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## Scientific dialogue in interactive digital media

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### 1. Revolutions in scientific communication

In the second half of the 17<sup>th</sup> century the introduction of scientific journals like the “Journal des Sçavans” or the “Acta Eruditorum” caused a revolution in scientific communication. Whereas up to then scientists privately communicated by means of letters or publicly communicated mainly by writing pamphlets and publishing books, the new journals opened up new avenues of communication in the republic of letters. These journals appeared at relatively short intervals and provided the opportunity to report on one’s own research or, by writing reviews, to report on and criticize the work of others, for scientists all over Europe to read and to respond. What changed was, on the one hand, the degree of publicity of scientific enterprises and, on the other, the amount of interactivity that was created by the new media. And finally, the speed of publication was a factor to be noted, very much like in the case of the newly-invented newspapers 50 years before. But it was obviously more than that. Making all this recent research available to the scientific public and opening up opportunities for discussion also changed modes of research qualitatively. Maybe the most import factor was the sparking-off and channeling of a multitude of controversies which contributed to the confrontation and clarification of theoretical views and empirical results and thereby helped advance science in an amazing way. In Marcelo Dascal’s words: “Controversies are indispensable for the formation, evolution and evaluation of (scientific) theories, because it is through them that the essential role of criticism in engendering, improving, and controlling the “well-formedness” and the “empirical content” of scientific theories is performed (Dascal 1998, 147). But generally speaking, it was the *combination* of information on new discoveries and theories with critique and controversy which formed a constellation of forms of communication which helped to advance science in a way that was inconceivable before.<sup>1</sup> One of the most fascinat-

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<sup>1</sup> On the historical pragmatics of controversy cf. Fritz (2008) and Fritz (2010).

ing elements of this development was the rise of the scientific research article which evolved as a new genre of scientific discourse, competing with pamphlets and books.<sup>2</sup>

Recent developments in digital technology have initiated changes in the practice of scientific communication which are comparable to the revolution in scientific communication brought about through the introduction of scientific journals. As observers and historians of scientific communication we are today in the happy position to be able to follow the progress of evolving digital media and genres of communication in our own present time.<sup>3</sup>

## **2. Digital formats and forms of communication**

In the last few years various formats of digital communication on the internet have opened up new perspectives for scientific dialogue. In addition to providing a space for factual scientific information, formats like mailing lists, discussion groups and weblogs (blogs) are used as platforms for critical reviews and polemical exchanges. Open peer review journals not only organize a publicly transparent review process, but also encourage authors to reply to criticism and permit a wider scientific public to join in the critical discussion. Generally speaking, there are two factors which immediately come to mind as characteristic of the new media, i.e. the increased speed both of the diffusion of information and of interactive responses and the enormous width of public availability of information and participation. One of the interesting questions concerning such a development is whether, like in the 17<sup>th</sup> century, these innovations will actually change fundamental aspects of the practice of science and, if so, in which way and in what forms of variation to be found in different scientific communities. There are indications that changes of a considerable magnitude can indeed be expected. Some authors already speak of a new perspective on science, termed “cyberscience” (cf. Nentwich 2003, Nentwich 2010).

Viewed from an evolutionary perspective, we would expect in this situation the typical combination of innovation and inertia which is generally characteristic of the introduction phase of new media. And in fact traditional rules and patterns of communication show up in the practice of the new formats, but there are also new communicative tasks which call for new or modified communicative principles and strategies and also for the development of new

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<sup>2</sup> Gross/Harmon/Reidy (2002) track the progress of the scientific research article as an evolving genre of scientific discourse.

<sup>3</sup> The present paper is based on recent research done in a project on “Scientific information, critique and controversy in digital media”, which is being conducted at the Center for Media and Interactivity of the Justus-Liebig-University, Gießen (Germany) and which is funded by the VW Foundation. I gratefully acknowledge input given by the members of the project, in particular Anita Bader and Thomas Gloning. I am also grateful for having had the opportunity to discuss the Makarieva controversy with Marcelo Dascal.

text types. In many cases innovations of practice are established implicitly, in other cases, however, new problems are explicitly mentioned and possible solutions to new tasks of communication are extensively discussed by moderators and other members of the relevant communities.<sup>4</sup> So, to get a realistic view of the actual practice of communication in the various new digital formats one has to provide a detailed analysis of actual “threads” in the respective formats, including quantitative data, and supplement this with an examination of the reflexive moves in such communications.<sup>5</sup>

Looking at the various formats of digital scientific communication, we find specimens of a wide variety of types of individual contributions (“postings”) and of interactive sequences (“threads”), i.e. minor forms of communication, of which I shall only mention a small selection in this paper and of which I shall only deal with an even smaller number in more detail.

Starting off with mailing lists as a relatively old format, which was first introduced in the middle of the 1980s, its original inventors thought of them as information channels and discussion forums. A typical mission statement can be found on the starting page of the Humanist Discussion Group: “Humanist is an international online seminar on humanities computing and the digital humanities. Its primary aim is to provide a forum for discussion of intellectual, scholarly, pedagogical, and social issues and for exchange of information among participants.”<sup>6</sup> It is interesting to see that in the early history of mailing lists there was a degree of uncertainty as to what the tasks of the new format should be. A very interesting discussion was reported by one of the initiators of the *Humanist* list, Willard McCarty, in 1992:

„Within the first few months of its history, complainants sorted themselves out into two doctrinally opposed groups. The “radicals” (as I will call them) tended to declare that HUMANIST should provide a totally unrestricted forum for discussion without any formal structures whatsoever; the “reactionaries” (again my term) that material of insufficiently high quality should be rigorously excluded. In essence, both groups appeared to be interpreting e-mail as a variant of a former medium – for the radicals it was oral conversation, gloriously magnified; for the reactionaries, formal publication, wonderfully cheaper and faster – but neither really saw it as something new. They tended to see divergent features of the new medium as faults. Some had ideas about how these faults could be repaired, others took them as evidence of irreparable shortcomings, hence the unimportance of the whole enterprise HUMANIST represents.” (McCarty 1992, 213)

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<sup>4</sup> For an evolutionary perspective on recent developments in digital formats and forms of communication cf. Bader/Fritz (2010).

