

Emanuel Kulczycki, PhD
Communication Theory and Philosophy Department, Philosophy Institute
Adam Mickiewicz University, Poznan

Blogs and scientific services.

Scientific communication in culture of convergence

Abstract: *The development of the means of communication has led to significant changes in the functioning of science, as well as, in the way research findings are published. The paper deals with the subject of the academic blogosphere as an example of using new media in the process of the dissemination of science. Science communication with the use of Internet tools is beginning to operate in the paradigm of the convergence culture, combining the old with the new media in the process of knowledge distribution. The old media, not only has not been abandoned but it continues to be used and supported by new technologies (the role of social media in the process of science communication is discussed herein by using the examples of Twitter, Facebook and Google Plus).*

In addition to indicating basic historical and typological elements within the scope of functioning of science blogs, the paper presents the functions that a blog can offer to author-scientists, readers and the society. It examines the reasons and motivations behind starting a blog, as well as, the reasons for not blogging about science (e.g. a personal character of the blog, or an objective character of scientific information). The author attempts to draw the panorama of the Polish academic blogosphere (presenting an overview of projects and initiatives) and discusses blogging by using the example of his own blog, Communication researcher workshop (Warsztat badacza komunikacji). He presents blogs as a modern tool for scientific communication and examines the challenges and problems that could arise during the process of creating a science web service geared towards a wide audience (students, as much as, research fellows).

On the basis of works conducted on the vertical portal Science and Progress (Nauka i Postęp) created by the Poznań University of Technology, Polish Television in Poznań, as well as, the Marshal Office of the Wielkopolski Region, he points out the difficulties in the integration of the old and new media emerging in the process of promotion and dissemination of science. Among other sources, the analysis considers the studies conducted by TNS Pentor as part of a project, which led to the development of Science and Progress.

Keywords: *science communication, social media, academic blogosphere*

1. Science communication convergence

As a part of the scientific process, science communication has undergone dramatic changes along with the expansion of the Internet. The development of new tools now occurs rapidly and, more importantly, sometimes it transpires without the participation of the scientific community (researchers often do not know that special solutions are being created for them).

The newly created media do not destroy, but enable the evolution of the means of scientific communication used until now. The model of disseminating research findings via publication in scientific journals and books, as well as, through presentation on conferences, which has been in operation for so many years, has not been abandoned; instead, it is being supported by new Internet solutions, such as, blogs, social networks, microblogs and other services that make direct video broadcasting possible.

Viewing the old and new media as solutions that are working side by side as opposed to competing against each other, is tied to considering the current changes in modern

culture, namely in terms of the so-called convergence culture¹. Technological, industrial, cultural and social changes are transforming the circulation of media in such a way that content flow between them is devoid of obstacles. In this work, the reflections on the convergence culture serve as a background, exposing the dependencies occurring in modern science and culture; the convergence culture as such does not constitute the subject of this paper.

Media convergence (by providing new solutions and their permeation with the old) makes it possible for the users/amateurs to join in the process of content creation. This, in turn, results in such an amount of materials that their processing is possible only collectively (collective intelligence). The difficulties posed by reflecting upon the very definition of culture convergence, not to mention the problematic terminology of “culture” or “medium”, will not be dealt with in this work².

The key aspect of the subject considered herein is one, which highlights the issue of changes in science communication. Science communication is a process, which serves to³:

1. Inform about and promote the outcome of research (the aim is accumulation of knowledge).
2. Inform the society about the outcome of research studies conducted but scientists and scientific institutions (scientists informing the non-scientists).

It is a process (according to the theory of convergence communication of D. Lawrence Kincaid), which is not seen as a single action used to transfer information (as in traditional communication transmission models of, for example, Shannon-Weaver or Roman Jakobson), but as a continuous sharing of content⁴. This is why, in the convergence culture, influenced by shifts on all the mentioned levels, science communication has three important consequences, which transform the nature of this process.

1.1. First consequence: “Black box fallacy”

The term “black box fallacy” was introduced by Henry Jenkins, who used it in the convergence culture to describe the concept that, along with the development of new media and the dying out of old media, there will be one universal solution (a device) for the use and production of various content. However, it became known that new devices function next to the previous ones, and the user is thus exposed to a larger number of channels, which he needs to use in order to remain up to date in the subject of interest to him. Until recently, researchers and scientists (considering the

¹ See JENKINS, H. *Kultura konwergencji: zderzenie starych i nowych mediów*. Warszawa: Wydaw. Akademickie i Profesjonalne, 2007.

² More on the subject of the term media convergence can be found in: KOPECKA-PIECH, K. *Koncepcje konwergencji mediów*. *Studia Medioznawcze* 2011, no. 3 (46), p. 25; JASKOWSKA, B. *O kulturze konwergencji słów kilka*. *Biuletyn EBIB* [on-line]. 2008, no. 1 (92) [Cited 18.01.2012]. Available from Internet: <http://www.ebib.info/2008/92/a.php?jaskowska>; *Biuletyn EBIB: Kultura konwergencji — idzie nowe* [on-line]. 2008, no. 1 (92) [Cited 6.02.2012]. Available from Internet: <http://www.ebib.info/2008/92/>.

³ In English, the first definition of science communication refers to *scholarly communication*, while the second, to *science communication*.

⁴ KINCAID, L.D. *Convergence theory*. In: LITTLEJOHN S.W., FOSS K.A. (ed.). *Encyclopedia of communication theory*. Vol.1. Los Angeles: Sage Publications, 2009, pp. 188–189.

entire time span of the modern science practice) used physical libraries, and published their research findings in print journals and books, as well as, presented them in conferences. Nowadays, they use the same methods, however, additionally, they browse through digital collections, use research repositories, blogs, microblogs and social networks, as well as, search engines. In addition to print, also used are technological solutions that offer sound (podcasts) and image (vblogs).

1.2. Second consequence: Science 2.0 — new tools and amateurs

The consequence of this convergence of science communication is also e-science (Science 2.0). The term is a problematic one and it requires constant analysis. From the point of view of the present work, it is important to note that along with technological developments, used in the scientific process are blogs, social networking portals, and repositories, which enable the participation of “amateurs” in the scientific discourse.

On the level of science communication, these so-called amateurs are undergraduate or doctorate students who can create their own science blogs or Internet journals. Until recently, this group was excluded from the discourse in their area because participation required being published in peer-reviewed journals. It is worth noticing that this type of publishing has an informal character, such as electronic mail, conversations and discussion lists. In his introduction to *Open science guide (Przewodnik po otwartej nauce)*, Edwin Bendyk points out that *Polish science continues to be stuck in the old, modernist communication model, which was dominated by a clear division of labour: scientists conduct the research, results of which they communicate through specialised channels, such as reviewed scientific journals and conferences*⁵. Science communication in the convergence culture deviates from this pattern.

1.3. Third consequence: Open access to knowledge

The last consequence discussed here is the possibility of creating and propagating open access to knowledge, which gives the recipient of information (not always the author and publisher) the possibility of free access to content. This is possible mainly thanks to methods, in which the scientists themselves:

1. actively deposit their own work⁶ — self-archiving (e.g. repositories),
2. upload publications and research on various platforms that enable self-publishing (blogs, self-publishing services).

