Organizations and Strategies in Astronomy 3 (OSA 3)
Ed. A. Heck, (c) Kluwer 2002

EDITORIAL

"Heck! [no swearing, just calling my name] Look at this!", he said one evening, obviously irritated and waving a stack of administrative papers while entering my office. "When I started working here, the whole University was managed by one single person, the Secretary General who did a good job. Now they are a legion in that Administration Department and they spend their time issuing non-senses!"

I have still his warm deep voice in my ears. That prestigious astronomer had been my boss for my first year in professional astronomy before I moved, within the same institute, to another group more involved in observational activities. In the early seventies, it regularly happened that his window (upstairs) and my window (downstairs) were the only ones illuminated very late. We rarely interfered with each other, but that evening he had been upset by some complications uselessly generated by someone at the main University building downtown. And he needed to get his anger out.

What would he say today?

In some countries, conducting leading-edge research in universities has become a really challenging exercise. Research is sometimes totally ignored by criteria retaining only educational activities (teaching, supervision of students, and so on). A couple of years after the anecdote above, I had to painfully experience it myself. Following a policy based on the number of students only, a reorganization of Belgian universities hit severely the oldest ones with well-developed research activities. Thus about two hundred young researchers were laid off from my university only and many had to look for a better fortune abroad. Who could pretend that, beyond the individual dramas, such a forced diaspora of brains is not harmful to a country[1]? Still such mistakes recurrently appear here and there round the world.

[1]It could be ironically recalled that, on 1st October 1927, King Albert I of Belgians declared in a vigorous discourse preparing the creation of the Belgian *Fonds National de la Recherche Scientifique*: "The fate of nations who neglect science and scholars is marked for decadence." – a matter of meditation for short-sighted policy-makers!

Because astronomy is comparatively not attracting anymore enough students, an increasing number of university researchers in astronomy have to devote a significant amount of their time to educational activities in other disciplines – going sometimes as far as teaching computer science to students in biology or in medicine. Is this really the cross-fertilization between research and education sought for?

There are plenty of additional reasons for frustration. Because of the way research orientations are set and dealt with today, both nationally and internationally, persons in charge of observatories, institutes or departments are now often more administrators than directors. Worse, they are frequently denied the flexibility and the intelligence to manage the funds allotted to them. Innumerable regulations and outside accountants – not unfrequently inadequate and stonewalling – create such a rigid context that it acts often as a carcanet on research dynamics.

The authority on personnel is another issue. In all respect for democratic aspirations, concertation procedures and rights to express opinions, it must however be emphasized that an organization cannot be run efficiently without clear and obeyed chains of command and responsibilities. We are often far from such situations with come-and-go short-term managers having to deal with tenure-holding employees on whom little if any pressure can be made in practice.

Motivation through on-the-job good environment has often to be resorted to as the main workable incentive in sometimes complex human patterns. On the other hand, occasional laisser-faire has to be blamed on careerist managers who wish to move peacefully to other positions and thus avoid conflicting situations even when firm interventions would be needed to restore priorities and to remind duties.

The list of miseries could be extended. You should feel lucky if your own research environment is totally deprived from them while they are all too familiar to a non-negligible number of our colleagues round the world. These persons had generally no other choice to do research and they have to be commended for what they achieve in such conditions.

Quality and evaluation

One of the tasks of the administration of research is to evaluate it. Evaluation implies quality and *vice versa*. Evaluation and quality are key themes of the OSA Books that will come back regularly to these concepts and offer chapters illustrating how they are dealt with in real life.

What is a research of quality? Shall we say that it pushes knowledge significantly forward? Of course, this is not quite a definition since we should

now explain what we mean by 'knowledge', 'significantly' and 'forward'. It is much easier to explain *how* a research of quality can be identified.

As the concept of quality is subjective, generations of evaluation committee members have attempted to define and refine "objective" criteria. This is what scientometrics is supposed to be. But it is often reduced to bibliometrics which is centered on publications. Bibliometrics does not deal with the substance of research, *i.e.* the progress of knowledge. It is concerned with the productivity of 'papers' and with their citations in subsequent publications (often confusingly referred to as 'impact').

