

On Appel Index of MATH/CHEM/COMP Conference

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Key words An index measuring the mathematical content of an interdisciplinary area is described and calculated for the MATH/CHEM/COMP conference. Some further areas of application of this index in mathematical chemistry are indicated.

Appel index

INTRODUCTION

It is of utmost importance for any conference in an interdisciplinary or multidisciplinary area to maintain a proper balance of contributions from its constituent basic disciplines. Unfortunately, it is not always easy to determine such quantities; detailed knowledge of the area is a necessary prerequisite. For the members of the scientific committee of the conference such a knowledge may be safely assumed, but for a mortal considering to attend the conference this is not always the case. We present here a simple method, proposed by Appel in Ref. 1 (no, not that Appel of the Four Color fame), that enables one to easily determine the mathematical content of a given conference, or more generally, of a given interdisciplinary area. The method requires no specialist knowledge; all that is required are old conference proceedings, elementary reading and counting abilities and a software capable of plotting simple graphs. As a case study, we apply this method to the proceedings from the last eleven MATH/CHEM/COMP conferences and analyze its degree of mathematicity. Finally, we indicate some further possibilities of application of this method in mathematical chemistry.

THEORETICAL FOUNDATIONS

The method of determining the mathematical content of a given area rests on the following key observation, made by Appel:¹

When writing a joint paper, mathematicians order their names alphabetically, while other scientists use different criteria to order their names, but only rarely the alphabetical one.

For example, the chief of the lab goes first, or last; or the host goes first or last; or the one with money goes first, or last; or the one that did most of the work goes first, or last; or the most senior author goes first, or last. The reader can, probably, continue the list by some equally imaginative examples from his own experience.

There may be an objection that this is not always the case, but for the sake of the story, we will stick to this observation, and take it as an axiom. Assuming it as an axiom, we will make no attempts to explain the key observation. One possible explanation, offered by Shalosh B. Ekhad,² and not necessarily supported by all authors of the present article, is that mathematicians are inherently nicer and less competitive, while other scientists have a pecking order.

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Table I. The Appel index for the MATH/CHEM/COMP conference by years

Y	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
$\aleph(Y)$	0.000	0.110	0.240	0.145	0.220	0.000	0.140	0.230	0.430	0.220	0.095

Of course, it is possible that the names of authors appear in alphabetic order even on a paper jointly written by non-mathematicians. The probability of such an event is $1/k!$ for a paper with k authors.

Suppose, now, that in a particular community of authors fraction p are non-mathematicians and $1-p$ are mathematicians. Then the probability that a given k -author paper is signed in alphabetic order is $(1-p) + p/k!$.

The second term describes the probability that the names of k non-mathematicians on a joint paper appear in alphabetic order.

If there are n_k k -author papers, $k \geq 2$, the probability of having exactly a_k alphabetic k -author papers for all $k \geq 2$ is given by

$$L(p) = \prod_{k \geq 2} \left(1 - p + \frac{p}{k!}\right)^{a_k} \left(p - \frac{p}{k!}\right)^{n_k - a_k} \binom{n_k}{a_k}.$$

Now, take a pile of conference proceedings, and determine n_k and a_k for all $k \geq 2$. (Unfortunately, single-author papers carry no information, at least no information relevant for our purpose.) The problem is now to determine the most likely value of p to produce these proceedings. In other words, we want to maximize the function $L(p)$. The easiest way to do this (and still good enough for our goal) is to plot the function $L(p)$ for values of p between 0 and 1 and to read off the approximate position of the maximum. The resulting value p_{\max} we subtract from 1 (remember, we want to determine the fraction of mathematicians) and call this quantity the

Appel index of the considered conference. (The name of Appel factor was proposed in reference,² but we prefer the term index. The reason is that there are many other indices in mathematical chemistry. On the other hand, the term factor appears also in context of sun-protecting lotions, and the first association of many Croatian readers may be very far from the field of mathematical chemistry, or even science at all.) The Appel index of a given conference C we denote by $\aleph(C)$.