2. Blogs and the blogosphere

The basic subject of this analysis is the academic blogosphere. Because of the character of the analysis, the discussion on the definition of a blog is omitted. It is

⁵ BENDYK, E. Wiedza dla wszystkich. In: HOFMOKL J. [et al.] (ed.). *Przewodnik po otwartej nauce* [on-line]. Warsaw: Interdyscyplinarne Centrum Modelowania Matematycznego i Komputerowego, 2009 [Cited 22.01.2012]. Available from Internet: <http://otwartanauka.pl/wp-content/uploads/2010/01/przewodnik-po-otwartej-nauce.pdf>.

⁶ NOWAK, P. „Samopublikowanie”: stara metoda — nowy sens w dobie e-science. *Biblioteka* [on-line]. 2009, no. 13 (22), pp. 87–100 [Cited 25.01.2012]. Available from Internet: <https://repozytorium.amu.edu.pl/jspui/bitstream/10593/630/1/Nowak.pdf>.

difficult to define the blog as a modern communication medium because of the technological changes, which take place very rapidly, introducing new opportunities for technical tools or for the interface⁷. This is why there are doubts whether a blog can be maintained by several persons, whether it has to be of a personal character (i.e. whether it can be maintained by an institution or not), as well as — the question most asked in the blogosphere — when does a blog stop being a blog and become a website.

Therefore, the assumption is made that a blog is a website:

1. containing a chronological and, as much as it is possible, cyclical entries — this being one of the key elements separating a blog from an author's home page,
2. where the creator of the blog (blogger) is its owner.

It is most common for blogs to be of textual nature; although there exists a categorisation of blogs according to the type of uploaded material (photoblog, podcast, vlog), it is the technological evolution that makes it possible to include all types of content in the blog at the same time. It is worth mentioning that the microblog is also a kind of blog, such as Twitter or Blip, in which the length of entries contain a limited number of characters (for instance, in Twitter, one entry can have 140 characters). An example of this type of an on-line service also shows how difficult is the categorisation of blogs: Twitter as a microblog is most commonly considered a text blog. However, by using the Twitpic application, it is possible to insert photos and video on Twitter.

That is why the title of this text contains the term “science blogs and services” — sometimes it is really difficult to establish a satisfactory milestone.

However, the blogosphere is a term addressing the overall number of blogs on the Internet, as well as, social networks organised around these blogs: created by the bloggers themselves as much as the readers. Blogosphere is created and maintained by not only the involvement of readers and bloggers, but also through technical tools such as:

1. blogroll — a list of links to blogs recommended by the author;
2. comment systems — comments incite the discussion among the readers and the bloggers, and also enable the creation of social networks by observing similar conversations, in which the commentators have taken part — this sort of tool is made possible by a commenting service called Disqus;
3. blog aggregators — services collecting information on entries from various blogs, which make it possible for a global search;
4. trackback — a protocol, which reports about the reaction caused by an entry being published on a blog (if, in his entry X, blogger B links to entry Y by

⁷ In literature on the subject there are etymological analyses of the term blog, also considering what it is and how to categorise its various forms. See BOYD, D. A blogger's blog: exploring the definition of a medium. *Reconstruction* [on-line]. 2006, vol. 6, no. 4 [Cited 11.01.2012]. Available from Internet: <http://reconstruction.eserver.org/064/boyd.shtml>; JAROSZ, B. *Blog jako zjawisko społeczne i artystyczne* [on-line]. 2007 [Cited 16.01.2012]. Available from Internet: <http://www.up.krakow.pl/ktime/ref2007/Jarosz.pdf>; KIRCHHOFF, L., BRUNS, A., NICOLAI, T. Investigating the impact of the blogosphere: using PageRank to determine the distribution of attention. In: *Proceedings Association of Internet Researchers* [on-line]. 2007 [Cited 12.01.2012]. Available from Internet: <http://snurb.info/files/talks2007/Blogosphere%20Impact.pdf>.

blogger A, then blogger A will see a note on his blog — most often a type of comment under the entry — information and link to entry X).

One should also mention two terms: blogging, which refers to the practice of communication via a blog, and blogger, which refers to the author of the blog. The latter term is problematic due to the fact that scientists sometimes do not mind maintaining a blog of their own but they are reluctant to call themselves bloggers⁸. This is why the term blogger does not refer to the blog author only but also to a person, who identifies with this type of communication practice. It can be said that a blogger accepts the communication techniques attributed to blogging, while a person who maintains a blog merely abides by these techniques⁹.

2.1. Academic blogosphere

Research on blogs and the blogosphere has been conducted almost since the beginning of their formation. Most commonly, the mentioned research involves analysis on a global scale, that is, the overall blogging activity in a given, most often geographically determined, blogosphere. An example of such research in Poland is the study undertaken by Marek Jeleśniański, the author of the *eredaktor.pl* (<http://eredaktor.pl>)¹⁰ blog, in which he writes, among others, that in 2010, 55% of the blogging population consisted of men and the medium age of the blogger at that time was 27 years old¹¹. However, in case of the academic blogosphere¹², which is a specific social construct, such an approach is not adequate; the key factor is not “geographical location” but the scientific “quality” of blogs, as well as, the language. This is what determines the specificity of “subjects” in the academic blogosphere.

Therefore, the following “subjects” can be identified in the academic blogosphere:

- Scientist blogs (science blogs) — blogs created most often by one person writing mainly about his or her research. In this case, findings of already conducted and published research would be shared on the blog or the blog would take on a character of an “open diary” documenting research currently in progress¹³.

⁸ Comp. DOUCET, A. Scholarly reflections on blogging: once a tortoise, never a hare. *The Chronicle of Higher Education* [on-line]. January 3, 2012 [Cited 20.01.2012]. Available from Internet: <http://chronicle.com/article/Scholarly-Reflections-on/130191/>.

⁹ The distinction between acceptance and abiding by certain techniques used in the communication practice is accepted here following the idea theory of culture of Jerzy Kmita. It is my understanding that there is a lack of clarity in the distinction between the blogger and the person maintaining a blog — nevertheless used and “required” by the bloggers themselves. See KMITA, J. *O kulturze symbolicznej*. Warsaw: Centralny Ośrodek Metodyki Upowszechniania Kultury, 1982.

¹⁰ All links to web pages presented in this text and in footnotes are current as of 11.01.2012.

¹¹ JELEŚNIAŃSKI, M. *Polska blogosfera — wyniki badań z 2010 r.* [on-line]. Rybnik: Oxido, 2011, pp. 4–5 [Cited 21.01.2012]. Available from Internet: <http://eredaktor.pl/pdf/polska-blogosfera-wyniki-badan-2010.pdf>.

¹² The Polish term used in this paper, blogosfera naukowa (science blogosphere), corresponds to the English academic blogosphere (blogosfera akademicka). Another term used sometimes is science blogosphere, however, in the literature on the subject, this term appears less commonly. As of January 18, 2012, Google registers about 10 600 hits for academic blogosphere, while it registers about 4340 hits for scientific blogosphere. The Google Blogs search engine renders similar results of 1370 and 293, respectively.

