

Viewpoint

Author Order: What Science Can Learn from the Arts

Some thoughts about author order in research papers.

IMAGINE YOU ARE sitting in a movie theater. You have been viewing the film *The King's Speech* and you are now watching the closing scene. The film is over, and on the screen, darkened for the credits, you read the following, with no explanation of any kind: Tom Hooper, David Seidler, Colin Firth, Geoffrey Rush, Helena Bonham Carter. It is probably not very difficult for you to infer which role each of them has played in the making of the film. But, just in case, the real credits, unlike our fictitious ones, make it quite clear that Tom Hooper is the director; David Seidler wrote the original story on which the film is based; and Colin Firth, Geoffrey Rush, and Helena Bonham Carter are the leading actors. If we remain in our seats in the theater, we also learn the identity of the supporting actors, producers, sound mixers, set decorators, and many others associated with the film we have just viewed.

Is it obvious? Of course, it is. We are familiar with this happening at the end of any film shown in any theater anywhere in the world, that something similar may be said for novels, where the names of the author, the editor, the cover artist, and the publisher are all given, which is true of many other kinds of art.

How different this is from the headings of most scientific papers! In this case it is up to the reader to deduce who does what in the collective task of research. In our opinion, science would do well to take stock of what happens in the art world, for to discern

the role of each of the researchers engaged in a study is not so easy, as we will describe here.

The Importance of Research in Universities Today

Of course, any university seeking prestige must offer a high standard of teaching. Today, however, although teaching is the reason for a univer-

sity's existence, what is really valued is research, which is the yardstick by which universities are measured, not just in the authors' home country Spain, but also in the rest of Europe and in the U.S.^{1,3}

The importance of research in the life and prestige of a university would not be a problem if it were not for the fact that research usually has to pay



for itself, which means the lecturer-researcher must spend a great deal of his or her time carrying out managerial duties such as making contact with companies, handling money, recruiting staff, and supervising research teams.

Although the proportion of time spent on administrative or managerial tasks, on research, and on teaching varies from country to country and indeed from university to university, it may be said that the university lecturer has a threefold professional function: he or she must be skilled in teaching (and must be a good communicator and educator), in researching, and in management.

In each discipline, research is carried out in different ways, but it would be very difficult to picture it functioning outside the context of a team. At least, this is always the case with software engineering. Within teams, certain kinds of researchers may be distinguished:

- ▶ Fellows and graduate or undergraduate students awarded a grant who normally deal with routine activities (implementation, translation when their teammates do not speak English, machine installation and maintenance, and so forth).

- ▶ Staff, which sometimes also includes graduate students hired in the context of a research project, who gather information from bibliographical sources, propose new solutions to existing problems, among other tasks.

- ▶ The team leader, who is usually responsible for deciding what topics the team will deal with and how they

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should be addressed. The team leader is also the coordinator and promoter of the various projects financing the research undertaken by the team. In other words, the team leader is ultimately responsible for the entire team.

This is the hierarchy, which may include more ranks for larger groups, governing the work of teams. The results of their work, good or bad, are published in scientific journals or communicated at conferences and it is this dissemination that, as we mentioned earlier, allows a lecturer's work to be assessed.

Yet, within the hierarchy, whose job is it to publish the results? And who should appear as the author? Should it be the actual writer of the paper? Or should it be the person who found the problem and decided it would be a good starting point for some research? Or should it be the person who eventually found the solution? But, then, what about the person who implemented it? And the person responsible for the maintenance of the machine used for the work? Who, indeed, owns the intellectual property of a research paper?

The solution the scientific community has been using involves allowing for several proprietors, who are the co-authors of the studies presented at conferences or published in journals.²⁻⁴ But this solution leaves at least two major questions unanswered:

- ▶ In what order should the co-authors appear?

- ▶ What exactly has each of the people appearing as co-authors contributed to the study?

As for the first question, there is no standard criterion. In some cases, the team leader appears first, followed by a staff member and lastly the fellow or scholar (who has sometimes done the most work). In other cases, the names are ordered according to the relative importance and scope of their contributions. This option introduces certain problems, for it is not always easy to assess importance and scope. Other teams use alphabetical order, which does not seem to be the most objective criterion.

A further problem involved in finding a logical order for the names is that it is not always easy to determine who is responsible for a given solution as the final result is usually the reward for teamwork. Sometimes the credit for a goal should not all go to the last person to kick the ball.

A Role for Each Person

We now consider the second question. In any research project it is usually quite clear who does what. This information is, however, hidden in the final result. We do not believe there is any difficulty involved in clearly specifying the extent to which each researcher has contributed to carrying out the study.

And this is where we began this Viewpoint. By following the examples of other fields—the cinema, in order to retain the analogy—it would be easy to give a simple answer to the two questions we have so far left unanswered.

When the Academy of Motion Picture Arts and Sciences awarded the Oscar for the best foreign language film in 1999 to *All About My Mother*, for example, Pedro Almodóvar was not the only winner of the golden statuette, for a number were congratulated, as several had collaborated in the work and all of them had a right to be recognized for it, including Penélope Cruz, Cecilia Roth, and Agustín Almodóvar. Who “presents the paper”? Who is the real “author” of a film?