<sup>5</sup> As Renear and Palmer note in a related context, we need “finer-grained methods that analyze what scientists actually do and value” (Renear/Palmer 2009, 832). The present project aims to provide such methods.

<sup>6</sup> URL: <http://digitalhumanities.org/humanist/> (25.02.2010)

Typical information provided in mailing lists included and still includes calls for papers, reports on conferences, announcements of currently available jobs, and notices and reviews of new publications. But one also finds more personal postings like death notices, as could be witnessed in the ARGTHRY discussion list a few weeks ago, when a member of the list drew the attention of the other members to the death of Michael Leff, President of the Rhetoric Society of America.<sup>7</sup> This posting triggered a whole thread with postings expressing sadness, including longer personal tributes and references to obituary notes in other digital media. This type of posting shows that mailing lists also contribute to a process of community building, although they are not generally counted among the “social media” characteristic of Web 2.0, like blogs and *Twitter*. Another interesting type of exchange often arises from requests for information, which initiate longer threads of information-giving moves. On the Lingtyp mailing list (within LINGUIST List) a linguist asked on 07.08.2007: „I'm looking for instances and references concerning personal pronoun borrowing [equivalents of I, YOU, HE] in Eurasia”.<sup>8</sup> A day later he posted: “During the last 24h I received a total of 17 e-mails on-list and off-list regarding my query. Thank you very much for answering and providing both references and further examples!“ This is characteristic of the speed and effectiveness of digital interaction which one often finds on these lists. Sometimes such requests for information also start discussions, as in the case of a longish thread on the problem of the dating of “Beowulf” by means of metrical and linguistic criteria, which was initiated in the ANSAXNET discussion forum by a posting (01.03.2007) mailed by Geoffrey Russom, asking if there had been any “significant response to Fulk’s book (A History of Old English Meter)” which he might have overlooked. There ensued “an energetic exchange”, as one participant put it, with 64 postings in five days and a remarkable division of opinions. A similar discussion on “orality versus literacy” in Anglo-Saxon literature was also sparked off by an information request by Russom a year later in the same mailing list (61 postings from 21 participants within seven days, starting on 11.02.2008).

Another type of move frequently initiating discussions and even full-blown controversies is the publication of a review. I shall present a short analysis of such a controversy later on, so I shall leave it at that at the moment. Generally speaking, there was a considerable amount of discussions in the early days of mailing lists, which, however, at least in many lists, diminished in the course of time, changing some lists from discussion groups to service lists. In order to counterbalance this tendency and to initiate high-quality discussions, the editor of the *Shaksper* mailing list – original spelling, no misprint – created so-called RoundTables on

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<sup>7</sup> Address of ARGTHRY: [ARGTHTRY@yorku.ca](mailto:ARGTHTRY@yorku.ca)

<sup>8</sup> URL: <http://linguistlist.org/> (25.02.2010)

selected topics. His idea how such a RoundTable should be organized is very interesting, so I shall quote from his programmatic statement in some detail (Saturday, 9 December 2006):<sup>9</sup>

Focused Topic: Each topic will be of current academic interest to the discipline of Shakespeare or Early Modern Studies.

Guest Moderator: A Guest Moderator (GM) will be responsible for initiating, moderating, directing, and concluding the discussions.

Reading List: A Reading List of three to five items suggested by the Guest Moderator will be available on the SHAKSPER server for a limited time as if they were set aside in a reserved collection in a library.

The readings will be announced at least two weeks before discussion begins and anyone participating will be expected to be thoroughly familiar with them.

Digest of RoundTable Postings: Once a week, on Tuesdays, a digest of RoundTable postings (clearly identified as such to distinguish it from daily SHAKSPER discussions) will be distributed to the membership. The Guest Moderator will initiate the discussions with, for example, a question and will organize and comment on the week's submissions before suggesting the direction that discussions should follow the subsequent week. [...] The Guest Moderator will determine, announce, and conclude discussion of the topic. The final digest in a RoundTable thread will be the Guest Moderator's summary statement. After an interim, another RoundTable will begin.

The first *Shaksper* RoundTable on “Presentism” was quite successful, so this could be a model of how to create focussed discussions in mailing lists.