¹³ Among “classical” blogs of scientists are, for instance, Bogusław Śliwerski’s *Pedagogue* (<http://sliwerski-pedagog.blogspot.com/>) or Michael E. Smith’s *Publishing Archeology*

- Blogs about science — blogs most often created by a group of people covering a wide variety of scientific subjects, dealing with topics of the same kind¹⁴.
- University blogs — official blogs of research and higher education institutions maintained by departments of information or promotion¹⁵.
- Aggregators of blogs and science entries — platforms collecting full entries or links to entries in external science blogs in one single place¹⁶.
- Science blog websites — platforms (Internet services) with various science blogs maintained under the same brand name¹⁷.
- Science microblogs — on-line services enabling the publication of short text information, single photos or short movies within one entry¹⁸.

Due to the nature of the blog content, these can be divided¹⁹ into five categories (it should be stressed that the division refers to all types of blogs, not only to science blogs):

- filter — blog type, which contains information and material from sources external to the blog;
- personal journal — a blog focused mainly on personal ideas — with introspective content;
- k-blog (knowledge blog) — subject blog focused on a specific product, idea or topic;
- mixed — a blog, whose character does not allow for distinguishing a dominant way of inserting content, or the blog's objective — most commonly appearing are the above three strategies in varying proportions;
- other — all other science blogs that were not included in the above classification.

The categorisation of blogs based on systems of content management, represented disciplines, number of comments, goes beyond the scope of the approach taken in

(<http://publishingarchaeology.blogspot.com>).

¹⁴ Blogs about science are, for instance, *Badania.net* (<http://badania.net/>), as well as, *Filozofia.TV* (<http://filozofia.tv/>).

¹⁵ In the Polish academic blogosphere, one that stands out is that of the University of Łódź (<http://unilodz.blogspot.com/>).

¹⁶ Currently, the only functioning aggregator of science blogs, which consider the Polish language blogosphere as a separate category is *ResearchBlogging.org* (<http://researchblogging.org/>). On January 25, 2012, the domain <http://bloginaukowe.org> launched an aggregator of Polish science blogs (Agregator Polskich Blogów Naukowych), which employs RSS channels to collect blog entries and presents their headings (as of 27.01.2012, there were entries from 52 blogs). At this moment, only after a few days of this aggregator's functioning, an evaluation of this project cannot be made.

¹⁷ The Polish blogosphere has not seen yet any science blog websites. However, one similar web service can be pointed out, namely, five blogs maintained under the brand name of the Faculty of Management and Economics of the Gdańsk University of Technology. The English language blogosphere has seen creation of networks, such as, PLoS Blogs (<http://blogs.plos.org>) or ScienceBlogs (<http://scienceblogs.com/>).

¹⁸ An example is Henry Jenkins' microblog on Twitter (<http://twitter.com/henryjenkins>) or Paul Levinson's (<http://twitter.com/PaulLev>), as well as, University of Silesia's microblog (<http://twitter.com/USinKatowice>).

¹⁹ In this work, the characteristics of the types of blogs based on content follow that of: HERRING, S.C. [et al.]. Bridging the gap: a genre analysis of weblogs. In: *Proceedings of the 37th Hawaii International Conference on System Sciences* [on-line]. Hawaii, 2004 [Cited 11.01.2012]. Available from Internet: <http://www.csus.edu/indiv/s/stonerm/genreanalysisofweblogs.pdf>.

this paper, in which the focus is above all on the social aspects of science blogging.

2.2. Research on academic blogosphere conducted to date

The interest in the academic blogosphere has only been noted for the past few years. Debates on academic blogging²⁰ are more frequent than analysis²¹. One of the most significant studies on the subject was conducted by a Swedish researcher, Sara Kjellberg of Lund University, whose findings were published in the journal "Human IT", in the article titled *Blogs as interface between several worlds. A case study of the Swedish academic blogosphere*²². The work studied academic blogs created by Swedish bloggers. It analysed the following features: information enabling the identification of the blogger, education, affiliation, subject matter of the blogs, language, the blog's purpose, target group, technical aspects, blog's activity, visibility in search engines, association with other science blogs²³.

According to Kjellberg's study, a typical science blog, maintained by Swedish researchers, is written by one person, a male PhD student, publishing in his national language and using his real name. The blog is typically a filter type, based on a Wordpress or Blogger platform and functioning on a domain external to the university server²⁴.

The Swedish researcher notes that it is very difficult to identify the target group of the science blog readers: bloggers do not establish clearly whether their explanations of studies are addressed to a broad audience or to their colleagues. Nearly all studied blogs express both approaches, and therefore, one can make the preliminary assumption that it is one of the basic ways of establishing the target group.

In addition to studies on blogs, there are analyses of the use of blogs in the promotion of science publications. This primarily refers to Twitter, which has not earned a big number of enthusiasts in Poland, whereas it is widely used in the

²⁰ Often these are short presentations from several blogs, single publications. Interesting material can be found in the profile of the Canadian researcher Carolyn Hank on the Slideshare website: (<http://www.slideshare.net/carolynhank>). It should be pointed out that C. Hank uses the term blogademia (blog+academia) to refer to science blogs.

²¹ See ADMIN. *Academics and universities should embrace blogging as a vital tool of academic communication and impact* [on-line]. 20.06.2011 [Cited 23.01.2012]. Available from Internet: <http://blogs.lse.ac.uk/impactofsocialsciences/2011/06/20/academics-blogging-vital-tool-for-academic-communication-impact/>; ADMIN. *Running a successful academic blog can make you feel like a rock star: authenticity and narrative are essential for forging your own digital identity* [on-line]. 15.08.2012 [Cited 22.01.2012]. Available from Internet: <http://blogs.lse.ac.uk/impactofsocialsciences/2011/08/15/digital-identity-blogging-thesis-whisperer/>; DOUCET, A. op. cit.; FULLICK, M. *Should you enter the academic blogosphere?* [on-line]. Ottawa: University Affairs, 2011 [Cited 22.01.2012]. Available from Internet: <http://www.universityaffairs.ca/should-you-enter-the-academic-blogosphere.aspx>; NIELSEN, M. The new Einsteins will be scientists who share. *The Wall Street Journal* [on-line]. October 29, 2011 [Cited 22.01.2012]. Available from Internet: <http://online.wsj.com/article/SB10001424052970204644504576653573191370088.html>.

²² KJELLBERG, S. *Blogs as interface between several worlds. A case study of the Swedish academic blogosphere*. *Human IT* [on-line]. 2010, vol. 10, no. 3 [Cited 22.01.2012]. Available from Internet: http://www.hb.se/bhs/ith/3-10/sk_eng.pdf.

²³ Ibidem, pp. 37–42.

²⁴ Ibidem, p. 20

American scientific community. The guideline *Using Twitter in university research, teaching and impact activities* states that Twitter can be used in research projects by tweeting (inserting entries on the microblog) about new publications, applying hashtags (#)²⁵ in order to make the publications more visible, using crowdsourcing²⁶, thus increasing the size of the audience²⁷. In the “Journal of Medical Internet Research”, Gunther Eysenbach published an article, in which he shows that by analysing tweets it is possible to predict which texts will be cited the most²⁸. Eysenbach’s study allows us to conclude that articles, which became the subject of the largest number of tweets, were cited as much as eleven times more than the ones that were rarely tweeted on.

The social media (which include Twitter) play an increasing role in science communication. On her blog appearing in the science blogs service called *The Scientific American*, Christie Wilcox posted a guide for scientists in several parts, in which she attempts to convince researchers that using such tools is essential to effective communication in science. Wilcox observes that a mere 18% of Americans is able to provide a name of a contemporary scientist²⁹. In her opinion, this statistic can be changed by using services, such as, Twitter, Facebook or Google Plus.

