday life.

Carroll's promotion of logic in public debates might be illustrated by a case that happened in the summer of 1877 when his vacations at Eastbourne coincided with a local debate on the merits of vaccination. The story of a local grocer who was prosecuted for neglecting to have his child vaccinated opened a dispute in the columns of *The Eastbourne Chronicle*, as to whether children should be vaccinated. Anti-vaccinators supported their claims with statistical arguments that Carroll held to be unsatisfactory. Hence, he entered the scene "as a mathematician, not as a doctor" to point out the insufficiencies of the statistical arguments that were offered. The interesting point for our concern is that Carroll did not necessarily engage in the debate to defend one view over the other, but rather intervened to assess the logical value of the arguments and to refute what he held to be a fallacy. In his last letter on the topic, he explains how he "did not come forward as a champion in the controversy, but as a critic; and [he] concerned [himself] rather with the logical accuracy of the weapons than with the result of the fight" [Carroll, 1976, pp. 12–13].

Religious thinking was a specific region where Carroll believed that logic plays a significant role. Actually, religion was probably a crucial

motivation that made him later work hard on his logic treatise which he regarded as a "work for *God*" [Cohen & Green, 1979, p. 1100; Richards, 2015]. Carroll was a deacon and, although he never proceeded to priest's orders, he often preached. On several occasions, he warned that the "bad logic that occurs in many and many a well-meant sermon, is a real danger to modern Christianity" [Collingwood, 1898, p. 301]. Carroll's belief in the utility of logic for religious thinking led him to work on a book about religious difficulties treated "from a logical point of view, in order to help those, who feel such difficulties, to get their ideas clear, and to see what are the logical results of the various views held." [Cohen & Gandolfo, 1987, p. 319]. Carroll unfortunately never managed to complete this work. However, a surviving fragment devoted to the difficulty of 'Eternal punishment' gives an outline of what Carroll had in mind. The difficulty is first expressed in the form of distinct incompatible propositions that are clearly formulated. Then, Carroll considers for each proposition "what would be the logical consequences of abandoning it". The reader is then invited to choose the views that may be held "without violating the inexorable laws of logical reasoning" [Collingwood, 1899, p. 348, 354]. Interestingly, Carroll again does not specify which view he himself held. He justifies his silence by his object that was "throughout, *not* to indicate one course rather than another, but to help the Reader to see clearly *what* the possible courses are, and *what* he is virtually accepting, or denying, in choosing any *one* of them" [Collingwood, 1899, p. 355].

Carroll also publicly defended some of his views, but he was far from winning all the battles he engaged in and logic proved not to be the decisive weapon he anticipated. A particular example is of interest for our purpose: in the early 1880s, Carroll attended lawn tennis games and observed that tournaments' procedures involved an important element of chance that prevented a fair awarding of prizes among players. Hence, he designed and published a "true method for assigning prizes with a proof of the fallacy of the present method" [Abeles, 2001, p. 71]. The promotion of his method in the *St. James Gazette* led him to controversy with a correspondent identified as "Cavendish" on what ought to be a good method of competition in tennis tournaments. The interesting point for our purpose is that while

Carroll insisted on approaching the subject "mathematically", his opponent retorted that the "real argument is not a mathematical one. It is this: What do the players like, and what is it that induces them to enter for matches?" [Abeles, 2001, p. 81, 92]. Later on, Carroll admitted that he was powerless on this topic since players themselves seemed to deliberately prefer systems of competition that substituted chance for skill [Abeles, 2001, p. 62]. Hence, no matter how fallacious the present method was, its application was justified by the will of the players.