A certain degree of erosion of mailing lists was speeded up by the advent of scientific weblogs around 2000, so that there is, in some quarters, the growing conviction that mailing lists are about to be superseded by blogs and possibly other formats. In September 2007, Mills Kelly, Professor of History, prognosticated the death of mailing lists in a blog posting with the title „The end of H-Net?“, at least for the field of History:<sup>10</sup> „But the objective measure of traffic—at least in this small snapshot—seems to indicate that H-Net has ridden the email horse a little too long. Given the rapid growth in history blogs as a way for those in our discipline to communicate with one another, I suspect that more and more scholars and teachers are turning away from email and to the newer forms of scholarly communication.“

Weblogs, which have been gaining ground in the last seven or eight years, started off as a means for individuals to post remarks on their life and opinions to a wider public. But this

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<sup>9</sup> URL: <http://www.shaksper.net/> (25.02.2010)

<sup>10</sup> URL: <http://edwired.org/?p=204> (06.03.2010)

format has been increasingly also used in scientific contexts. A case in point is the blog *Language Log*, which is devoted to linguistic topics and which has long passed the two million visitor mark.<sup>11</sup> This is a group blog, i.e. a blog produced by several authors, which is not uncommon among science blogs. A selection of posts from this blog was published some time ago in print (Lieberman/Pullum 2006), which, of course, is an interesting filiation of media. In the introduction to this book, the authors mentioned some of the advantages of writing blog postings instead of using traditional publishing channels, of which three can be gleaned from the following passage: “Refereed journal articles often take 15 months to get refereed and revised and resubmitted and reviewed and copy-edited and typeset and proofread and printed and bound and distributed to people who can pay the huge prices that many professional journals charge or who have access through university libraries. The first responses in print may take another 15 months or more. Full and widespread appreciation of the contribution of an article might take 15 years. On *Language Log*, you can see your stuff published where everyone in the world can see it for free just 15 seconds after you write it, and you often have some feedback in 15 minutes. That’s an improvement of four or five orders of magnitude. It’s scholarship on methamphetamines. Publication for speed freaks” (Lieberman/Pullum 2003, xvi). Rhetoric aside, this passage mentions speed of publication, open access for everybody, and interactivity as essentials of blog publishing. As for the aspect of interactivity, many blogs today have a comment option for readers to post their opinion on the published blogs. However, it is still a minority of blogs that permit comments on comments, which would enable the users to create discussion threads of the type known from mailing lists. From the point of view of the average academic, writing scientific blogs is still a new experience for many people who are used to writing fairly long papers in journals and collected volumes. There is obviously a new text type evolving here, or rather a family of text types, which have in common that instances of these types should be short, to the point, maybe not too serious and, if possible, high-quality, raising important questions or drawing attention to interesting answers published elsewhere. These criteria are not easy to meet, but *Language Log* is certainly a place where some exemplars of these text types can be found. Another high-quality scientific blog of a different type that is worth mentioning is “*The n-Category Café*, a group blog on math, physics and philosophy”.<sup>12</sup> This is a blog for specialists in higher category theory and similar exotic fields. But it does not take a specialist to realize that the postings, both

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<sup>11</sup> URL: <http://www.languagelog.com>. (25.02.2010) A similar type of blog is represented by the German “Bremer Sprachlog”, which was active from 2007 to 2010. Its owner, Anatol Stefanowitsch, recently moved to a scientific blog portal: <http://www.wissenslogs.de/> (25.02.2010).

<sup>12</sup> URL: <http://golem.ph.utexas.edu/category/> (25.02.2010)

blogs and comments, are highly professional and goal-orientated and, at times, also amusing. This blog, incidentally, is known for having cast doubt on the scientific quality and respectability of a well-known scientific journal (“Chaos, Solitons and Fractals”, published by Elsevier) and its editor, Mohamed El Naschie, an information that hit “traditional” media like newspapers about two weeks later and which finally forced El Naschie to resign from his editorship.

This blog is also remarkable in that members of the group noticed a disadvantage of their blog format and decided to remedy this by supplementing their blog with a second format. What they noticed was that in the course of long discussions valuable information tended to get lost through the additive documentation of the blog format. One of the protagonists of this blog, John Baez, wrote: “Urs [another protagonist, GF] has written tons of material. But a blog is not optimal for finding all that material. A blog is great for conversations, but we need something that's more like an enormous collection of papers organized according to subject” (02.09.2007). A few days later, the colleague mentioned by John Baez specified what the format he envisaged should be like: “...in general, I imagine a place where we don't heap posts on top of each other but gradually refine and evolve the existing material to ever greater heights of perfection (ahem)” (Urs Schreiber, 07.09.2007). The solution to this problem finally consisted in the creation of a wiki called “*n*-Category lab” in November 2008. The distribution of roles between blog and wiki was described as follows: “This is a joint collaborative laboratory dealing with *n*-dimensional Mathematics, Physics and Philosophy. It has grown out of and is attached to the *n*-Category Café. You come here to work and go there to chat” (Urs Schreiber, 28.11.2008). On its present HomePage this wiki is characterized in a similar way: “This is a *wiki*-lab for collaborative work on Mathematics, Physics and Philosophy – especially from the *n*-point of view: insofar as these subjects are usefully treated with tools and notions of category theory or higher category theory. We think of this wiki as our lab book that we happen to keep lying around openly. We originally designed this place as an adjunct to the *n*-Category Café, but it's more independent now”.<sup>13</sup> So what we have here is a combination of media formats which are functionally differentiated and which complement each other in fulfilling the communicative needs and requirements of scientists.<sup>14</sup>

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<sup>13</sup> URL: <http://ncatlab.org/nlab/show/HomePage> (25.02.2010)

<sup>14</sup> On the use of combinations of digital media in scientific communication cf. Fritz/Bader (2010).