The discussion on the subject of the role of the social media deserves its own separate analysis. However, it should be pointed out that it is difficult to draw a clear line between the blogosphere, the social media users, as well as, users of science services taking on the shape of social media, such as, Academia.edu (<http://academia.edu/>) or ResearchGate.net (<http://researchgate.net/>). In the age of the convergence culture, all types of websites co-exist and complement each other. We use blogs to publish entries on research so that, next, we can upload research findings in PDF to services, such as Academia.edu. Finally, we tweet on this activity and we post a status note on Facebook, all of which with the purpose of circulating the information in an uninterrupted manner.

3. Overview of the Polish academic blogosphere

As of yet, the Polish blogosphere has not been researched. One of the first texts dedicated to the phenomenon of science blogs was the work of Piotr Celiński titled *Science made its way to blogs (Nauka trafiła do blogów)*, published on *Wyborcza.pl* on November 10, 2006. When writing about the occurrence of blogging in science, Celiński observes that, *from the layman’s point of view, science blogs have a tremendous advantage over professional journals. They are written in a language*

²⁵ Hashtags (#) play the role of “social network” tags and serve to categorise content and assist in searching by category. Each entry can be marked with many hashtags.

²⁶ Crowdsourcing — work of the Internet community, which sees the emergence of a collaborating “collective intelligence”, described in the beginning of this text.

²⁷ MOLLETT, A., MORAN, D., DUNLEAVY, P. *Using Twitter in university research, teaching and impact activities* [on-line]. 2011, p. 7 [Cited 28.01.2012]. Available from Internet: [http://eprints.lse.ac.uk/38489/1/Using_Twitter_in_university_research%2C_teaching_and_impact_activities_\(LSE_RO\).pdf](http://eprints.lse.ac.uk/38489/1/Using_Twitter_in_university_research%2C_teaching_and_impact_activities_(LSE_RO).pdf).

²⁸ EYSENBACH, G. Can tweets predict citations? Metrics of social impact based on Twitter and correlation with traditional metrics of scientific impact. *Journal of Medical Internet Research* [on-line]. 2011, vol. 13, no. 4 [Cited 6.02.2012]. Available from Internet: <http://www.jmir.org/2011/4/e123/>.

²⁹ WILCOX, C. *Social media for scientists* [on-line]. 2011 [Cited 23.01.2012]. Available from Internet: <http://blogs.scientificamerican.com/science-sushi/>.

free of jargon. They demonstrate that scientists are regular people, and that science itself is not rigid and emotionless³⁰. At the end of the material, there are links to blogs, though unfortunately only one Polish blog is listed, that of E. Bendyk.

Several entries on science blogging can be found on Anna Nacher's weblog who, in her post, *Do humanists blog and why not? (Dlaczego (i czy) humaniści nie blogują?)* writes, among others, about the lack of time for blogging caused by an incessant rat race imposed by the new way of practicing and assessing science in Poland³¹. Karolina Olszewska of the Polish Press Agency (PAP, Polska Agencja Prasowa) conducted an interview with Professor Stanisław Czachorowski, in which the interviewee is presented as a science blogger³². S. Czachorowski himself states on his weblog: *When I started blogging more than five years ago, it was an experiment (many treated my attempts and me as an oddity and something, or someone, that was not serious). It seemed to me that it would be a short-lived experiment. I am not the only one who is surprised by the reality*³³.

On the website History and Media (Historia i Media) in his post *Workshop: science blogs for dummies (Warsztat: blogi naukowe dla opornych)*, Marcin Wilkowski points out: *It is difficult to speak of the Polish academic blogosphere. The fact that there exist blogs of this character does not automatically confirm the existence of the blogosphere, a certain network of connections and relations between certain blogs by the use of links and comments. In Poland, there does not exist an on-line service similar to Edublogs or Echo.gmu.edu, and surely, the key problem is lack of content, which such services could aggregate*³⁴.

3.1. Science blogs in the Polish language

The below description of the Polish academic blogosphere refers to blogs created in the Polish language only, following the assumption that maintaining a science blog in English makes the blog part of the English blogademia, as termed by Carolyn Hank.

Polish science blogs are dispersed, i.e. they are not organised on a platform such as the English language ScienceBlogs (<http://scienceblogs.com>) or Scientific American (<http://blogs.scientificamerican.com>).

This makes it difficult for readers not only to reach the blogs, but also, for the blogosphere to form itself, as it is based on the connections among the bloggers. In terms of the academic blog aggregators, there is also a lack of examples. One of the

³⁰ CELIŃSKI, P. Nauka trafiła do blogów. *Wyborcza.pl*. [on-line]. 10.11.2006 [Cited 22.01.2012]. Available from Internet: <http://wyborcza.pl/1,75248,3727822.html>.

³¹ NACHER, A. *Dlaczego (i czy) polscy humaniści nie blogują?* [on-line]. 20.03.2011 [Cited 26.01.2012]. Available from Internet: <http://nytuan.wordpress.com/2011/03/20/dlaczego-i-czy-polscy-humanisci-nie-bloguja/>.

³² OLSZEWSKA, K. *Blogi naukowe to swoista przestrzeń publiczna* [on-line]. 2.11.2011 [Cited 22.01.2012]. Available from Internet: [http://naukawpolsce.pap.pl/palio/html.run?Instance=cms_naukapl.pap.pl&PageID=1&s=szablon.depesza&dz=szablon.depesza&dep=385451&data=&lang=PL&Checksum=1021382225](http://naukawpolsce.pap.pl/palio/html.run?Instance=cms_naukapl.pap.pl&PageID=1&s=szablon.dep esza&dz=szablon.depesza&dep=385451&data=&lang=PL&Checksum=1021382225).

³³ CZACHOROWSKI, S. *Blog naukowy jako innowacja (nie tylko na prowincji)* [on-line]. 29.12.2010 [Cited 20.01.2012]. Available from Internet: <http://czachorowski.blox.pl/2010/12/Blog-naukowy-jako-innowacja-nie-tylko-na-prowincji.html>.

³⁴ WILKOWSKI, M. *Warsztat: blogi naukowe dla opornych* [on-line]. 4.05.2010 [Cited 22.01.2012]. Available from Internet: <http://historiaimedia.org/2010/05/04/warsztat-blogi-naukowe-dla-opornych/>.

most interesting aggregators is ResearchBlogging.org (<http://researchblogging.com>), which includes Polish language blogs, aggregating entries that link to articles in peer-reviewed journals and adding a short bibliography created, among others by the DOI. However, in 2011, there were posts from only 17 Polish language blogs; in order for the blog to be listed in the service only one entry had to be made (only a few blogs posted several or more entries during the year 2011).

At the beginning of 2011, in the on-line service Science 3.0 (<http://www.science3point0.com>), there was an attempt to create a Polish version of a catalogue of science blogs, however, its alpha version was suspended in the first quarter of last year. In 2008, the web service Knowledge and Education (Wiedza i Edukacja, <http://wiedzaiedukacja.eu/e-biblioteka/blogi-naukowe>) began creating a catalogue of academic blogs — it contains 13 blogs to date (only a portion in Polish).

