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

Born on 27 January 1832, he was Student at Christ Church, Oxford, 1852-56, 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 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 Horda 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).

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
orate has had its votes wasted. In Dodgson's view, the existence of
wasted voter's implies that some voters are not having their preferences fully
represented. He finds \( r = 1 \), 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
\( s \), for \( s > 4 \).

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

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