Carroll's ideal of rigour that he championed in public debates unsurprisingly is also essential in his mathematical investigations. His numerous writings in this discipline attest a great concern with the precision of notations and the rigour of arguments. Such is found in his *Elementary Treatise on Determinants*, for instance, where Carroll explains that he had in view "to present the subject as a continuous chain of argument, separated from all accessories of explanation or illustration, a form which [he] venture[s] to think better suited for a treatise on exact science than the semi-colloquial semi-logical form often adopted by Mathematical writers" [Carroll, 1867, p. iii]. Carroll's championing of logic can be even more evidently traced in his geometrical interests and, particularly, in his defence of Euclid's *Elements* as a textbook for geometrical teaching. Carroll considered that the charm of mathematics springs from the "absolute *certainty* of its results [while] Most other Sciences are in a state of constant flux – the precious truths of one generation being smiled at as paradoxes by the second generation, and contemptuously swept away as childish nonsense by the third" [Carroll, 1890, p. xv]. This permanence of mathematical truths was of great importance within the Victorian ideal of the liberal education that was promoted in the Universities of Oxford and Cambridge. This education was not necessarily preparing the individual for a specific profession, clergymen excepted. The training rather aimed at forming the minds and characters of the students, who are expected to learn correct reasoning and good manners. Topics that were viewed as 'long established' were favoured as the ingredients of a liberal education, and thus should be mastered first.

Among the mathematical sciences, geometry, in its Euclidean form, was particularly appreciated for the needs of liberal education as it "really consists entirely of manifest examples of perfect reasoning: the reasoning being expressed in words which convince the mind, in virtue of the special forms and relations to which they directly refer" [Whewell, 1845, p. 29]. As such, Euclid was taught as much for the sake of its logic as it was for the sake of its geometry, not to mention that it was a classical text. These advantages made Euclid's *Elements* the principal textbook for the purpose of geometrical teaching, with hundreds of editions published in the Victorian period. However, a protest movement started at the end of the 1860s to challenge Euclid's domination and several rival manuals were offered to replace Euclid's. By 1871, an *Association for the Improvement of Geometrical Teaching* was founded in order to promote reforms in geometrical teaching. In the 1880s, this anti-Euclid association published a syllabus and a textbook that were submitted to the examination boards of Oxford and Cambridge Universities but which did not meet with the success expected. Actually, Euclid's authority was maintained until 1903 when its sequence of theorems was eventually dropped from the requirements of examination in those universities [Moktefi, 2011]. Carroll actively participated in this educational debate among British mathematicians and mathematics teachers on the suitability of Euclid's book for teaching purposes. In 1879, he published a fervent defence of Euclid against his rivals. The book was offered as a drama where the main modern textbooks were reviewed and compared to Euclid's work. Carroll expected a good manual of geometry to "exercise the learner in habits of clear definite conception, and enable him to test the logical value of a scientific argument" [Carroll, 1885, p. 7]. In order to assess the modern textbooks, Carroll designed a symbolic notation to exhibit the structure of the geometrical demonstrations and the logical fallacies that might have been committed. Accordingly, Carroll disqualified Euclid's rivals on the grounds of their logical imprecision. Carroll concluded that Euclid's work was logically superior and as such should be maintained for the purpose of geometrical teaching in schools and Colleges.

Feeding the mind

Carroll's belief in the social utility of logic led him to the idea of writing a treatise on logic in such a way as for it to be understood by a wide audience. While working on this treatise, it occurred to Carroll that he could make a game of it. Hence he published in 1886 *The Game of Logic*, a booklet that was accompanied with a board and counters with which players would enjoy the pleasure, if any, of solving syllogisms. The production of this game beautifully illustrates Carroll's concern with the promotion of logic. Contrary to his previous scientific works that were signed with his real name 'Charles L. Dodgson', Carroll signed the booklet (and his subsequent logical writings) with his literary pseudonym in order to give it further publicity. The game was produced with the same design as Carroll's *Alice's Adventures Under Ground*, a facsimile of Carroll's original *Alice* tale. The two books were scheduled to simultaneously appear at Christmas 1886, but Carroll's dissatisfaction with the printing of his logic booklet made him prepare a new edition for the following year [Imholtz, 2008]. Carroll expected the players of his logic game to get "a little instruction as well. But is there any great harm in *that*, so long as you get plenty of amusement?" [Carroll, 1887, preface]. However, in spite of his fervent plea and countless efforts, the book did not meet the success that Carroll expected. Critics mostly felt uneasy with the book's mixture of amusement and instruction "on the principle that two things, each good in itself, often make when mixed a third thing which is neither good nor desirable" [Anonymous, 1887, p. 121].

