

Mathematics and US presidential elections -- how to make each state a "battleground" without abolishing the Electoral College.

On June 17, an audience of more than 60 attended a public lecture in the School of Mathematics at the University of Manchester entitled "How America Chooses its Presidents" given by Dr. Alexander S. Belenky, a visiting scholar from the Centre for Engineering Systems Fundamentals at the Massachusetts Institute of Technology, USA.

Here is a brief summary of the ideas put forward during the course of the lecture.

1. *The lecture addressed two principal concerns of many Americans regarding the existing system of electing a US President.*
 - a) *Since a US President is not directly elected by the American people, a candidate who is favoured by a plurality (or a majority) of voters can lose the election, and*
 - b) *Due to the "winner-take-all" principle of awarding electoral votes in a state--according to which the winner of the state-wide popular vote receives all the electoral votes to which the state is entitled in the election--the election campaigns focus on a relatively small minority of the states, known as the "battleground states" (This principle is currently employed by 48 states and by the District of Columbia (D.C.), whereas the states of Maine and Nebraska award one electoral vote each to the winner of the popular vote in each of their congressional districts and two electoral votes "at large," i.e. to the winner of the state-wide popular vote.)*
2. *Currently there are two proposals for reforming the system of electing a US President which have been widely discussed in the American media. Both proposals imply abolishing the Electoral College, either de jure--by introducing a direct popular election of a President through a constitutional amendment--or de facto--by exploiting the right of the states to choose a manner of appointing state presidential electors. The authors of the second proposal believe that the states have the right to appoint state electors collectively, in particular, by a group of the states controlling any majority of the electoral votes that are in play in the election.*

While both proposals address concern a) to a certain extent, if implemented, they would likely focus election campaigns on populated states, where a majority of all eligible voters reside. (Currently, more than 56% of all eligible US voters reside in 11 largest states.) Moreover, both proposals deviate from the federalist principle underlying the structure of the US, despite the fact that this principle was key to reaching the historic 1787 Great Compromise, establishing the Electoral College-based system of electing a US President. Adopting the second proposal would mean that the signatories to a pool of the states controlling at least 270 electoral votes combined do not any longer honour the Great Compromise with respect to electing a US President, even if more than one quarter of the states oppose this idea.

3. *Dr. Belenky's lecture addressed both concerns a) and b). Until "three-fourths" of the states support abolishing the Electoral College in favour of direct popular election of a US President by means of a constitutional amendment, the nationwide popular vote should be "a" rather than "the" decisive factor in determining the election outcome while the choice of the states should remain as a decisive factor as well. Dr. Belenky proposes two concepts of the US Presidency: a "President of the people"--a presidential candidate who garners a majority of the voting electorate--and a "President of the states"--a presidential candidate who is the choice of a majority of 51 members of the Union--50 states and the District of Columbia. If there is a candidate who is both a President of the people and a President of the states, this candidate should win the Presidency. If there is no such person, or if less than 50% of all eligible voters vote, then the existing election system takes over, i.e. either the election is decided by the Electoral College or Congress chooses the next President.*

Implementing Dr. Belenky's proposal gives eligible US citizens a constitutionally guaranteed right to vote for President and Vice-President directly, and it would make the expressed will of the state voters superior to the right of the state legislature to choose a method of appointing state Presidential electors (i.e. members of the Electoral College) in any manner they want. Implementing this proposal would also encourage the candidates to campaign throughout the country, since in order to win a majority of all votes cast (the popular vote) the candidates would likely campaign in large and medium-sized states--where an overwhelming majority of voters reside--whereas to win in at least 26 of the 50 states (or in 25 states and in D.C.), they

would likely campaign in small states as well. Finally, since the Electoral College may eventually decide the election outcome, the candidates would likely campaign in current battleground states.

Under Dr. Belenky's proposal, no state stands to lose, since all the states keep all their Electoral College benefits and gain more attention from the candidates than they currently enjoy. So Dr. Belenky believes that a constitutional amendment introducing this proposal is likely to be supported by at least three quarters of the states, which distinguishes his proposal from the above-mentioned two proposals to introduce direct popular election of a US President. Dr. Belenky's proposal builds on the existing election system rather than calling for its abolition; however, he proposes to use the Electoral College mechanism only as a backup - when there is no consensus between the nation as a whole and the states (as equal members of the Union) on who should be the next President, i.e. when no presidential candidate is both a President of the people and a President of the states.

4. Dr. Belenky has demonstrated mathematically that in US Presidential elections held between 1948 and 2004, only 16.1% – 22.1% of all voting voters could have elected a US President [1], whereas the rules that he proposes eliminate such weird, yet in principle possible outcomes. His mathematical result generalizes and clarifies the result published by the distinguished mathematician George Polya in 1961 [2], regarding the minimum fraction of the popular vote that can elect a US President in the Electoral College.

5. A wide range of questions were raised by the attendees of the lecture. In particular, the role of the media in communicating helpful ideas of mathematicians studying the Electoral College to the American electorate was widely discussed. Possible outcomes of the 2008 Presidential election were discussed, along with the rules currently employed by the Democratic Party in the nomination process, with particular reference to the 2008 primaries and caucuses. Dr. Belenky's proposal for reforming the system of electing a US President can also be successfully applied to the nomination process for the party candidate, a fact that was first reported by John Baer, a columnist at the Philadelphia Daily News [3].

Also briefly mentioned was a "modified winner-take-all" principle of awarding state electoral votes that would potentially make every state "battleground", even under the existing system of electing a US President. An article describing the proposed principle--which any state may introduce without amending the Constitution - has recently been accepted for publication in *Mathematical and Computer Modelling*, an Elsevier Journal [4].

The public lecture was organised by Michael Tso--a lecturer in O.R. (Operational Research) and Statistics in the School of Mathematics—in the framework of a series of topical workshops hosted by Manchester School of Mathematical Sciences (MIMS). The idea to organize a lecture on such a topical theme was actively supported by professors John Keane, School of Computer Science and David Farrell, head of the School of Social Sciences at the University of Manchester. The lecture has demonstrated the usefulness of a systems analysis approach to a decision process of global importance.

REFERENCES

[1] A. S. Belenky. "A 0-1 knapsack model for evaluating the possible Electoral College performance in two-party US presidential elections." In press

[2] G. Polya, "The minimum fraction of the popular vote that can elect the President of the United States", *Mathematical Teacher* 54, 130-133, (1961).

[3] J. Baer, "A fair plan for choosing between them." *Philadelphia Daily News*, May 7, 2008.

[4] A. S. Belenky. "A modified "winner-take-all" rule for awarding state electoral votes in U.S. presidential elections and a game model for its analysis". In press

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