THE MATH/CHEM/COMP CONFERENCE: A CASE STUDY

As a case study of the applicability of the Appel index to mathematical chemistry, we consider the MATH/CHEM/COMP conference. The conference seems almost ideally suitable for this purpose, due to its interdisciplinary character, long tradition and excellent record in the form of books of abstracts. The Appel index was calculated for the years 1991–2001. The results are summarized in Table I and graphically presented in Figure 1.

From the data in Table I we can compute the average of Appel index of the conference over the last eleven years. This quantity is equal to 0.166. It means that the conference is only 16.6 % mathematical. Is it enough for the conference that proudly puts mathematics on the first place in its name, we leave to the reader to decide. Certain comfort can be found in the fact that overall trend seems to be improving, as indicated by the positivity of the leading coefficient in the line of the best fit. The best

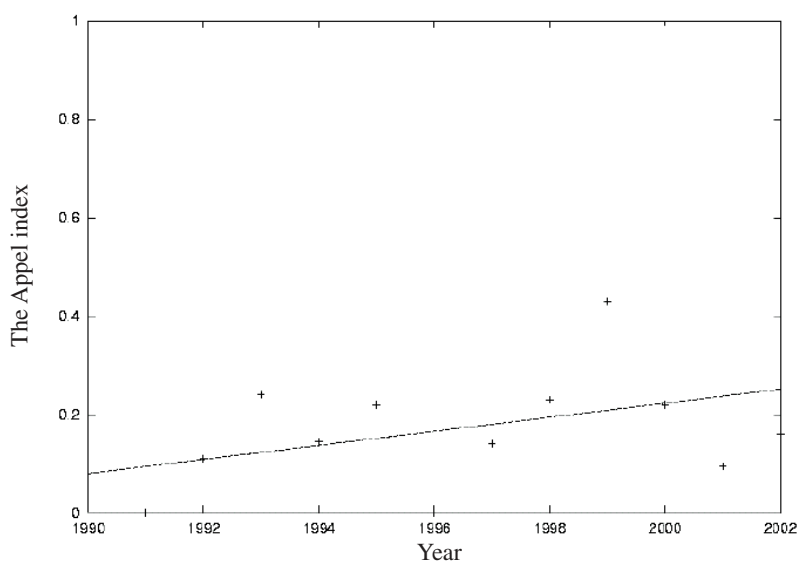


Figure 1. The Appel index for the MATH/ CHEM/ COMP conference by years and the line of the best fit.

linear fit is given by $y = 0.0143(x - 1990) + 0.08$. Thus, the mathematical content of the conference is growing at the rate of about 1.4 percent by year. We hope that this analysis will help the reader to determine in which year(s) the conference will be (or had been) just to his taste.

As a kind of a control experiment, we have also computed the Appel index for the DU'2000 NMR conference, and found it to be zero, in full accordance with our expectations.

FURTHER RESEARCH

As it was noted by author of reference,² the Appel index can be calculated not only for conferences, but also for the bibliography of any interdisciplinary book. It would be very interesting to determine the Appel index for the chemical graph theory, as given in the bibliography of

Ref. 3. Also, extending the Ekhad's line of thought, it would be interesting to analyze trends of Appel index of some interdisciplinary journals, such as *Match*, the *Journal of Mathematical Chemistry* and the *Journal of Chemical Information and Computer Sciences*.

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SAŽETAK

O Appelovome indeksu znanstvenih skupova MATH/CHEM/COMP

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Opisan je indeks koji mjeri matematički sadržaj danoga interdisciplinarnoga područja. Izračunane su vrijednost toga indeksa međunarodnih znanstvenih skupova MATH/CHEM/COMP i navedena neka područja moguće primjene toga indeksa u matematičkoj kemiji.