The mixed reception of his logic game did not discourage Carroll from promoting logic. Indeed, he devoted in subsequent years a lot of his time to teaching logic privately and in Oxford schools [Wakeling, 1978]. He also continued working on his popular treatise, which he planned to publish in three parts, by level of difficulty. The first volume of *Symbolic Logic* eventually appeared in 1896. Carroll promoted the book and did his best to give it a large exposition. He again signed it with his literary pseudonym, wrote it in such a way as to be understood by a wide audience, and invented numerous original examples to illustrate it. He pressed his publisher to de-

crease the price of the book and to increase the size of the word "Elementary" on the front page. Finally, he printed and spread a pamphlet to promote the imminent publication of the book. In spite of several interesting innovations, Carroll's logic treatise did not transform the discipline [Moktefi, 2008]. This is hardly surprising when we are reminded that its author himself labelled it as 'Elementary'. In his introduction, Carroll claimed that he "avoided all difficulties which seemed to [him] to be beyond the grasp of an intelligent child of (say) twelve or fourteen years of age" [Carroll, 1897, p. xvi]. Carroll was working on the next volumes that were expected to tackle more advanced problems, but his death in 1898 prevented him from completing them. Surviving fragments have been collected, published and praised in 1977 by philosopher William W. Bartley III, but they are hardly representative of what Carroll might have eventually produced [Bartley, 1986].

What is of interest for our present purpose is that Carroll devoted time and effort to making the book accessible to a wide (and young) audience. He actually claimed that his treatise was "the very first attempt (with the exception of [his] own little book, *The Game of Logic*, published in 1886, a very incomplete performance) that has been made to *popularise* this fascinating subject" [Carroll, 1897, p. xiv]. This claim for priority might surprise, as it is known that many popular accounts of logic were previously published. Carroll himself possessed in his private library at least two such works: J. W. Gilbart's *Logic for the Million* (1865) and A. Swinbourne's *Picture Logic* (1875) [Lovett, 2005, p. 129, 301]. The former work aimed at explaining the art of Logic "in such a way as to be readily understood even by those men and women who have not had the advantage of a literary education" [Gilbart, 1860, p. v], while the latter work was designed for a younger audience [Swinbourne, 1875]. Hence, it is necessary to keep in mind that what Carroll was specifically concerned with was the popularization of symbolic logic in order to understand his priority claim. It is notable that Carroll titled a book meant to popularize this "fascinating subject" with such an austere title as *Symbolic Logic* (and was only second to Venn in doing so), while he used more colourful titles for his previous popular science books: *A Tangled Tale* (1885) and *The Game of Logic* (1886). This

confirms the importance there was for him to make his work specifically stand within the symbolic trend.

It is difficult to support the notion that Carroll succeeded in popularizing symbolic logic. Although Carroll claimed that he taught the subject to "*many* children" who took "a real intelligent interest in" it [Carroll, 1897, pp. xvi–xvii], it is likely that *many more* children did not share his enthusiasm. Carroll's logic pupils, as is attested by their recollections, all agree that it was his great delight to teach them his game of logic, but far from all his pupils managed to master it [Cohen, 1989]. The magazine of an Oxford school reported in 1887 on a logic examination and stated that "the results were not good, considering how much trouble Mr. Dodgson had taken in trying to make us understand his lecture" [Abeles, 2010, p. 246]. Although Carroll's methods might have been perceived as difficult by the young to whom it was addressed, the complication might lie in the nature of the subject itself rather than in the labour of the author. Carroll knew the difficult challenge he was facing: in the pamphlet advertising the imminent publication of his logic book, Carroll warned the readers about "popular ideas about Logic […] which have prevented its receiving anything like the attention which it deserves" [Abeles, 2010, p. 92]. Then, he addressed specifically three such misconceptions which he tries to refute: Logic would be difficult, uninteresting and useless. He concedes that the two first objections might be urged against formal logic, but not against his symbolic logic, and thus invites the readers to try his methods before making up their minds about it. As to the inutility of logic expressed in the third objection, Carroll fiercely defended the merits of logic, be it formal or symbolic, and argued that the accomplished logician is "the holder of an "Open Sesame!" to an inexhaustible treasure-house of varied interests [and] may apply his skill to any and every subject of human thought" [Abeles, 2010, pp. 91–92].