Using search engines or catalogues available in blogging platforms in order to find blogs does not render satisfying results. The best way of finding Polish science blogs is by combining the search of already found science blogs (browsing through the blogroll, which references other science blogs) with the Google Blogs search function (<http://www.google.com/blogsearch>). Clearly, all results have to be checked one by one and they have to be separated, however, this remains the best solution at the moment.

It should be noted that the number of academic blogs is increasing; as of February 13, 2011, the Google search of the term science blog (blog naukowy) rendered about 1070 hits. Nearly a year later (January 21, 2012), the number of hits multiplied by five, resulting in about 5290. This does not change the fact that the Polish discourse on the academic blogosphere is only just beginning. A search of the term academic blogosphere (blogosfera akademicka) conducted on January 20 of this year rendered 2 results, whereas the search science blogosphere (blogosfera naukowa) came back with 3 results. Nevertheless, this does not mean that there is a lack of discussion on the subject; the discussion is simply not yet visible.

In February 2011, on the blog *Communication researcher workshop (Warsztat badacza komunikacji)*, I began creating a catalogue of science blogs in order to make it possible for the readers to become familiar with the emerging academic blogosphere. The first version of the catalogue was created on the basis of Google and Google Blogs search engines, the ResearchBlogging.org catalogue, as well as, blogrolls of certain blogs. It was possible to catalogue 53 blogs satisfying the below conditions:

1. the blog had to be in the Polish language,
2. the blog could not be “abandoned”; it was assumed that in the past six months there must have been at least one entry,
3. the blog had to be about science, research, projects, a scientist’s blog revealing his work (and not only his “home page”).

At the end of January 2012, the catalogue grew to 101 blogs. The blogosphere is a uniquely dynamic phenomenon: after almost a year, 45 of the 53 originally identified blogs still fulfil the above criteria, one was cancelled, two became by invitation only, and in five of them the last entry has not been made in more than

6 months.

The Polish academic blogosphere is beginning to grow and become consolidated, however, it needs an improvement to its image: it is not that blogging is still considered an activity that is not serious enough; it is seen as an activity that is inappropriate to the image of the scientist. For this reason, in the *Communication researcher workshop* blog, I started a series of publications (interviews) with science bloggers called *Science blogger profiles* (*Sylwetki blogerów naukowych*, http://ekulczycki.pl/sylwetki_blogerow/). By sending invitations to individual bloggers, I received not only answers to survey questions but also I was able to begin a discussion on the subject of the perceptions on the Polish academic blogosphere with its creators.

3.2. Functions and the image of science blogs

A science blog can fulfil several roles, which most commonly co-exist. In a mentioned interview series, S. Czachorowski states: *If a biologist talks to a philosopher or a mathematician, is it a scientific or popularising activity? You cannot separate one from the other*³⁵. Therefore, in the case of science blogs, many activities, or roles, can be mentioned:

- educational and didactic role,
- publication of one's own results,
- establishing contacts for cooperation, solving research problems³⁶,
- providing information to science journalists,
- publication of negative results,
- self promotion,
- initiating debates about science³⁷,
- financial role — direct profits³⁸ (paid access to content) or indirect (creating the image of an expert in a certain discipline and thus gaining a larger number of orders).

³⁵ OLSZEWSKA, K. op. cit.

³⁶ Tim Gowers — In January 2009, a mathematician from Cambridge posted a difficult mathematical problem on his blog, which became commented on after a few hours. Thanks to the help received by mathematicians from, among others, Canada and Hungary, the problem was solved in six weeks. See NIELSEN, M. op. cit.; M. Fullick points out that blogging helps to develop relationships with students, helps created interdisciplinary collaboration and allows for crossing disciplinary boundaries. What is more, blogging can lead to obtaining contracts, consulting research work, or invitations to write academic papers. See FULLICK, M. op. Cit.

³⁷ Bogusław Śliwerski believes that, by blogging, he has an influence *on employers, or education institution or higher education officials, in order for them not to make and/or conceal pathological actions*. See KULCZYCKI, E. *Sylwetka blogera naukowego: Bogusław Śliwerski* [on-line]. 25.01.2012 [Cited 27.01.2012]. Available from Internet: http://ekulczycki.pl/warsztat_badacza/boguslaw-sliwerski. In December 2011, on the blog of Michał Żmihorski, *Ecology and Evolution*, a critical entry was published on the National Science Centre (Narodowe Centrum Nauki) and on the rules of reviewing grant proposals (<http://zmihor.blogspot.com/2011/12/ncn-wiecej-niz-kilka-uwag-krytycznych.html>). The post was commented on by, among others, Prof. Paweł Koteja, an NSC expert, who used the comments from the blog in a larger response, which was published in "Gazeta Wyborcza". See KULCZYCKI, E. *Sylwetka blogera naukowego: Stanisław Czachorowski* [on-line]. 23.01.2012 [Cited 27.01.2012]. Available from Internet: http://ekulczycki.pl/warsztat_badacza/stanislaw-czachorowski/.

³⁸ One of the most popular blogs *Archeowieści*, in the Polish blogosphere, whose author is Wojciech Pastuszka, provides a portion of its entries upon paid subscription.

Science blogs are becoming the business card of the scientist but also of the science community. According to research conducted by Robert Kostka-Zawadzki, the Internet talks about the scientists but the scientists do not talk about themselves: *Science doesn't exist as a separate category in the Polish blogosphere. The blog of the year contest (Onet.pl) does not consider at all the category of science; there are science blogs but they are kept by enthusiasts, journalists, and less commonly by scientists*³⁹. One of the biggest events uniting Polish bloggers organised in Gdańsk, "Blog Forum Gdańsk", also does not take notice of the existence of the academic blogosphere.

How do scientists themselves justify and perceive their blogging? The following three responses were selected. The author of the blog *Written from the lab (Pisane z labu)* says: *I have been wondering why this blog exists. At the beginning, it was meant to be a humoresque with a pinch of science. I want to sneak in something educational by the way, for the general audience. On top of that, I touch on exceptionally uncomfortable topics related to the Polish diagnostics in "professional meanders". Despite removing some posts, I wonder if, on the one hand, I am not over the top and on the other, I wonder if I am not making this page into an indigestible pulp following the rule that if something is for everything, it is good for nothing*⁴⁰.

S. Czachorowski of the *Professors' talk blog (Profesorskie gadanie)* on the benefits of blogging: *The benefit is also an easier contact with students and non-university readers. It is the contact with journalists (lately) — proposing subjects, provoking the consideration of a problem (thanks to linking the blog to two information services, many texts are re-printed and re-edited, and the subject is considered and developed). Perhaps there are no scientific benefits — maybe finding me as an entomologist. To the community? It is, above all, the dissemination of knowledge and improving the image of the scientist. To me, personally? I write because it is a pleasure. Financial benefits are none (even the advertising is not effective, after a year 7PLN was collected). Perhaps in some sort of an indirect way, for example, popularity (if it exists?) and therefore, a more favoured attitude of the students coming to classes (but that is enigmatic and cannot be verified)*⁴¹.

Bogusław Śliwerski of the *Pedagogue blog (Pedagog)* about science blogging: *For me, it is an excellent way of communicating with a community of anonymous readers, numbering already a thousand, whom I do not see but I can consider their reception of content, expectations or their own suggestions of problems worthy of research study, social and educational intervention or expert consultation*⁴².