### 3. Scientific controversies in digital media

#### 3.1 Areas and contexts of controversy in digital media

As I mentioned at the beginning of this paper, controversies can be considered an efficient motor of scientific progress. So it could be a measure of the success of the new digital science media, if one could show that these media encourage fruitful controversies. Now there is no simple answer to the question if this is the case. On the one hand there are indications that many scientists shun controversies because they feel they are likely to be harmful to their reputation, because it is not obvious that they produce results, and because, therefore, they tend to be seen as a waste of time. For scientists in this frame of mind, online controversies appear particularly dangerous on account of their speed and their wide distribution. On the other hand there are certain topics and certain contexts where controversies are rife. Typically, controversial topics are topics on the borderline between science and politics and ideology, e.g. climate controversies or controversies on creationism and similar topics. In many cases where discussions on such topics are conducted on mailing lists or blogs there is a tendency for ideological dogmatists and other destructive participants (“trolls”) to intrude on and even dominate such discussions, which makes them less attractive for “genuine” scientists. I shall mention a comparatively mild example of this type of thread later in this section. Finally, there are high-quality discussions in mailing lists, blogs and open peer review journals, which are often sparked off by new scientific publications in paper or online media. Frequently, the starting point for such a controversy is a review of a new book or a paper submitted for publication in an open peer review journal. Whereas the open peer review process is specifically geared towards an interactive procedure, discussions of reviews are still up against the prejudice that an author should not reply to his reviewer. This principle is still fairly well established, although it is by no means a necessary precondition of a successful reviewing process, as the early history of reviewing in the 17<sup>th</sup> and 18<sup>th</sup> centuries shows. In the 18<sup>th</sup> century, for example, it was not only perfectly acceptable for an author to publicly discuss a review of his book with his reviewer, but there were actually journals which specialized in counter-critique (“Antikritik”).<sup>15</sup> So one remarkable innovation in digital scientific media seems to be the revival of the practice of interactive reviewing, a practice which was all but lost in traditional review journals. I shall reflect in more detail on two instances of such reviewing controversies in the following sections of my paper.

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<sup>15</sup> On the history of reviewing in the 18th century cf. Habel (2007).

Before going on to discuss these two controversies I shall give an example of an exchange which shows elements of serious discussion and intrusions of trolling and which is particularly remarkable for the fact that the topic moves from one medium to another, so that we find a constellation of media dealing with this topic.

On July 30<sup>th</sup>, 2008 a paper with the title “Dinosaurian Soft Tissues Interpreted as Bacterial Biofilms“ by T. G. Kaye and his collaborators appeared in PLoS ONE, an interactive open-access journal for the communication of peer-reviewed scientific and medical research.<sup>16</sup> This paper was a critical reaction to earlier studies by Mary Higby Schweitzer and her associates, who had claimed to have identified and isolated soft tissues from a 68 million year old fossil bone. The paper by Kaye et al. was discussed in several postings to PLoS ONE from August 8<sup>th</sup> to August 22<sup>nd</sup>, some of which defended the claims of Schweitzer et al. On the day of its publication in PLoS ONE, Tara C. Smith, an Assistant Professor of Epidemiology, summarized the article by Kaye and part of the earlier controversy on her own blog *Aetiology* and explained its main point to non-specialists:<sup>17</sup>

An interesting new paper is just out today in PLoS ONE. You recall the announcement a few years back that soft tissue that resembled organic tissue had been isolated from a Tyrannosaurus femur. This started off a huge controversy in the field (and beyond) – researchers disagreeing with each other whether the structures seen were indeed blood cells and vessels; creationists crowing about how this finding represented "proof" that the earth was indeed young and dinosaurs had existed just a few thousand years ago; and of course, talk of cloning and DNA analysis. On the side of "soft tissue = dino blood" were findings that reported identification of the iron-containing protein heme (potentially from the red blood cells) and morphology of cells and vessels similar to that seen in modern-day ostriches and emu. However, the new paper by Kaye et al. provides an alternative explanation: that the structures aren't actual vessels and cells, but are instead iron-rich bacterial biofilms. [...]

This blog is commented upon in 20 postings on July, 30<sup>th</sup> and August, 1<sup>st</sup> 2008. Two of the postings are particularly interesting from our point of view. The first is by Tom Kaye, one of the authors of the paper discussed on this blog:

Hello All,

Tom Kaye here from the paper. Since this seems to be the blog with the most activity, I will offer to answer any questions for the group.

Tom

Posted by: Tom Kaye | July 30, 2008 5:11 PM

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<sup>16</sup> URL: <http://www.plosone.org/home.action> (25.02.2010)

<sup>17</sup> URL: <http://scienceblogs.com/aetiology/> (25.02.2010)

The second one is by the owner of the blog, Tara C. Smith, who directly addresses Tom Kaye and mentions another blog, where there is a lively discussion on the same topic going on:

Hi Tom -

Thanks for stopping by! There's also a good discussion over at Panda's Thumb, where I cross-posted this. If you can ignore the trolls (the creationists etc.) there are some good questions you may be able to respond to over there also.

Posted by: Tara C. Smith | July 30, 2008 5:56 PM

The relevant discussion on *Panda's Thumb*, a scientific weblog on questions of evolution, comprises 122 comments from July, 30<sup>th</sup> to August, 15<sup>th</sup>.<sup>18</sup> Among these postings there are quite a number of serious, scientifically-informed contributions, e.g. by Gary Hurd, who mentions a number of objections to Kaye's paper which seem to speak in favour of the position of Schweitzer et al. To this Tom Kaye answers in a longish posting, explaining the aims and methods of his paper and solomonically suggesting that "a third party [should] come in with the proper team that can look at both sets of data and formulate the proper tests". But there is also at least one obvious anti-evolutionist with the following comment:

HR Pufnstuf | July 30, 2008 4:03 PM | Reply

The propagandists for the religion of evolutionism thought that the existence of soft dinosaur tissue would win them more converts until Christians pointed out what that would mean for their "millions of years" fantasy—so now, they are in backtrack mode!