Bibliometrics has both the advantage and the disadvantage of being simple and easy. It readily quantifies the productivity of people and organizations. It has become an activity *per se*, a kind of pan-disciplinary *audimat* of research, keeping busy many people worldwide and being taken very seriously in numerous circles.

Bibliometrics is however a limited and partial tool, hence an unsatisfactory one, that must be convolved with other indicators if one wishes to perform an efficient evaluation and especially if one has to deal with persons with similar qualifications, but different activity profiles, within the same organization.

The shortcomings of bibliometrics are well known:
– there is lack of conceptual clarity as to what the number of publications actually measures; while it may be regarded as a reasonable measure of scientific production, its status as an indicator of scientific *progress* is uncertain;
– the scientific production is also influenced by social and political pressures, by publication practices of the employing institutions, by the research area, by the emphasis placed on the number of publications for career progress, and so on; additionally, these factors and their relative importance may vary with time;
– for some scientists, or groups of scientists, the correlation between 'quantity' and 'quality' is small or even zero[2];
– publication counts by themselves fail to "distinguish between the fluency of genius and the loud noises of empty vessels[3]";
– attempts to attach a 'quality index' or 'impact factor[4]' to journals fail to confront the problem of the wide variation of quality *within* a journal;
– citation sources may substantially bias analyses (only first author listed, poor coverage of non-English-speaking countries, and so on);

[2]Smith, R. & Fiedler, F.E. 1971, 'The Measurement of Scholarly Work: A Critical Review of the Literature', *Educ. Record*, 225-232.

[3]'Is Your Lab Well Cited?', *Nature* **227**, 219.

[4]Garfield, E. 1972, 'What Scientific Journals can tell us about Scientific Journals', *IEEE Trans. Prof. Comm.* **PC-16/4**, 200-202.

– the number of citations may reflect 'quantity' as well as 'quality' of publications[5];
– certain kinds of papers are more frequently cited than others of similar quality; poor-quality papers might be too frequently cited because they are controversial; high-quality papers might be initially ignored because they are ahead of time;
– other factors such as self-citations (not only for a single author, but also within a groups of authors), the halo or aura effect, etc., have also to be counted with, not to forget the biases on refereeing itself induced by the mother tongue[6], the country of residence or of work[7], etc.;
– and so on.

Some of these comments have been extracted from the already aging but still to-be-read paper by Martin & Irvine[8]. The authors stress that 'quantity' and 'quality' of research may be misleading terms and add:

> " ... although no *absolute* quantification of basic research is possible, one can make valid and useful *comparisons* between the scientific performance of different research groups, provided that careful thought is given both to the choice of groups for comparison, and to the question of what the various indicators of scientific performance are actually measuring."

When speaking of astronomy-related institutions, people involved in service activities (resident astronomers operating instruments, maintainers of resources and databases, and so on) and in other tasks (developers of instrumentation, data/information handling specialists, and so on) would largely be disadvantaged by the only consideration of bibliometrics since their primary activity is not aiming at publishing. The same remark would be of application for members spending a significant amount of their time in teaching, supervising theses, and so on (see above).

All such activities belong however to the research context, even if one agrees with Moravcsik[9] that it is necessary to distinguish between scientific activity, scientific production and scientific progress. Additionally, quality, importance and impact of a specific work must be distinguished.

Bibliometric indices are thus questionable in various respects and one should not rely entirely on them. This is why they are often used together with other indicators, such as peer evaluation, discoveries and recognition

[5]See for instance, among many, Coghlan, A. 1991, 'Citation System May Encourage Banal Research' *New Scientist* (11 May 1991) 13.

[6]See for instance the three contributions on the theme 'Beyond the Language Barrier' by Sanberg, P.R., Borlongan, C.V. & Nishino, H. (*Nature* **384**, 1996, 608), Fewer, G. (*Nature*, **385**, 1997, 764) and Umakantha, N. (*Nature*,1997 **385**, 764).