None of the above-mentioned researchers believes that the basic motivation for maintaining a blog is the popularisation of his own research work. This would agree

³⁹ KOSTKA-ZAWDZKI, R. *Wizerunek polskich naukowców w internecie* [on-line]. [Cited 21.01.2012]. Available from Internet: http://www.slideshare.net/Tomek_01/prezentacja-wizerunek-polskich-naukowcow-w-internecie.

⁴⁰ *Po co ci blog?* [on-line]. 2.10.2010 [Cited 20.01.2012]. Available from Internet: http://zlabu.blogspot.com/2010_08_29_archive.html

⁴¹ KULCZYCKI, E. *Sylwetka blogera naukowego: Stanisław Czachorowski*, op. cit.

⁴² KULCZYCKI, E. *Sylwetka blogera naukowego: Bogusław Śliwerski*, op. cit

with the analysis of the Swedish blogosphere conducted by Kjellberg⁴³. However, blogging is often related to a disagreement with the still functioning (in the opinion of many, an obsolete) model of science communication, namely, long periods in awaiting the response of the key publishers of journals, who maintain a system of unpredictable reviewers⁴⁴.

3.3. The criticism of academic blogging

Maintaining science blogs is often received as an insignificant and not serious activity. It is criticised not only for its status and image in the society but also, it has been pointed out that academic blogging can be dangerous to science in some ways. The following arguments appearing in the criticism of science blogging can be identified:

1. The image in the immediate environment — the practice of science is a respected and serious work, thus blogging, as an insignificant activity, strikes the ethos of the scientist. The argument is held without the understanding of what blogging is and what the possibilities it offers. When asked about the reaction of his immediate environment to his blogging, S. Czachorowski responded: *Very different, in the beginning clearly negative and ironic. Later on, silence and anonymous spite, using it to question the scientific achievement. Positive reactions only from the non-academic community*⁴⁵.
2. The “contradiction” of science blogging — the scientists were “trained” to provide factual information while blogging requires an opinion. Laura Bonetta brings up a statement of a Duke University researcher: *I am a scientist and my opinion actually does not matter a bit. It is the data that matters and my interpretation of the data*⁴⁶. This argument is based on the premise that the scientists that do not blog present the “naked facts” in the name of science, while bloggers writing about their results are distorting them in unauthorised opinions.
3. The wastefulness of time — the practice of science is a very time-consuming activity and time should not be wasted on blogging. The argument is connected to the accepted assumption that blogging is not a serious activity, which does not play any role in science communication. In the opinion of Melonie Fullick, publications appearing in reviewed journals are still an indicator of the professional status of the scientist. Therefore, even students consider science blogging a waste of time, because it is a form of self-publishing and, as such, it is not subject for the required review process⁴⁷.
4. Publishing the “unpublished data”, that is, the criticism of the “open notebook” — the argument is not so much a criticism of academic blogging itself as it is an indication that it can become an obstacle in “classical” publishing of research results. However, it should be pointed out that the majority of

⁴³ KJELLBERG, S. op. cit

⁴⁴ O'KEEFE, K. *Articles tweeted about are 11 times more likely to be highly cited in journal articles* [on-line]. 15.01.2012 [Cited 27.01.2012]. Available from Internet: <http://kevin.lexblog.com/2012/01/articles/social-media-1/articles-tweeted-about-are-11-times-more-likely-to-be-highly-cited-in-journal-articles/>.

⁴⁵ KULCZYCKI, E. *Sylwetka blogera naukowego: Stanisław Czachorowski*, op. cit.

⁴⁶ BONETTA, L. *Scientists enter the blogosphere*. *Cell* [on-line]. 2007, vol. 129, no. 3, p. 444 [Cited 20.01.2012]. Available from Internet: <http://download.cell.com/pdf/PIIS0092867407005430.pdf>.

⁴⁷ FULLICK, M. op. cit.

bloggers does not write about their “unpublished studies”, i.e. does not practice the open notebook science. The scientists realise that this would mean diminishing their chances for getting their work published in reviewed journals, which most commonly require the submitted materials to be previously unpublished⁴⁸. The authors of *Open science guide* point out that the barrier for these types of initiatives within the developing Science 2.0 is *the lack of parameterisation and evaluation mechanisms, equivalent to the mechanisms established in the traditional forms of science communication*⁴⁹.

5. The quality of published data — publishing research on a blog has to be an indicator of the quality of research. If something appears on a blog it means that it could not have appeared anywhere else because of its unimportant or uninteresting nature. In her text *Should you enter the academic blogosphere?*, M. Fullick brings up a statement made by Chris Parsons, who heard that his works are of lower quality because they are published on the Internet, i.e. they were not good enough to become published anywhere else⁵⁰.
6. The destruction of the old (and by implication, the good) science communication model — blogging destroys the classical academic publishing. Edward J. Blum believes that all academic disciplines will lose their credibility without the reviewing system developed over many generations⁵¹.

It seems that, within the frame of the convergence culture, the new way of practicing science communication will, in fact, function next to the existing model rather than override it. Following the authors of *Open science guide*, it has been mentioned previously, that there is a lack of reviewing standards within the frame of some initiatives of Science 2.0, however, it does not mean that the initiatives should be discontinued.

3.4. “Communication researcher workshop”

Since January 2011, under the name of *Communication researcher workshop*, I have been maintaining my own blog based on the Wordpress platform. It is a k-log (knowledge blog), in which I write about the workshop of scientists (research tools, computer software, legislation related to scientific work), as well as, about the reflections on the process of communication. Additionally, my efforts are aimed to support the development of the academic blogosphere by creating, among others, the already mentioned *Catalogue of science blogs* and *Science blogger profiles*.

Readers are informed about the new entries via RSS channels, a Facebook fan page, Google Plus entries, as well as, tweeting. The blog registers about 40 thousand visits a month (10 thousand unique visitors), as of January 2012. The blog is visited daily by an average of 400-600 users. Every entry is prepared carefully, sometimes devoting half an hour and sometimes several hours. The preparation of some entries takes several weeks, especially if additional documents for downloading

⁴⁸ BONETTA, L. op. cit., p. 445.

⁴⁹ HOFMOKL, J. [et al.] (ed.). *Przewodnik po otwartej nauce* [on-line]. Warsaw: Interdyscyplinarne Centrum Modelowania Matematycznego i Komputerowego, 2009, p. 62 [Cited 22.01.2012]. Available from Internet: <http://otwartanauka.pl/wp-content/uploads/2010/01/przewodnik-po-otwartej-nauce.pdf>.

⁵⁰ Comp. FULLICK, M. op. cit.

⁵¹ BLUM, E.J. *Blogging in the academy* [on-line]. 5.10.2010 [Cited 22.01.2012]. Available from Internet: <http://histsociety.blogspot.com/2010/10/blogging-in-academy.html?spref=tw>.

are being provided (e.g. review templates for scientific articles, editorial guidelines for authors).



Fig. 1. *Communication researcher workshop* : blog.

Source: Kulczycki, E. *Warsztat badacza komunikacji* [on-line]. [Cited 26.01.2012]. Available from Internet: <http://ekulczycki.pl/>.