This comment, including some quotations from the Kaye et al. paper, is given short shrift by one of the other commentators: „HR Pufnstuf vomits forth some weapons grade idiocy“. Kaye himself remarks on this episode: „I see there is the usual ID (i.e. Intelligent Design, GF) spam going on but if we can work around that I am willing to answer any reasonable questions“. So what we get on this blog is a mixed bag of serious discussion and facile polemics. And all this is happening on the very day the Kaye et al. paper was published. So, whatever the merits of this discussion were in terms of scientific progress, the author of the paper certainly got a remarkable amount of "attention space" (cf. Collins 2000, 38f.) within a short period of time, and if in science "success and failure is a function of the transmission of one's views" (Hull 1988, 361), the author doubtlessly achieved some success in having his views widely transmitted.

### 3.1 Discussing a review on a mailinglist

A first type of discussion following a review is represented by the material from the LINGUIST List section on "book discussion" which I shall now discuss. The LINGUIST List

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<sup>18</sup> URL: <http://pandasthumb.org> (25.02.2010)

is the biggest website for academic linguists, providing mailing lists for various sub-disciplines. The purpose of the book discussion section is presented as follows: “We strongly encourage discussion (including book authors if they so desire and their response is appropriate) of reviews. We do this because we feel the electronic medium allows us to provide a service that print sources cannot” (posting by Andrew Carnie, then moderator in charge of reviews, on October 3<sup>rd</sup>, 2000). In 2002, a notice by the moderator sounded even more inviting to authors: „What follows is a review or discussion note contributed to our Book Discussion Forum. We expect discussions to be informal and interactive; and the author of the book discussed is cordially invited to join in.”

On July 3<sup>rd</sup>, 2002 Joybrato Mukherjee published on LINGUIST List a review of the “Cambridge Grammar of the English Language” by Rodney Huddleston and Geoffrey K. Pullum, published in 2000 by Cambridge University Press. The ensuing controversy consisted of three further contributions, a response to this review by Pullum, posted on July 15<sup>th</sup>, a reply to this response by Mukherjee on July 20<sup>th</sup>, and a final reply by Pullum on July 22<sup>nd</sup>.

The content of the review can be described as follows: Mukherjee starts off by praising the “admirable achievement and the monumental quality of this volume“ and then goes on to give a synopsis of the content of the chapters of the grammar and to compare it with one of its competitors, the widely used “Comprehensive Grammar of the English Language” by Quirk et al. (1985). After these largely descriptive passages, Mukherjee turns to a critical evaluation of the grammar. His main points of criticism concern the presumed fact that this grammar is mainly based on one grammatical model, i.e. Generative Grammar, and that it is not “a genuinely corpus-based description of English” like the one published by Biber et al. (1999). There are also some minor objections concerning the lack of „multiple analyses“ and the use of diagrams. Mukherjee ends on a conciliatory, if not exactly enthusiastic note: „Comprehensive as it is, the Cambridge Grammar is without any doubt a reference work that should be available to all grammarians. Whether it will gain a position similar to the Comprehensive Grammar after, say, ten years remains to be seen.“

In his response to this review, Pullum starts by mentioning Mukherjee’s two main objections: “He criticizes CGEL for not being corpus-based, and for adopting analyses on grounds of dogma rather than evidence.” He then berates Mukherjee for making misattributions with respect to the grammars mentioned and accuses him of failing “to show respect for textual evidence”, the latter remark being a classic tit-for-tat move. He then asserts that “all his negative criticisms of CGEL rest on false claims” and decides to “offer a brief response to

half a dozen especially egregious ones”. He now numbers his objections from 1 to 6 and deals with each one in detail. (I cannot go into this detail here.)

In his rejoinder, Mukherjee first voices his dissatisfaction with Pullum’s presenting his reviewer as “someone who lacks even basic reading skills” and announces his intention to correct this picture. He then takes up all Pullum’s objections and deals with them point by point in the order presented by his opponent. This procedure, which is a traditional pattern of topic management in scientific controversies, often leads to longish texts. This is also true of Mukherjee’s rejoinder, which amounts to 3698 words, including references. His treatment of individual objections includes the discussion of conceptual problems, theoretical arguments against Pullum’s position, and the giving of counterexamples and references. So this contribution to the controversy is very much in the tradition of scientific writing as we find it in books and articles, but not normally as a defence of a review.

In the final contribution to the controversy, Pullum uses a very interesting strategy, which consists in claiming that “despite the trappings of squabble and a charge of “strangely offensive tone”, much agreement emerges on matters of fact”. He then goes on to enumerate 10 points of agreement, which he briefly deals with in the course of his posting. If one looks at these points closely, one realizes that Pullum does indeed accept some of Mukherjee’s minor complaints, but that his presentation of “agreement” mainly serves to assert his own position in the controversy. At one point, he admits that in the discussion he “took the liberty of a little *ad hominem* dig in the ribs against Mukherjee”. And finally, he acknowledges that “Mukherjee’s review made numerous statements about *The Cambridge Grammar* in terms of high and unreserved praise”, that he “noted those generous and positive remarks”, and that “all the collaborating authors of the book were flattered and gratified to read them.” So, in spite of a polemical note here and there, politeness and a factual tone prevail.

If one had to evaluate the quality and the usefulness of this controversy, two aspects which are relevant for the assessment of this kind of online exchange, one would probably agree that this exchange of arguments came up to the standards expected of scientific discussions and that it contributed to the clarification of the positions involved. For the opponents, the discussion provided an opportunity to broadcast their views, and for novice grammarians and non-specialist linguists it provided an introduction to a major conflict in present-day grammar writing between theory-based and corpus-based conceptions. Considering in addition the comparative speed of publication and its wide distribution, this type of review-cum-discussion on mailing lists or blogs can certainly be considered a useful addition to the media of scientific dialogue. Of course, this type of dialogue forces reviewers to take into account

the fact that their review may be severely scrutinized and criticized, and it possibly confronts authors with the obligation to answer criticisms voiced in a review. In both cases, the interactive procedure changes the roles of reviewer and reviewee.