In fact, it does not occur to most people to ask such a question. When the film is over the credits begin to roll, showing everyone from the “team leader” to the “scholar,” with a clear indication of the way in which each one has contributed to the making of the film. There is, then, no doubt as to who

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the “author” is, but neither is there any doubt concerning the way in which each “co-author” has participated: each person’s name appears together with a specific job (producer, director, costume designer, and so on).

Furthermore, neither is there any problem concerning the order in which the different names appear: what is important is each one’s role, and this, as we have said, is made quite clear. It is neither better nor worse to come earlier or later, just as it is not better or worse to be an actress or a director; it is simply different.

Different people are also involved in the publishing of a book (the writer, the publisher, the style corrector, the layout artist, and others), while in a soccer/football team there will be a goalkeeper, forwards, defenders, and a coach, and a piece of music will entail the work of one or more composers, a songwriter or librettist, one or more vocalists, people playing various musical instruments, and all this is clearly described on the packaging of the CD or record album. Everything is made clear and each person involved gets his or her due credit. It seems so simple: a matter that in other fields has been perfectly sorted out still poses a problem for scientists (forever, it would seem, in a world of their own).


To continue with the analogy of the cinema, we could single out the following roles (which, naturally enough, would not always have to be played by the same person): the director would be the team leader; the leading actor would be a staff member involved in a special way with the topic, the supporting actors would be the scholars and fellows and the producer would be the partner financing the project. It is obvious that this classification will have to allow for “multiple roles and migration between jobs.”

In addition, we suggest some other roles that could appear on our “poster”: the project director, original idea, implementation, writing up, experiment design, performance of experiments, and so forth. These categories will of course vary depending on the type of research done, just as they vary in the realm of filmmaking depending on whether a film is a cartoon or a documentary, for example.

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Science seeks to contribute its knowledge to the world, but it sometimes avoids reality so much that it is not capable of looking to its neighbors and learning from art or literature. Only the synergy of the purely technical or scientific disciplines with the humanities will make for a complete world.

We now present the credits for this Viewpoint:

- ▶ Original Idea: Esperanza Marcos
 - ▶ Written by: Esperanza Marcos, Juan Manuel Vara, Valeria de Castro
 - ▶ Style Correction: Emilia Marcos
 - ▶ English Revision: Gordon Keitch
 - ▶ Financed by the Spanish Ministry of Science and Innovation in the framework of the MASAI project (TIN-2011-22617)
 - ▶ Project lead: Esperanza Marcos
- Isn’t that better? 

References

1. Atkinson, R.C. and Blanpied, W.A. Research universities: Core of the U.S. science and technology system. *Technology in Society* 30, 1 (Jan. 2008), 30–48.
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3. Harman, G. Funding of university research. In *International Encyclopedia of Education (Third Edition)*, P. Peterson, E. Baker, and B. McGaw, Eds., Elsevier, Oxford, 2010, 279–285.
4. Wager, E. Recognition, reward, and responsibility: Why the authorship of scientific papers matters. *Maturitas* 62, 2 (Feb. 20, 2009), 109–112.

Esperanza Marcos (esperanza.marcos@urjc.es) is a professor of computer science at University Rey Juan Carlos, Madrid, Spain.

Juan M. Vara (juanmanuel.vara@urjc.es) is an associate professor of computer science at University Rey Juan Carlos, Madrid, Spain.

Valeria De Castro (valeria.decastro@urjc.es) is an associate professor of computer science at University Rey Juan Carlos, Madrid, Spain.

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Calendar of Events

September 16–20

9th International Conference on Autonomic Computing, San Jose, CA,
Sponsored: SIGARCH,
Contact: Dejan S. Milojicic,
Email: dejan@hpl.hp.com

September 19–20

2012 ACM-IEEE International Symposium on Empirical Software Engineering and Measurement, Lund, Sweden,
Sponsored: SIGSOFT,
Contact: Runeson Per,
Email: per.runeson@cs.lth.se

September 19–21

Principles and Practice of Declarative Programming, Leuven, Belgium,
Contact: Daniel De Schreye,
Email: danny.deschreye@cs.kuleuven.be

September 19–23

International Conference on Parallel Architectures and Compilation Techniques, Minneapolis, MN,
Sponsored: SIGARCH,
Contact: Pen-Chung Yew,
Phone: 612-625-7387,
Email: yew@cs.umn.edu

September 21

Facial Analysis and Animation, United Kingdom,
Contact: Cosker Darren,
Email: dpc@cs.bath.ac.uk

September 21–25

14th International Conference on Human Computer Interaction with Mobile Devices and Services, San Francisco, CA,
Sponsored: SIGCHI,
Contact: Elizabeth Churchill,
Phone: 650-814-7825,
Email: efchurchill@gmail.com

September 24–26

International Conference on Body Area Networks, Oslo, Norway,
Contact: Balasingham Ilangko,
Email: ilangko.balasingham@medisin.uio.no

September 26–28

AudioMostly: A conference on interaction with sound Corfu, Greece,
Contact: Andreas Floros,
Email: floros@ionio.gr