[7]See *e.g.* Rumjanek, F.D. 1996, 'Paranoid About Peer Review?', *Nature* **384**, 509.

[8]Martin, B.R. & Irvine, J. 1983, 'Assessing Basic Research', *J. Res. Pol.* **12**, 61-90.

[9]Moravcsik, M.J. 1973, 'Measures of Scientific Growth', *J. Res. Pol.* **2**, 266-275.

(awards, honours, invited lectures, etc.). These other indicators have also their own share of shortcomings and it is intended to come back to them in subsequent OSA volumes.

Let's face it: so far, sociologists of science have remained short of offering reliable criteria taking into account the complexity involved when evaluating individuals and organizations. They are also largely unable to take into account the internal dynamics of scientific disciplines as they are very frequently outsiders to these. Politicians and science policy setters themselves are often unaware of the shortcomings of the methodologies used for obtaining the data they are relying on.

A few representative and well-informed wise men behind closed doors might still be for long a not-so-bad and significantly cheaper way of evaluating people, of taking decisions and of determining policies.

Virtually yours

Since the previous editorial in OSA Book II, so-called 'virtual observatories[10] (VOs)' have been doing well[11] in spite of some reservations expressed here and there[12]. Such projects are sociologically and strategically interesting in various respects.

It is fascinating (well, is it really?) to observe how, with such big undertakings approved (also outside astronomy) and more generally with the corresponding priorities identified[13], so many proposals are attempting to be funded or even simply to be recognized under that umbrella.

For all the hype they can generate, VOs are nothing but the natural and logical continuation of earlier structures and organizations. Astronomical information evolved dramatically: observational measurements, catalogues, logs and archives were gathered together in data centers; these became information hubs as they offered over the years more and more differentiated services (bibliography, yellow pages, software, documentation of all kinds, and so on); distributed facilities were made possible with the appearance and multiplication of networks.

[10] An unfortunate label for distributed digital research facilities (Heck, A. 2001, 'Virtual Observatories or Rather Digital Research Facilities?', *American Astron. Soc. Newsl.* **104**, 2) that seems now generally adopted.

[11] See *e.g.* Brunner, R.J., Djorgovski, S.G. & Szalay, A.S. (Eds.) 2001, 'Virtual Observatories of the Future', *Astron. Soc. Pacific Conf. Series* **225**, xxii + 374 pp. (ISBN 1-58381-057-9).

[12] See for instance Fosbury, B. 2001, 'The Astrophysical Virtual Observatory – The Devil's Advocate View', *European Astron. Soc. Newsl.* **22**, 10-11.

[13] See for instance the latest 'decennial report' from the US National Research Council: McKee, Ch.F. & Taylor Jr., J.H. 2001, 'Astronomy and Astrophysics in the New Millennium', Nat. Acad. Press, Washington, xxiv + 246 pp.

Anyone associated with astronomical information in the broad sense (thus any researcher working on 'real' data) can only be happy such global undertakings have now been assigned *ad hoc* priorities and are finally taking shape.

The emphasis on funding large infrastructures is taking place also in other disciplines than astronomy and on a much larger scale than just transnationally in Europe. The history of European astronomy has however been marked by the *Carte du Ciel* episode that engulfed during critical decades the resources of many observatories in that continent – for results, say, not quite at the level expected. The *Carte du Ciel* has been blamed by many for the delayed flourishing of astrophysics in Europe while it was happily taking off on the other side of the Atlantic.

Fears expressed more diffusely here and there point also at the way those substantial funds assigned to the VO projects will be piloted and the expression of 'computer games' is not unfrequently heard. The last decades of the century that ended recently saw an unprecedented development of instrumentation together with a panchromatization of research in astronomy. It is obvious that, at the other end of the chain, we must now tailor our tools to the deluge of data collected by that powerful and multifaceted instrumentation. Substantial resources have to be devoted to design the most appropriate and efficient methodologies and technologies to that purpose – including that age-old concept of interoperability made indispensable by interconnecting data repositories and archives originally not intended to be cross-used.