### 3.2 Controversies in public peer review

A different type of communication between reviewers, reviewee(s) and the scientific public can be found in public peer review journals, which aim to make the reviewing process for the acceptance of research papers more transparent and, in some cases, publicly accessible. Among the new open access journals we find different versions of the reviewing process, which vary as to the amount of interactivity and transparency in the different phases of the reviewing and publication process. One variant is represented by *PLoS ONE*, an open access journal for all disciplines within science and medicine. In their mission statement the editors describe their reviewing process as follows “*PLoS ONE* will rigorously peer-review your submissions and publish all papers that are judged to be technically sound. Judgments about the importance of any particular paper are then made after publication by the readership (who are the most qualified to determine what is of interest to them).”<sup>19</sup> So in this case, we have a traditional reviewing process with an interactive open “reviewing” phase, sometimes called “open peer commentary”, after the publication of the paper. Another variant is represented by *Biology Direct*, an open access journal for the full spectrum of biological science. The journal’s reviewing policy is described as follows: “*Biology Direct*’s key aim is to provide authors and readers with an alternative to the traditional model of peer review. This includes making the author responsible for obtaining reviewers’ reports [from a panel of potential reviewers provided by the journal’s Editorial Board, GF]; making the peer review process open rather than anonymous; and making the reviewers’ reports public, thus increasing the responsibility of the referees and eliminating sources of abuse in the refereeing process.”<sup>20</sup> Compared with *PLoS ONE* the reviewing process is made more transparent by having the reviewers selected by the authors and by the subsequent publication of the reviews. What is still lacking in this system is a genuine dialogue between reviewers, reviewees and the public. A fully developed interactive reviewing process was introduced in 2001 by *Atmospheric Chemistry and Physics* (ACP), “an international scientific journal dedicated to the publication and public discussion of high quality studies investigating the Earth’s atmosphere and the underlying chemical and physical processes”. “*Atmospheric Chemistry and Physics* has an innovative two-stage publication process involving the scientific discussion forum *Atmospheric Chemistry and Physics*

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<sup>19</sup> URL: <http://www.plosone.org/static/information.action> (25.02.2010)

<sup>20</sup> URL: <http://www.biology-direct.com/info/about/> (25.02.2010)

Discussions (ACPD). [...] In the first stage, papers that pass a rapid access peer-review are immediately published on the Atmospheric Chemistry and Physics Discussions (ACPD) website. They are then subject to Interactive Public Discussion, during which the referees' comments (anonymous or attributed), additional short comments by other members of the scientific community (attributed) and the authors' replies are also published in ACPD. In the second stage, the peer-review process is completed and, if accepted, the final revised papers are published in ACPD.”<sup>21</sup> From the point of view of dialogue analysis, this type of interactive public discussion provides a remarkable complex of forms of participation and types of posting.

I shall now sketch some of the results of a case study on one of the most lively controversies conducted on the ACPD discussion forum, the discussion on a paper by A. M. Makarieva and two collaborators “On the validity of representing hurricanes as Carnot heat engines” (Atmos. Chem. Phys. Discuss., 8, 17423-17437, 2008). After having passed the preliminary reviewing process, the paper was published as a “discussion paper” on Sept. 19<sup>th</sup>, 2008. As they state in their abstract, the authors “argue, on the basis of a detailed critique of published literature, that the existing thermodynamic theory of hurricanes, where it is assumed that the hurricane power is formed due to heat input from the ocean, is not physically consistent, as it comes in conflict with the first and second laws of thermodynamics.” In the second part of their paper they outline an alternative explanation based on the description of an “atmospheric process occurring at the expense of condensation of water vapour that creates a drop of local air pressure”. It is interesting to see that in the ensuing discussion the main point of attack is the challenge presented by the authors to the widely accepted “standard theory” of hurricane formation.

The first public reaction is an anonymous referee comment by one of the reviewers, posted on Oct. 3<sup>rd</sup>, 2008, about two weeks after publication of the paper. (I shall call this reviewer R1.) It is worth mentioning that in this particular discussion all the referee comments are made anonymously, which is not always the case in this journal. In his posting, R1 only refers to part one of the paper and claims that Makarieva’s criticism of the standard theory rests on misinterpretations of the works of Emanuel, the most prominent representative of this theory. R1 mentions three particular cases, trying to show that Makarieva’s objections are unfounded. For one of these cases he points out that the problem in question had been exten-

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<sup>21</sup> URL: <http://www.atmospheric-chemistry-and-physics.net/home.html> (25.02.2010)

sively discussed in the literature, adding references to relevant publications. The following day, Makarieva answers, taking up R1's arguments point by point, trying to refute them, and suggesting, as a concession to the reviewer's position, the withdrawal of one section of their paper. On Oct. 12<sup>th</sup>, R1 answers, insisting on his criticism and adding the remark that the authors of the paper, who tended to focus their arguments on fundamentals of physics, should take notice of the state of discussion in meteorological science – even if they themselves were not members of this community. The latter remark obviously points to a conflict between meteorologists and theoretical physicists in this matter, which seems to lie at the back of much of this controversy. In the second part of his comment, R1 in turn deals with the three attempted refutations point-by-point, a classic procedure of academic disputation.