The contact with readers is established via three main channels: comments under entries, comments under Facebook notes or by electronic mail. The largest volume of contact is made by e-mail, often including a clarification for why the reader is making a contact in this way: the user, most often not a blogger, does not want to clutter the blog. Thus, it is not that the reader does not wish to express his thoughts publicly (especially since it can be done anonymously), however, it is due to the implicit assumption that the content presented on the blog belongs to the blog's author (owner). One might imagine that this is due to the fact that the blog is perceived as a blog of the scientist, who communicates his findings, studies, hence the polemic questions and doubts (posed by other scientists) should not take on a different form. In other words, a blog entry should be commented on with a separate entry on a different blog.

The blog *Communication researcher workshop* fulfils several of the stated functions. I post teaching materials for students, informing them about my own publications in separate entries. However, I do not limit myself to providing information on already published results. In the blog, I also release original work, whose first publication is precisely on this platform. This is the case with the developing definition of communicology, thus it can be said that, in some ways, the blog is kept as an open notebook.

4. The challenges facing science web services

The challenges facing science web services depend on the type of on-line service

(blog, microblog, vertical portals, portals); however, it is possible to specify also those types of services that must cope with all forms of scientific activity on the Internet. I would like to focus on several key issues, based on experiences gained through blogging, as well as, by working on the vertical portal Science and Progress (Nauka i Postęp, <http://naukaipostep.pl>)⁵².

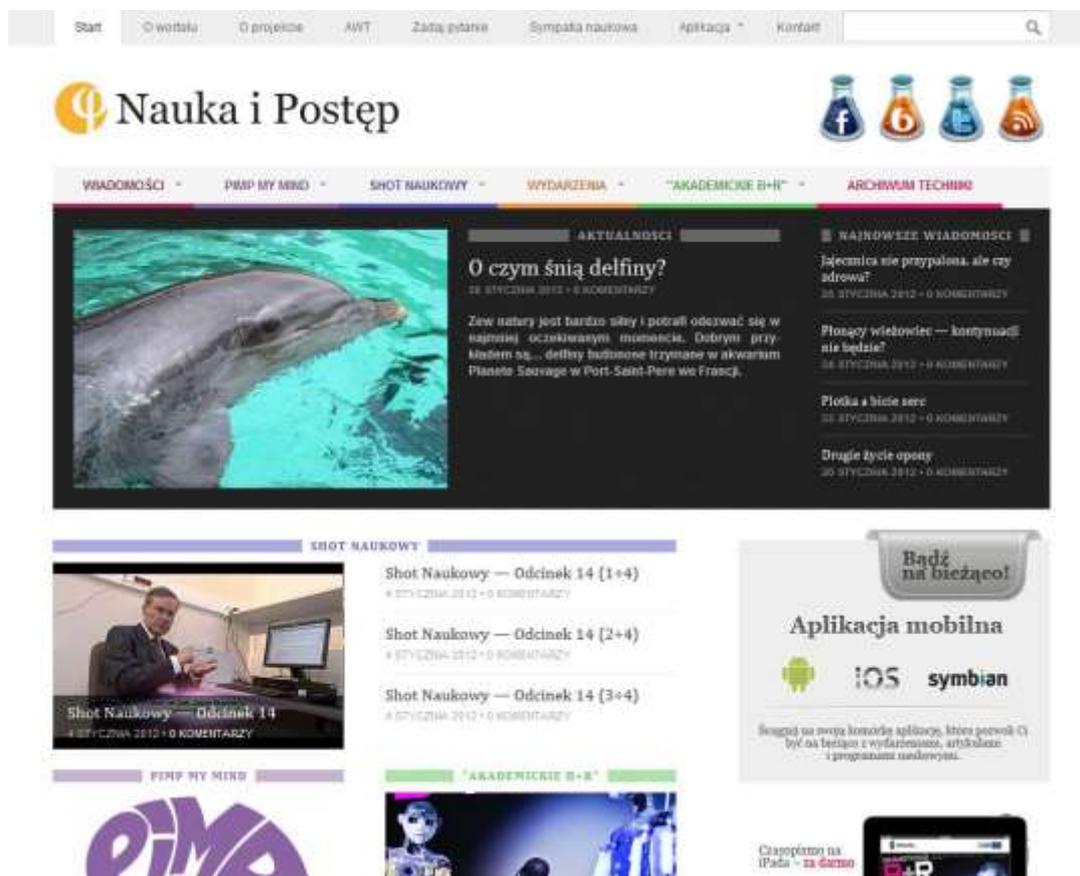


Fig. 2. Web portal Science and Progress.
Source: *Nauka i Postęp* [on-line]. [Cited 26.01.2012]. Available from Internet:
<http://www.naukaipostep.pl/>.

The assumed audience of the vertical portal consists of students, research workers, as well as, the R&D industry. The aim of the vertical portal is the promotion of Polish science and Polish scientists, presentation of news from the world of science. The virtual portal offers radio broadcasts called “Pimp my mind”, television programmes “Science shot” („Shot naukowy”), “Academical R&D” („Akademickie B+R”) quarterly, mobile software and “Science Archives” („Archiwum Nauki”).

In the promotion of the above products, social media (Twitter, Facebook, Blip) and the newest technological solutions (mobile software for Android, iOS, Symbian and a journal published in PDF and a dedicated version for the iPad) are used. As part of

⁵² Vertical portal Science and Progress is created as part of the project „Partnerski Związek Nauki i Postępu” conducted by the Marshal Office of the Wielkopolska Region, as well as, the Poznań University of Technology and the Polish Television in Poznań within the frame of the *Program Operacyjny Kapitał Ludzki, Priorytet IV „Szcolnictwo wyższe i nauka”, Działanie 4.2 „Rozwój kwalifikacji kadr systemu B+R i wzrost świadomości roli nauki, w rozwoju gospodarczym”*.

the project, TNS Pentor conducts qualitative and quantitative studies of communication channels. Tests are carried out, among others, on the use of new technologies in the process of science communication, on the credibility of information depending on the selected form, on the effectiveness of given solutions, as well as, on the preferences of target groups.

The example of the vertical portal Science and Progress is given here in order to indicate that the challenges faced by the academic blogosphere do not differ from the challenges faced by “classical” science web services. This occurs due to the nature of science communication carried out on the Internet. Three main reasons for this can be identified:

1. Accessibility — in the process of science communication, the recipients expect full and open access to information — regardless of the device (“black box fallacy”).

The recipients of science communication search for interesting content available mainly on the Internet. The below graph shows the responses of students asked to state which sources of information they use in obtaining knowledge. The top two answers include web sites and portals, which become the main sources of information.