Carroll might look as a white knight naively and hopelessly trying to spread good logic around, but it would be unfair and misleading to think that his efforts were entirely vain. Confirmed logicians early on admired the book for its style and richness and still appeal to it for educational purposes. Logician Hugh MacColl, who reviewed Carroll's *Symbolic Logic* in

1896, spoke highly of the book's writing, although he did not adhere to the methods it describes. He affirmed that the book was "well arranged, its expositions are lucid, it has an excellent stock of examples – many of them worked out, and not a few witty and amusing; and its arguments, even when wrong, are always acute and well worth weighing" [MacColl, 1896, p. 520]. Later on, in a 1905 letter to Bertrand Russell, MacColl recalled how he interrupted his logic investigations for about thirteen years until the reading of Carroll's book "rekindled the old fire which [he] thought extinct" and decided him to reinvest himself in logic [Abeles & Moktefi, 2011, p. 56]. It must also be reminded that Carroll championed symbolic logic at a time when not many logicians did believe in it. Contrary to what some historical accounts might suggest, symbolic logic was far from being widespread in Carroll's time. Only a minority of logicians worked in this direction, and as such, Carroll's work contributed by its mere existence, and whatever publicity it got, to the promotion of symbolic logic as a new trend in logical studies. This was specifically relevant in Oxford where Carroll faced the opposition of the Professor of Logic, John Cook Wilson, who was a notorious opponent to symbolic logic [Marion, Moktefi, 2014].

Carroll seems to have taken some pride and enjoyment in this position as an outsider within the discipline, and modestly referred to himself as "an obscure Writer on Logic" [Carroll, 1897, p. 184]. In contrast, he often referred to his colleagues as "The Logicians", hardly spoke of them in any positive way and rarely named any in particular. This generic title is said to cover "The writers, and editors, of the Logical text-books which run in the ordinary grooves" [Carroll, 1897, p. 165]. As such, "The Logicians" were mainly the traditional logicians whose textbooks were used for the teaching of the subject, unlike symbolic logicians. In a letter to his publisher on 19 October 1895, Carroll expressed his regret that his treatise could not be used in present university examinations as the logic taught there differs. However, he had "no doubt that Symbolic Logic (not necessarily [*his*] particular method, but *some* such method) will, *some* day, supersede Formal Logic, as it is immensely superior to it: but there are no signs, as yet, of such a revolution" [Cohen & Gandolfo, 1987, p. 323]. Ironically, Carroll's wish for the replacement of old logic by symbolic logic was not shared by John

Venn, the leading British symbolic logician of his time. Indeed, Venn made high claims for the merits of traditional logic over symbolic logic as an educational discipline, notably because it kept "its rules and forms of expression in tolerably close harmony with the language of ordinary life" [Venn, 1894, p. xxvi]. Also, traditional logic "is much more closely connected with the practical experiences and needs of ordinary life" [Venn, 1894, p. xxvi]. It is Carroll's greatest merit that he managed to design a symbolic logic that was free from Venn's objections. Indeed, unlike Venn and most symbolic logicians, Carroll worked his logic in conformity with the practices of ordinary life. This prominent principle will be evidenced in Carroll's treatment of the existential import of propositions.

The facts of Logic and the facts of Life

The problem of existential import was important to symbolic logicians because it significantly impacted the symbolic representation of the propositions they examined and, as such, it affected their suggestiveness and workability. Let us consider the three canonical forms of proposition: *A* ("All *x* are *y*"), *E* ("No *x* is *y*") and *I* ("Some *x* are *y*"). We will not address propositions of the form "Some *x* are not *y*" (generally known as *O* propositions) because Carroll systematically changed them into the form "Some *x* are *non-y*", and hence, viewed them as a variation of *I* propositions [Englebretsen & Gilday 1976]. There was general agreement as to the existential import of the *E* and *I* propositions: the former were said not to assert the existence of their subject, while the latter did. The case of *A* propositions is more controversial: traditional logicians tended to consider them as asserting the existence of their subject, while modern logicians do not. The old usage is evident in the traditional square of opposition where *I* propositions are said to be the subalterns of *A* propositions. This subalternation would not hold if *A* propositions did not have an existential import while *I* propositions did. However, an inconvenience of this doctrine, without further specifications, is that it invalidates contraposition. Indeed, while the proposition "All *x* are *y*" would assert the existence of *x*, its contraposition

