Place of Mathematics in the Parliament

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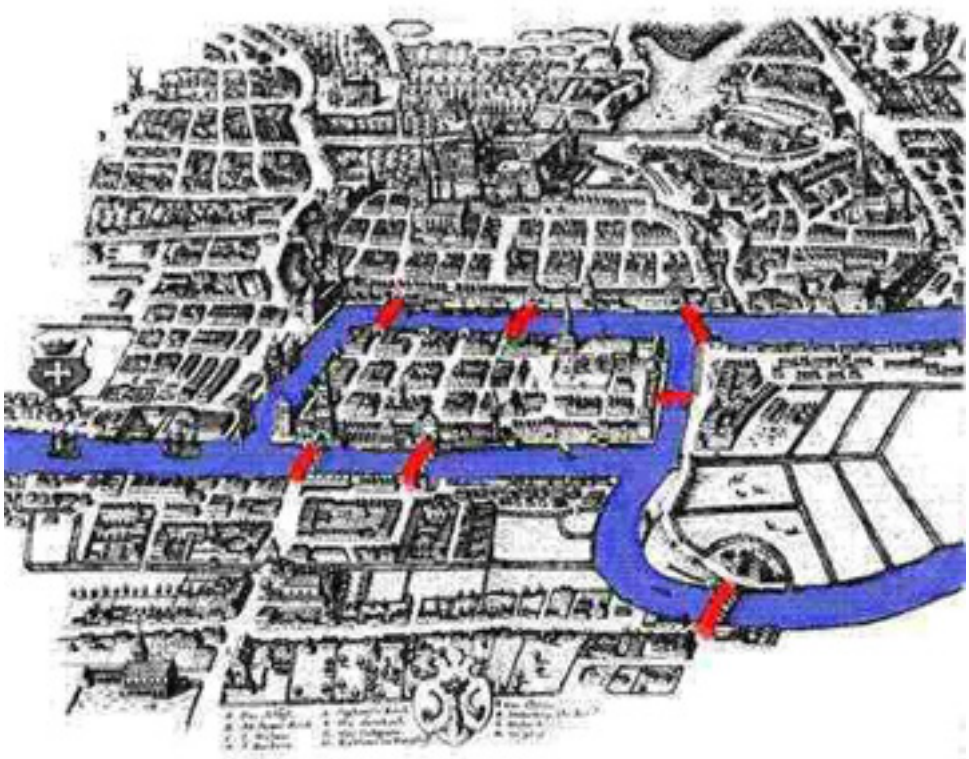
As part of the Royal Society MP-Scientist Pairing Scheme we have been paired to explore the ways in which scientists and politicians can gain from each other's perspectives. We are a mathematician from the University of East Anglia (Dr Džamonja) and an MP for Norwich and a former University of Anglia biologist (Dr Gibson). We were interested to find out what is the appreciation of mathematics in the government and more broadly parliament and the civil service, what is the actual role mathematics plays there, if there is a gap there and finally if such a gap exists, can it be narrowed. As part of the RS Scheme Dr Džamonja spent a week in the Parliament shadowing Dr Gibson.

Unsurprisingly, mathematics showed up in a number of ways in various parliamentary matters, but rather more surprisingly it seems to be the case that MPs are often taken out of their depth by such events. An example is in instances when they are asked to comment on the various statistics that they are quoting and they become inhibited by the lack of a background knowledge which would enable them to answer correctly. If one states that there is an 8% increase in applications for a certain programme, what is the baseline that one has in mind? Year 1997 or year 2006 or the 10 year period in between? If we have an increase of 0.5% of spending on a matter this year as compared to the last year, when we had a decrease of 0.5% compared to the previous year, is it clear to everybody that we are still spending less now than 2 years ago on the matter in hand? A minister was clearly baffled by such issues at a Select Committee Meeting we witnessed. In spite of such situations it would appear that many politicians we met did not quite appreciate that there is a role for mathematics in the political life.

In addition to the obvious need to understand and quote statistics correctly, here are some rather interesting ways contemporary mathematics influences political matters. The first example we take is the problem of transport. In the 18th century Euler proved that it is not possible to walk the 7 bridges of Koenigsberg/Kaliningrad by

crossing each bridge exactly once, no matter where one starts.



This is a simple example of a transport problem where one needs to optimise the route but the mathematics gives a limit to what can be done. This type of problem, raised to an incomparably more complex degree of sophistication and difficulty, is the subject of mathematical Graph Theory, see e.g. [1]. This is one of the many scientific elements one needs to study to devise transportation networks.

Another example we can take is in the area of IT. This may come as a surprise to some, but there are every day problems stated in mathematical terms that simply cannot ever be solved by a conventional computational approach. A famous example is a problem in which one is given a list of four hundred applicants for accommodation in which one hundred applicants will be accommodated in fifty duplex houses. However, there is also a list of incompatible pairs of applicants where no pair from the list should be neighbouring in the same house. It is very easy to check if any proposed ranking of these applicants satisfies the requirements. However, to actually generate a satisfactory ranking from scratch by checking all possibilities is basically impossible, the number of calculations that would be needed is larger than the number of atoms in the known universe! So we or our successors on this planet can never hope to build a supercomputer that can solve this type of problem by simple calculations. We may hope that it can be done by more ingenious programming (as indeed is the case with the example given here). It is one of the outstanding open problems of Computer Science and Mathematical Logic to determine if there are computational problems of this type that cannot be solved using any sort of intelligent programming, and genuinely require new sort of computers. This is known as the P versus NP problem, see [2] and it is one of the seven outstanding problems of mathematics for the 21st century, known as Clay's

Mathematical Institute Millennium list. Each of these problems has a one million dollars prize attached to it.

Mathematical aspects of politics and policy making quite clearly appear on the agenda of the Civil Service. There are many scientists working in and for the Civil Service. For example the Department of Transport employs a PhD mathematician involved in modelling and understanding of transportation networks. There are not that many scientists, in particular there seem to be no mathematicians, working in Parliament itself.

In addition to saving MPs from potentially embarrassing situations, we feel that there would be a public benefit in a closer engagement of the MPs with Mathematics. Not only would this allow for a more useful dialogue on scientific issues within Parliament but it would also allow the MPs to bring back to their constituencies an appreciation of the role mathematics has to play in every day life and in the future, nicely rounding the government's idea of increasing numeracy on a wider front. We are developing the idea of a week-long school of basic mathematical and statistical techniques to be taught to interested MPs. One clear impression that is to be had of the MPs is that they are able to learn a lot and on various issues within a very short period of time and therefore we are optimistic that such a school would significantly improve the mathematical background that we feel MPs need to have in modern politics.

References

[1] Berge, Claude & Ghouila-Houiri, A. (1962), *Programming, games and transportation networks*, New York: John Wiley & Sons, Inc.

[2] Cook S, *The P versus NP problem*, http://www.claymath.org/millenium/P_vs_NP/pvsnp.pdf