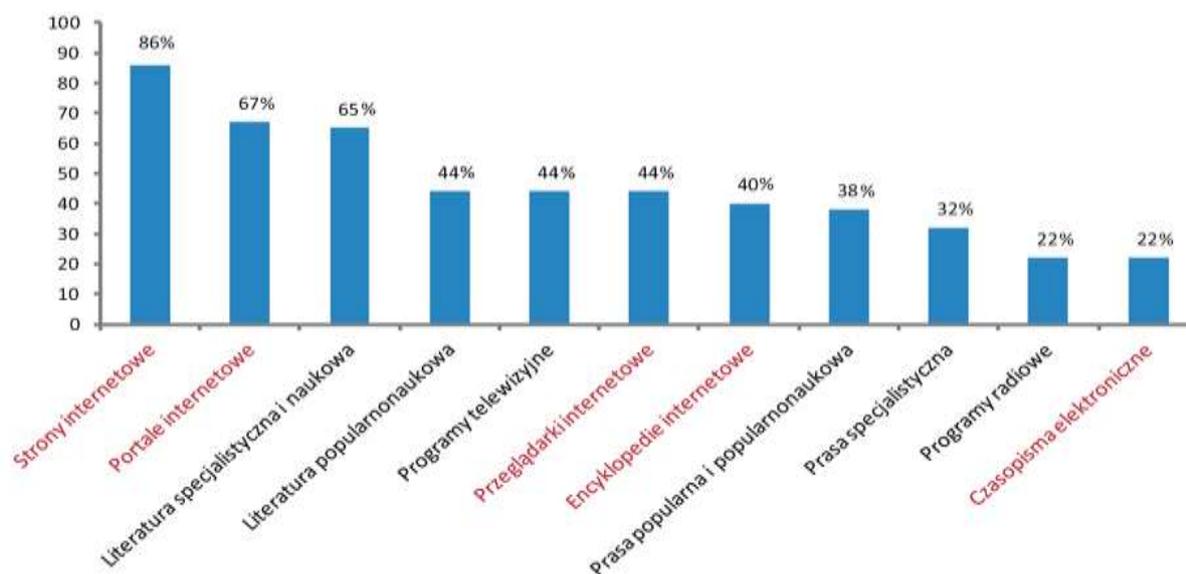


Fig. 3. Most commonly used information sources.

Source: Own study based on TNS PENTOR's *Raport z badania ilościowego dla Politechniki Poznańskiej, Urzędu Marszałkowskiego Województwa Wielkopolskiego zgodnie z metodyką M. Szafrąńskiego i M. Golińskiego*. 28 February 2011.

Nevertheless, from the perspective of the information sender (site author), an emergence of legal and technological problems can be seen. Ensuring open access to knowledge is a necessary, though insufficient, condition. Also necessary is a continuous readiness for implementing changes and solutions, as well as, an adaptation to new platforms and devices, such as, ebook readers, tablets and smartphones⁵³.

⁵³ TNS PENTOR. *Raport z badania ilościowego dla Politechniki Poznańskiej, Urzędu Marszałkowskiego Województwa Wielkopolskiego zgodnie z metodyką M. Szafrąńskiego i M. Golińskiego*. 28 July 2011.

2. Credibility of the medium — in the process of science communication, the recipients expect that the communicated content will be reliable and verified.

The question of credibility of information is linked to a problem presented earlier, that is, the still existing modernist system of evaluation and dissemination of science work. It has been recognised in the previous paragraphs that there is a need for creating a system of reviewing in the academic blogosphere — the same issue can be raised with reference to science services, which publish news from the world of science. The users expect that the information found on the Internet will be objective and believable (a problem constantly faced by Wikipedia).

Even the young users understand that the most accepted form of science communication in the current system consists of publication in scientific journals. The “Academical R&D” journal, considered one of the components of the vertical portal, received the highest scores on the scale of the “credibility of the source”: *it is a credible source of information. Such an evaluation was decided mainly by the fact that, in the opinion of the surveyed, the journal is professionally prepared, and the subject matter covered in it is treated in a comprehensive manner. Moreover, the form itself — the written word — is, for the surveyed, a more credible form of knowledge transfer. This is probably due to the fact that students are most used to this form of transfer of scientific information*⁵⁴.

This issue also functions on the level of old and new media convergence: the recipients expect the delivery of content to be done via new channels, while at the same time they consider the old media unattractive (television programmes, radio shows), credible and accurate.

3. The contradiction of interfaces — the creators, and thus, the scientists must devote their time to carry out the processes, which do not directly contribute to their academic advancement (writing texts for the Internet services, which do not gain scientific institutions any points within the parameterisation process).

One of the biggest issues from the perspective of the editor of the science web service is obtaining content for the service, despite having financial resources for this objective. Naturally, the authors of these texts are research fellows, PhD students and undergraduate students. However, another problem emerges here, namely that the research fellows do not want to waste time on publishing in web services since it does not contribute to their professional evaluation or advancement; the students prefer to invest their energy and time on publishing their texts in recognised and respected ways of disseminating research results, that is, in traditional journals. In assessing the achievement (e.g. in terms of evaluating habilitation candidates), the accomplishments in popularisation are also taken into account; it is, however, an optional achievement. The development of a systemic solution seems necessary, one, in which the scientists would understand the need of communicating their research findings not only via scientific journals, as well as, solutions that would contribute to increasing the credibility of this form of communication.

Science communication in the convergence culture faces many internal and external challenges. On the one hand, it must justify and legitimise its place in the scientific process; on the other hand, it has to develop rules for merging with the “old media”,

⁵⁴ TNS PENTOR. Badanie procesów komunikacji w obszarze Internet, TV, radio, czasopismo, BTL. In: *Badanie skuteczności działań w zakresie promocji nauki w projekcie Partnerski Związek Nauki i Postępu. Raport z badania jakościowego dla Politechniki Poznańskiej i Urzędu Marszałkowskiego Województwa Wielkopolskiego*. 28 February 2011.

that is, the reviewing system, as well as, publishing in journals and books. The academic blogosphere is a very good place for debating on this subject. However, the bloggers must also recognise that, in order for the discussion to be noticed by the advocates of the traditional ways of conducting science communication, it must also be carried out in journals and conferences, which seem to be the most neutral and appropriate place for posing the following question: does Science 2.0 need a reviewing system?

The question can also be reversed: can Science 2.0 become a reviewing system of classical science journals? The question is not at all unreasonable if we recall the reaction of the scientists after the "Science" journal published a study on a NASA discovery of arsenic bacteria as new forms of life. The significance of this event is that the publication was criticised on science blogs. However, as written by Rafał Marszałek, *the authors have declined responding to Redfield's criticism (and then, to others' criticisms) explaining that their publication appeared in a reviewed journal and they can only respond to criticism published in the same way*⁵⁵. As a result of the described situation, the editors of an equally prestigious journal, "Nature", stated in the introduction to one of its issues that *the bloggers and online commentators have an important part to play in the assessment of research findings*⁵⁶.

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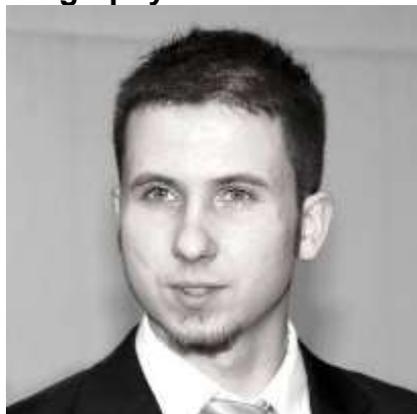
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Biography



A philosopher and a graduate of the Adam Mickiewicz University (UAM) in Poznan. Currently working in the Communication Theory and Philosophy Department of the Philosophy Institute UAM and in the Promotion and Information Department of the

Poznan University of Technology. He's writing a blog titled *Communication researcher workshop (Warsztat badacza komunikacji)*, where he deals with the subject of research tools, computer programs and legal provisions concerning scientific research. Editor-in-chief of the science portal Science and Progress (Nauka i Postęp). His responsibilities include preparing the popular science quarterly magazine "Academical R&D" („Akademickie B+R”) and taking care of the archival materials in "Tech Archive" („Archiwum Techniki”).