yields the proposition "All *non-y* are *non-x*", which merely asserts the existence of *non-x*. Saving the contraposition by dropping the existential import of *A* propositions has its own share of misfortunes: for instance, it invalidates the traditionally accepted syllogism *Darapti*, where a conclusion "Some *x* are *y*" is drawn from the premises: "All *m* are *x*" and "All *m* are *y*". Indeed, the premises of the syllogism would not entail the existence of *x*, while the conclusion does. The symbolic logician who designs a logic system has to make a choice as to what to be saved and what to be sacrificed. Venn stated that the symbolic logician has "to repudiate once for all any bounden obligation to either the language of common life, or that of the common logic" as he is merely concerned with "convenience and consistency in the working out of the Symbolic or Generalized Logic" [Venn, 1894, p. 145]. Hence, when it comes to the existential import, Venn and most symbolic logicians understandably preferred to drop the import of *A* propositions as it makes them easier to represent and to manipulate.

It must be remembered that early symbolic notations in logic, as designed by George Boole and his immediate followers, appealed to equations. For instance, the *E* proposition 'No *x* is *y*' would be represented by the algebraic formula '$x.y = 0$'. This expression asserts that the intersection of classes *x* and *y* is equal to the empty class (roughly understood). This simple idea works smoothly for negative propositions but fails when it comes to existential statements. Indeed, Boole and his followers could not represent the *I* proposition 'Some *x* is *y*' as '$x.y = 1$' because '1' stands for the universal class and the intersection of classes *x* and *y* does not necessarily cover it. All we know is that the intersection of *x* and *y* yields an indeterminate non-empty class that might conventionally be represented as *v*. Hence, one would have to write: '$x.y = v$'. Intriguingly, Venn also failed in representing existentials with his diagrams, despite his numerous graphical experiments [Moktefi & Pietarinen, 2015]. Boole and his followers were notoriously unhappy with their notations about particular propositions, and as such almost completely dismissed them from their logical works. This failure would have contaminated universal propositions if *A* propositions were held to assert the existence of their subjects. Instead,

propositions of the form "All *x* are *y*" were simply taken as equivalent to "No *x* is *non-y*", and as such, could easily be expressed as: '*x*. (1-*y*) = 0'. Dropping the existential import of *A* propositions simplifies their representation and manipulation, and as such, eases the general working of the whole logical calculus [Durand-Richard & Moktefi, 2014].

It is well-known that "Carroll did not accept [this] doctrine that has done so much to simplify traditional formal logic" [Braithwaite, 1932, p. 175]. However, it would be misleading to attribute Carroll's position to an obsessive conservatism. An examination of Carroll's treatment of existential statements shows that his view rather embraces his ideal of a logic that would be truthful to the practical usages of life. Carroll admitted that any view on existential import might be conveniently held provided that "it is consistent with itself and with the accepted facts of Logic" [Carroll, 1897, p. 166]. Given that the propositions *A*, *E* and *I* might assert or not assert the existence of their subjects, there are eight possible views to be considered. Carroll makes first a selection of views that might be conveniently held by eliminating those that conflict with the "facts of logic". Accordingly, he saved two views that he considered to be logically workable: Either (1) *I* and *A* propositions assert the existence of their subject while *E* propositions do not, or (2) *I* does not assert the existence of its subject while *A* and *E* propositions do. Carroll's selection, depending on what he held to be a fact of logic, might be disputed. However, this will not concern us in the present paper as it is the overall process that is of interest for us. Carroll believed that one might conveniently adopt any of the views that are permitted by logic.