Future will tell whether those means – financial, technical and human – involved in the VO projects will be effectively science-driven, bringing ultimately the advances in our understanding of the universe we are all looking for.

"Cosmic Cousteau" wanted

A couple of months ago, I attended the very successful *International Conference on Light Pollution*[14] organized in La Serena (Chile). Beyond specific strategies related to the theme (that will be presented in a forthcoming OSA volume), that conference emphasized several sociological aspects and, in particular, how important it was to avoid entering what could be called a *social deficit* for astronomy.

That conference also showed how Spanish is becoming an international language in astronomy, reflecting the presence and the multiplication of

[14]See Heck, A. 2002, 'A Very Successful Conference', *European Astron. Soc. Newsl.* **23**, in press, and mainly, when available, Schwarz, H. (Ed.) 2002, 'Light Pollution: The Global View', Kluwer Acad. Publ., in press.

excellent photon collectors in hispanic countries.

It is of course impossible to report here in details on all communications presented during the conference. Some of these are available on the web[15]. The range of presentations was as varied as the audience:
– light pollution around the world,
– existing regulations,
– protection of specific astronomical sites,
– studies of efficient outdoor lighting,
– design of adapted luminaries,
– safety problems,
– impact on environment,
– physiological effects on living beings,
– prospects of advertising from space,
– educational campaigns and public awareness,
– future trends,
– and so on.

Apart from the fact that astronomical facilities are not always the best examples in terms of fight against light pollution, winning this should probably start with asking ourselves the question: "What is the weight of astronomy in today's society?" If we, astronomers, are convinced of our good right, others consider us as rather small players, both economically and in number of people. Such an attitude can already be found routinely in the publishing world, for instance.

After the end of the Cold War and long after the landing of man on the Moon, the society at large has now other priorities (such as health, environment, security, unemployment, ...) than space investigations or cosmological perceptions. It is unlikely that leading citizens and decision makers/takers react enthusiastically to astronomical arguments. But experience shows an immediately good ear to economic ones: to illuminate where necessary for less money with adapted luminaries. It does not take long to peoples' representatives to realise that lighting towards the sky is wasting taxpayers' money.

Killing the myth "more light = more security" takes barely more time: too intense a lighting creates indeed deep shadows where potential assaillants can easily hide. The ideal situation comes from moderate glareless lighting (no light directly aimed at the eyes) allowing the pupils to open sufficiently and the eyes to see all details in the shadow areas. Anyone who has handled a photographic camera should be able to understand that argument.

[15]http://www.ctio.noao.edu/∼Eemond/lpc/lpc-presentations.html

There are also nowadays moral pressures, 'gentlemen' agreements, strong official recommendations from international bodies[16] and treaties for not polluting the skies with unnecessary light nor so-called obtrusive or dispensable spacecraft. Such a policy of securing international treaties and agreements should of course be pursued, even if experience shows that some of them, signed even at the highest level with all the mediatic hype, might be denounced, overturned or simply ignored years later when deemed appropriate by one of the partners. Such protections are thus very fragile. In most cases, the lack of effective sanctions reinforces the weakness of such an approach.

Surfing on the current environmental wave is probably a sounder strategy. The 'Last Frontier' is not Alaska (as they say there), but the deep space. The best perception one can have from it comes from dark starry skies. These can thus be considered as natural treasures or resources.

Developing ties with disciplines investigating physiological effects (such as circadian "spikes", disruptions of circadian cycles, sleep disorders, and so on) in living beings, including humans, is also strongly advisable. This has been well understood by the International Dark-Sky Association[17]. Economically and sociologically speaking, it seems now well established that not-well-rested populations are less productive and more unruly. This should be a concern for our policy setters in these times of global intensive economy and of increasing urban violence.

Misunderstandings must of course be avoided: astronomers are not aiming at totally black nights on Earth, but at a better, safer, more efficient and glareless lighting, directed only where it should illuminate without releasing upwards in the atmosphere masses of photons in distress[18].