On Oct. 25<sup>th</sup>, the second reviewer (R2) posts a comment, in which he positively evaluates Makarieva's criticism of the physical foundations of the standard theory and also himself criticizes this theory as a "perpetuum mobile hurricane model", which is, of course, a highly polemical move. He praises the competing theoretical approach of Makarieva et al. as a plausible, elegant and strong explanation. Finally, he gives his assessment of the paper as a "groundbreaking contribution to science" and comes out in favour of a speedy publication.

So, by this time there is a strong division of conflicting positions in this controversy. This is also the point where the third reviewer (R3) comes in. On Oct. 29<sup>th</sup>, R3 posts his first public comment, asserting that he finds "this paper to be incoherent at the least" and that it "is not worthy of publication in any respectable journal". He states that the strong criticism of Emanuel's theory was not well-founded and claims that much of the Makarieva paper was incomprehensible and what he did understand was wrong. He concludes by repeating his harsh judgement.

By this highly polemical posting, R3 creates a rather difficult position for Makarieva et al., who still count on having their paper published. In their reply of Oct. 30<sup>th</sup> they use a double strategy of attempting to convince the reviewers of the well-foundedness of their criticism and of reflecting on the course of the discussion itself. They start out with a polite move, but immediately turn to an ironical criticism of the reviewers' activities so far:

"We appreciate the statement of Referee 3 that our claim about the violation of the laws of thermodynamics demands serious justification. We learnt already from the preliminary comments of Referee 1 that our critique, as it appears in the discussion paper (DP), cannot be easily understood by at least two highly qualified representatives of the meteorological community, as the ACP referees undoubtedly are. We then undertook a detailed expansion of our arguments (AC1), which we posted as early as on the next day after our paper was published on September, 19th. Any review process normally includes revisions from the authors' side, spe-

cially those aimed at better presentation clarity. The ACPD platform makes this process easily accountable. We therefore suggest that the referee might be interested in reading the previous comments in this discussion, as they carry the answers to all concerns expressed in the present review.”

With these moves they suggest that at least two of the reviewers are not really qualified to judge their paper and that these reviewers had not actually taken account of the arguments presented in Makarieva’s various postings. The authors then go on to point out their arguments and where they are given in detail and also expand on some of these arguments. The last part of their reply is particularly interesting, as it concerns the style of the controversy and fundamental principles of open peer review:

“Finally, we would like to note that, in our view, the open discussion platform of the EGU journal sets up a new and high ethical and cultural standard of the peer review process. In this context, statements like “this paper is not worthy of publication in any respectable journals” should perhaps be viewed as atavisms of the background private communication between the editor and referee during conventional close review process. When such statements are made in open public discussion potentially read by hundreds of people, especially in the view that the referee cannot follow “much of the argument here”, they can be classified as a public assault to both the authors as well as to all those discussion participants who sign their names under very different opinions as well as to the ACPD journal itself (who did publish the paper).

Moreover, in our view, the above statement of referee 3 goes against the journal’s interest not only in its form, but also in its essence. We believe that the main target of this discussion is to reveal the scientific truth. The discussion paper is citable, covered in Scopus and available for analysis. Indeed, we come up with a rare claim that a framework published in high-profile journals is based on the concept of a perpetual motion machine and is fundamentally incorrect. Our arguments are all here. In our view, if our paper were published in ACP, then the responsibility to respond to our critique would go to the author of the criticized framework, as the normal practice in scientific literature goes. If, on the other hand, the ACP declined our paper for publication in the second stage, as recommended by Referee 3, future readers of this discussion would ultimately decide whether or not the journal actually signed its official name (while Referee 3 remaining anonymous) among the defendants of perpetuum mobile and against a new approach to hurricane physics. In any case, however, we believe that this discussion has a very substantial value. We are very grateful to the journal for letting us express our views on its pages.”

This is a remarkable document, touching on various basic aspects of open peer review, e.g. politeness and fairness principles, the responsibilities of the participants, anonymity of reviewers, burden of proof in scientific argument, and the question of who is “judge of contro-

versies” in science.<sup>22</sup> For reasons of space I cannot here go into further details of this controversy, which consists of 35 postings, taken all together. I should, however, like to mention a few aspects which illustrate aspects of the ACP reviewing process.

Apart from the authors and the reviewers, there are four more participants in this controversy. Three fellow scientists post short comments in which they support the views of Makarieva et al. A fourth scientist, a Dutch physicist and meteorologist, posts a longish comment, in which he puts forward a number of objections against Makarieva’s paper and gives arguments in favour of the standard theory. This posting is answered in detail by Makarieva, which leads to a mini-discussion within the total controversy. It is this thread of postings which shows to advantage the potential of the ACPD system for involving specialists outside the circle of reviewers in the open reviewing process.

The final stage of this interaction is rather dramatic, therefore I shall, in a few words, sketch its course. After the period of discussion, Makarieva et al. produced a revised version of their manuscript which was published on February 14<sup>th</sup>, 2009. This manuscript was then evaluated by the reviewers and the handling editor. On April 27<sup>th</sup>, 2009, the editor report was completed and sent to the authors of the discussion paper, signed by the editor. This report, which was published on May 4<sup>th</sup>, 2009, contained the rejection of the paper:

“As editor, I would not want to reject a paper simply because it was unconventional and controversial, particularly if it was also potentially important. However, I am afraid that after due consideration I have decided to reject this paper for publication. This is because I do not believe that it reaches the standards required for publication in its present form and I do not see a straightforward route to changing it to make it publishable. If you wish to pursue publication of your ideas in this paper then my suggestion is that you might want to consider presenting them in a different way, perhaps as I suggest in my more detailed comments below.”