While Venn favoured the ease of the logician in the working of his logic, Carroll privileged faithfulness to ordinary life practices. Hence, among the two views above on existential import that he pre-selected, Carroll excluded the second because "when we come to *test* it, as applied to the actual *facts* of life, we shall find I think, that it fits in with them so badly that its adoption would be, to say the least of it, singularly inconvenient for ordinary folk" [Carroll, 1897, p. 167]. Hence, Carroll retained the first view, making *I* and *A* propositions assert the existence of their subject

while *E* propositions do not. He held this view to mirror better than any other what he considered to be the facts of Logic and the facts of Life. Carroll's view on existential import is not original since it precisely is the view that was held by most traditional logicians in the Aristotelian line. It is, however, remarkable that he offered such "a fair rational reconstruction of Aristotle's own views" on existential import and was practically alone among symbolic logicians to adopt it [Slater, 1979, p. 39].

A happy consequence of Carroll's position is that it obliges the logician to seriously tackle the problem of existentials. It has been explained earlier how Boole and Venn failed in adequately representing particular propositions with symbolic notations. Consequently, their logical treatises are mainly devoted to universals, while particulars are dismissed. Venn minimized this fact arguing that to exclude particular propositions "from our rules would only be a slightly greater encroachment upon the full freedom of popular speech than has been already brought about by the exclusion of such terms as 'many', 'most' and others of a somewhat quantitative character. Particular propositions, in their common acceptation, are of [a] somewhat temporary and unscientific character. Science seeks for the universal, and will not be fully satisfied until it has attained it" [Venn, 1894, p. 189]. Carroll obviously could not share this view. In a letter to Cook Wilson, he justified the importance of particulars by their occurrence in ordinary life: "I fear I cannot agree with you in limiting the application of Logic to exact Science. In my view, it is of very great use in ordinary life, where *Particular* Conclusions are often the best we can get" [Bartley, 1986, pp. 376–377]. Carroll clearly approached logic as a discipline with applications in ordinary life, not merely as an instrument for scientific inquiry. He gave particulars the attention they needed and offered a rather effective representation for them. His symbolic notation appealed to subscripts: '1' stands for existence and '0' for non-existence. This makes it easy to express propositions: the universal 'No *x* is *y*' is represented as xy_0 while the particular 'Some *x* are *y*' is represented as xy_1. The representation of *A* propositions is more complex since they stand as double propositions: 'All *x* are *y*' is the combination of 'No *x* is *non-y*' and 'Some *x*

exists'. Hence, it is represented as $x_1y'_0$ (where y' stands for *non-y*) [Carroll, 1897; Moktefi, 2008]. It might be added that, unlike Venn, Carroll also distinctly represented existential statements with diagrammatic notations [Moktefi and Pietarinen, 2015]. The originality of Carroll's notations for the representation of particular propositions was acknowledged by his contemporaries [Sidgwick, 1887; MacColl, 1886].

Conclusion

It has been argued that Carroll did not adopt the "doctrine that has done so much to simplify traditional formal logic". This paper shows that it was Carroll's conviction in the social utility of symbolic logic that made him avoid that doctrine. Contrary to Venn who favoured convenience, Carroll privileged truthfulness to the usages of "common life", and as such developed a logic that he held to be a public good in the sense that it could be used for everyday life arguments and debates, and notably in religious thinking. In a way, it was Carroll's resolution to make a "human logic" that made him view it as a "work for God". This resolution certainly complicated his logic notations and methods, but this resistance was not without advantages as it made him effectively tackle particular propositions. In doing so, he designed an interesting and rather workable symbolic variation of traditional logic. From this perspective, his symbolic logic might be understood as a traditional logic which is worked out *with* symbols. Carroll, who dedicated his treatise to the memory of Aristotle, simply appealed to symbols in order to simplify the working of his logic. He complained that some formal logic textbooks "might almost have been composed with the benevolent intention of furnishing […] the *hardest* work that could be devised – giving the *maximum* of fatigue with the *minimum* of result" [Abeles, 2010, p. 92]. As such, Carroll did not consider symbolic logic to be inherently more useful than formal logic, but it was much simpler, and he moreover made it more interesting.

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Amirouche Moktefi,
Tallinn University of Technology, Estonia,
amirouche.moktefi@ttu.ee