

| | | | | | | | | | |
|-------|-------|-------|----------------|--------|------|--------|-----|-------|-------|
| E/No | C0260 | ENTRY | Carroll, Lewis | CHAR# | 7444 | KEY | GDH | DESP | 09-07 |
| READ1 | LB | RET | 19 08 | C-ALTS | 0 | E-ALTS | 1 | AUTRA | 1 |
| READ2 | | RET | | C-ALTS | | E-ALTS | | AUTRA | |
| READ3 | | RET | | C-ALTS | | E-ALTS | | AUTRA | |
| | | | | | | | | CORR1 | DW |
| | | | | | | | | CORR2 | |
| | | | | | | | | CORR3 | |
| | | | | | | | | DESP | 03-09 |

C0260

Carroll, Lewis (Charles Lutwidge Dodgson) (1832-1898).

Born on 27 January 1832, he was Student at Christ Church, Oxford, 1852-98, and Lecturer in Mathematics 1856-81. He died on 14 January 1898.

Lewis Carroll was the author of *Alice's Adventures in Wonderland* (1865), *Through the Looking Glass and What Alice Found There* (1872), and a large number of humorous poems of which 'The Hunting of the Snark' (1876) is the best known. In his real identity, that of Charles L. Dodgson, he was a mathematician of modest repute in the areas of geometry, recreational mathematics, and logic: author of *Euclid and his Modern Rivals* (1879), *Curiosa Mathematica* (1888, 1893), and *Symbolic Logic, Vol. I* (1896). Under either identity, however, he may appear to be a rather unlikely candidate for inclusion in an encyclopedia of economics. Yet his work on mechanisms for political representation anticipates important ideas in game theory and that branch of public choice theory having to do with committees and elections. The earliest work appears^{ed} in three privately printed pamphlets on *The Theory of the Committee* (1873, 1874, 1876) and dealt with a number of topics in majority rule procedures including a discussion of what is known today as the Borda count. Only recently has it been rediscovered and the significance of its contributions realized - almost entirely because of the historical scholarship of Duncan Black (1958, 1967, 1969, 1970).

appeared

Principles

^{Principles}
The Theory of Parliamentary Representation (1st edn, Nov. 1884, 2nd edn, Jan. 1885), applies techniques which we now associate with two-person zero-sum games to solve the problem of the optimal strategy for a two-party competition in a class of voting games in which each party must decide how many candidates it wishes to nominate in a constituency in which each voter may cast v votes (no more than one to each candidate) and there are m seats to be filled. If $v < m-1$ we have what is called the limited vote. If $v = m$ we have plurality or the bloc vote. To make the problem tractable, Dodgson supposes that each of the parties knows the number of its own supporters and those of the opposing party and that each party is able to direct the voting of each of its supporters exactly as it chooses. While not, of course, referring to it as such, he makes use of the idea of a maximin strategy in which each party chooses under the assumption

that the opposing party will be optimally distributing its voting strength among an optimal number of candidates.

In this same work, Dodgson considers the question of what voting rule of the type specified above will be optimal in the sense of minimizing the expected proportion of voters whose votes are 'wasted'. By a 'wasted' vote Dodgson here means that the voter's ballot played no part in effecting the outcome; e.g., if a party with s per cent of the electorate elects h candidates but would have elected that same number of candidates even if it had received support from only s' per cent of the electorate ($s' < s$), then $(s - s')$ per cent of the

vote

votes

electorate has had its votes wasted. In Dodgson's view, the existence of wasted voters implies that some voters are not having their preferences fully represented. He finds $v=1$, a special form of the limited vote, commonly called the single non-transferable vote (used in post-World War II Japan) to be optimal under this standard. Under the assumption of a rectangular distribution of party voting support, he finds that the reduction in the magnitude of the expected wasted vote drops off rapidly with increasing m , for $m > 4$.

In related work, Dodgson uses a game-theoretic style of argument to consider optimal party candidate strategies under a cumulative voting system (a semi-proportional system in which each voter may cumulate up to v votes on a single candidate) and under the Hare system (the single transferable vote, a proportional system in which voters indicate their relative orderings of the candidate). For the latter election system, Dodgson looks at the problem of rational coalition forming and provides some examples to show that the results of the Hare system need not be consistent with the expected outcome of a coalitional bargaining game between political parties. However, Dodgson's results are at best suggestive. Indeed the problem he posed has only just been solved (Sugden, 1983).

Dodgson's work on proportional representation was guided by his familiarity with research done by a number of Cambridge mathematicians (most involved to some degree with the Proportional Representation Society), a group whom Black (1970) identifies as the Cambridge School of Mathematical Politics. While Dodgson's treatment of proportional representation takes some essential ingredients from these earlier writers, his systematic treatment of the limited vote is a new creation. 'Where there had been only scattered fragments, he leaves a completed edifice' (Black, 1970). In making use of the maximin strategy to obtain an equilibrium solution to a particular two-person zero sum

80 game and in examining optimal coalitional strategies in the context of election
 81 politics, Dodgson's long-neglected work deserves recognition as a step on the
 82 road toward the development of the modern theory of political economy.

83 *Bernard Grofman*

84 **Selected Works**

- 85 1865, 1872. Carroll, Lewis. *The Annotated Alice: Alice's*
 86 *Adventures in Wonderland and Through the Looking Glass.*
 87 Ed. Martin Gardner, New York: New American Library, 1960.
 88 1873, 1874, 1876. Dodgson, Charles L. *The Theory of the*
 89 *Committee.* Privately printed.
 90 1879. Dodgson, C.L. *Euclid and his Modern Rivals.* London:
 91 Macmillan.
 92 1884, 1885. Dodgson, C.L. *The Principles of Parliamentary*
 93 *Representation.* London: Harrison.
 94 1888, 1893. Dodgson, C.L. *Curiosa Mathematica.* London:
 95 Macmillan.
 96 1896. Dodgson, C.L. *Symbolic Logic, Vol. I.* Reprinted,
 97 along with *Symbolic Logic, Vol. II,* ed. William W. Bartley, III.,
 98 London: Macmillan.

99 **Bibliography**

- 100 **Black, D. 1958.** *The Theory of Committees and Elections.*
 101 Cambridge: Cambridge University Press.
 102 **Black, D. 1967.** The central argument in Lewis Carroll's 'The
 103 Principles of Parliamentary Representation', *Papers on Non-Market*
 104 *Decision Making,* Fall.
 105 **Black, D. 1969.** Lewis Carroll and the theory of games. *American*
 106 *Economic Review Proceedings* 59(2), May, 206-16.
 107 **Black, D. 1970.** Lewis Carroll and the Cambridge Mathematical School
 108 of P.R.: Arthur Cohen and Edith Denman. *Public Choice* 8, Spring,
 109 1-28.
 110 **Black, D.** (forthcoming) *Lewis Carroll.*
 111 **←Lennon, F.B. 1962.** *The Life of Lewis Carroll.* New York:
 112 Macmillan.
 113 **Phillips, R. (ed.) 1971.** *Aspects of Alice.* New York: Vanguard;
 114 London: Gollancz; repr., New York: Vintage, 1977.
 115 **Sugden, R. 1983.** Free association and the theory of proportional
 116 representation. *American Political Science Review.*