The activity against light pollution belongs to a more general framework of improving the quality of life (ours and that of our followers): respect of natural resources, proper handling of garbage and used fluids, reduction of nuisances of all kinds, and so on. It is certainly a concern for all of us since we currently have no high-profile *"cosmic Cousteau"* to carry worldwide the good word on cosmic depths and wildlife. Therefore significant long-term efforts should be devoted to related information and education in order to secure appropriate public support. By no means should we be accused of a social deficit in this respect by the following generations.

[16]See for instance 'Obtrusive Space Advertising and Astronomical Research', *United Nations General Assembly Document* A/AC.105/777 (18 Dec. 2001).

[17]`http://www.darksky.org/`

[18]Sky pollution is however not restricted to the optical range. Radioastronomers have their share of serious trouble. Infrared laser communications with spacecraft (seemingly not regulated so far) pose new threats. See cited bibliography for details and for pointers to further reading.

The OSA Books series

This book is the third volume under the title *Organizations and Strategies in Astronomy (OSA)*. These OSA Books are intended to cover a large range of fields and themes[19]. In practice, one could say that all aspects of astronomy-related context and environment could be tackled in the spirit of sharing specific expertise and lessons learned.

Thus this series is a unique medium for scientists and non-scientists (sometimes from outside astronomy) to talk of themselves and of their life, to describe their experience and to discuss points on non-purely scientific matters – albeit of fundamental importance for the efficient conduct of scientific activities.

This book

This book starts with Astronaut Claude Nicollier sharing a few considerations from his repeated in-orbit servicing of the Hubble Space Telescope. Multifacet public-relation and outreach activities for a large national radio observatory are then illustrated by David Finley, while, from his long and successful editorship at *Sky & Telescope*, Leif Robinson shares his past experience and views on the future. An exemplary inter-institutional educational program at graduate level is then detailed by Joachim Trümper.

The chapter by Valerie Shrimplin on quality assurance in UK higher education is a most adequate transition towards evaluation themes covered by the two subsequent contributions: Eileen Friel on NSF evaluation processes for astronomy and Chris Benn on the scientific impact of large telescopes.

We then move to organizational matters with Valeriano Claros and Daniel Ponz discussing the evolving rôle of ground stations in space observatories, Piero Benvenuti offering sound insights regarding the so-called 'virtual observatories', and Daniel Enard issuing recommendations from his experience in managing large projects.

The next part of the book is devoting to more historical aspects of contemporary astronomy:
– the history of the Joint Organization for Solar Observations (JOSO) by Peter Brandt and Wolfgang Mattig;
– the evolution of astronomical organizations in South Africa by Michael Feast (to be continued in a forthcoming volume);
– the history and description of current astronomical organizations in the Czech and Slovak Republics, respectively by Jan Palouš and Victor Rušin together with collaborators.

[19]See for instance `http://vizier.u-strasbg.fr/~heck/osabooks.htm`

As a *point d'orgue* to the book, a historian, Joshua Stein, discusses the methodological similarities and dissimilarities between his discipline and astronomy while an astronomer, Don Osterbrock, emphasizes the need to understand astronomy for fully comprehending its history.

The book concludes with the updated bibliography of publications relating to socio-astronomy and to the interactions of the astronomy community with the society at large.

Acknowledgments

It has been a privilege and a great honour to be given the opportunity of compiling this book and interacting with the various contributors. The quality of the authors, the scope of experiences they cover, the messages they convey make of this book the natural continuation of the previous volumes.

The reader will certainly enjoy as much as I did going through such a variety of well-inspired chapters from so many different horizons, be it also because the contributors have done their best to write in a way understandable to readers who are not necessarily hyperspecialized in astronomy while providing specific detailed information and sometimes enlightening 'lessons learned' sections.

I am specially grateful to Roger Cayrel for writing the foreword of this book and to the various referees who ensured independent and prompt reading of the contributions.

Finally, it is a very pleasant duty to pay tribute here to the various people at *Kluwer Academic Publishers* who are enthusiastically supporting this series of volumes.

The Editor
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