There follows a detailed critique of the paper, including quotations from the reviewers’ final reports. In this situation, the authors of the paper, as a last resort, appealed to the Executive Committee to reconsider this decision. But this appeal was not successful. However, the whole process was so difficult and unusual that the executive editor took it upon him to go over the whole material accumulated in this interaction again half a year later, together with additional reviewers, in order to reassess the decision not to publish the paper. In a very balanced statement, published on Oct. 14<sup>th</sup>, 2009, he asserted that he found the exchange of arguments between authors and referees interesting and challenging and that he appreciated the clear formulation and the mathematical precision of the line of arguments and comments of Dr. Makarieva and co-authors, that, however, he had come to share the referees’ doubts con-

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<sup>22</sup> For the problem of „the judge of controversies“ cf. Leibniz’s reflections on this question (Leibniz 2008, 55ff.).

cerning the validity of the fundamental underlying assumptions, and that he therefore confirmed the preceding decision by the handling editor. He then added that due to the publication policy of ACPD the discussion paper of Makarieva et al. remained permanently archived, publicly accessible, and fully citable, so that free speech and documentation had been guaranteed. He closed his posting by reasserting the basic principles of open peer review.<sup>23</sup>

From the point of view of dialogue analysis, the interesting point about this exchange and the framework in which it was performed is the potential and scope for fruitful public scientific discussion embodied in this type of reviewing process. As for the participants, this type of interaction provides new opportunities, but it also poses new communicative tasks. Reviewers have to keep in mind that their reviews will be publicly available for criticism not only by the authors, but also by the relevant scientific community at large. This calls for a high level of rational argumentation and commits the reviewers to principles of politeness and objectivity. So, in a way, reviewing is harder in this kind of framework. And, of course, having to answer objections to your review can be hard work. This might be one of the reasons why finding a sufficient number of qualified reviewers is one of the major problems of open peer review. Authors have the opportunity to have their work closely scrutinized before it is finally put in print and they have the chance to receive attention – once their paper has cleared the hurdle of access review –, whether their paper is finally accepted or not. On the other hand, they have the obligation to answer objections in public within reasonably short time, which can be quite a challenge and possibly a problem for their reputation. For authors of short comments this option provides the chance to take part in a public scientific discussion without having to produce a paper of one's own, and for the lookers-on it provides the opportunity to recognize conflicting views and to observe the arguments for these views being presented in actual performance.

## **4. Conclusion**

In conclusion, I should like to mention a few aspects of digital interactive science which have recently been discussed in various publications and to which the examples presented in this paper are relevant, e.g. the varying degrees of acceptance of digital formats across the disciplines, the time budget problem, questions of quality management, the matter of speed in interaction, and types of texts produced in these media.

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<sup>23</sup> In this case we have a double answer to the question of the „judge of controversies“: Within the formal reviewing procedure, it is the editor who is judge, however, ultimately it is the scientific community.

As is usual with innovations, there are always enthusiastic early adopters and reluctant late adopters, and everything in between. In the case of the use of digital media for scientific dialogue the line between users and non-users coincides, at least partly, with disciplinary boundaries. Some disciplines tend to be early adopters, as seems to be the case with many sciences, e.g. physicists, whereas others, like some arts disciplines, tend to be later adopters. Of course, there are many exceptions, from the field of history to Anglo-Saxon literature and Shakespeare studies. The examples in this paper range from meteorology over biology, medicine and mathematics to linguistics, argumentation theory and the humanities in general.

One major objection to the use of the new digital media is the time budget problem. Staying online, organizing a blog or a mailing list, and reading and writing postings of various kinds is time-consuming, and if the profit gained by participating in this kind of communication is doubtful, one might decide against taking part in dialogues of this kind. This is certainly one of the barriers against the wider acceptance of interactive digital media in scientific communication.

Among the advantages of the new media, speed of interaction is generally mentioned as an important factor. However, speed is an ambivalent factor. On the one hand, speed in interaction may contribute to productivity and possibly to the feeling of flow we get in good conversations. On the other hand, speed may impair the rationality of communication, leading to emotional upheavals and unreflecting reactions, which may result in face-threats and a loss of argumentation quality. And, of course, it sometimes simply takes time to think seriously about a complex problem, before one is ready to reply to a posting.

Quality management in interactive science is another general problem frequently discussed in connection with the use of recent digital media. Generally speaking, there is no un-failing guarantee of high quality, whether in print media or in digital media. However, when one looks at individual postings or whole threads in mailing lists or blogs and open review journals, one often finds well-structured and well-reasoned postings as well as attractive discussions. The protagonists of open peer review in particular insist on the fact that many shortcomings of close peer review can be avoided by bringing everything out in the open interactively, so that, according to their view, the quality of the review process is in fact enhanced by public peer review.

A final point I should like to touch upon is the question of text types. As in the development of the research article in the “new” journals of the 17<sup>th</sup> century, we find new scientific text types like short comments and blogs emerging in the new digital media. We still seem to be in an early stage of development of these text types, where people are experimenting with

the potential of these text forms and where there is little standardization. That standardization can sometimes set in rather quickly, however, can be seen in the case of scientists' home pages, which showed a great deal of variety in the 1990s and which are fairly standardized today, following functional principles.

Concerning all the points mentioned, there is still a great amount of research to do in order to get a fuller picture of what is actually going on in this field and to come to a well-founded assessment of the potential of different formats for the fulfilment of the tasks and requirements of scientific research and scientific dialogue.

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