Organizations and Strategies in Astronomy 2 (OSA 2)
Ed. A. Heck, (c) Kluwer 2001

EDITORIAL

Kepler was married twice. On 27 April 1597, he married his first wife, Barbara Mühleck (then 23 years old), who gave him five children of whom only two survived. Arranged by friends and matchmakers, the marriage was rather unhappy, apparently because of the difficult personality of Barbara who died fourteen years later.

Friends and intermediaries interfered again for the second wedding with the difference that, this time, Kepler methodically selected his spouse from among the eleven(!) proposed candidates, explaining his choice in a letter that remains as a surprising document of a dozen printed pages. Thus, in 1613, at the age of 41, Kepler married Susanna Reuttinger (then 24) who gave him seven children of whom three died very young. That union was probably much happier than the first one since little is known of it.

Johannes Kepler, Keppler, Khepler, Kheppler or Keplerus (as he called himself) was born in Weil-der-Stadt in Swabia on 27 December 1571. He studied essentially in Tübingen (mainly theology and, among other disciplines, astronomy) and subsequently lived in Graz (teaching mathematics and astronomy), Prague (succeeding Tycho Brahe as imperial 'mathematicus'), Linz and Sagan.

As exemplified above, Kepler was obviously prone to develop plans and strategies. And he had to devise quite a number of them in his life, for professional and personal reasons.

Towards the end of his life, this led him to travel a great deal in spite of his frail health: to obtain from his august, but greedy, employers the arrears corresponding to his position; to defend his mother accused of witchcraft in Leonberg; to avoid the peasant revolts and the fluctuations of the Thirty Years' War; and also to make sure his books would be properly published. He died during one of those trips, in Regensburg on 15 November 1630.

Kepler was a famous astrologer, but he can be considered as one of the fathers of modern astronomy and his influence went well beyond this. He stated the three basic principles for the planetary motions (Kepler's '*laws*') which clarified the spatial organization of the solar system; he founded the modern theory of optics by offering a correct explanation of how the human eye worked; he was also the first one to understand what happens to light rays after entering a refracting telescope.

In *Astronomia Nova* (New Astronomy, 1609), he came so close to the concept of gravitation that it is difficult to understand why he did not formulate it explicitly (Newton was to later on). In *Somnium* (Dream of a Trip from the Earth to the Moon), published in 1634, a few years after his death, and which could be regarded as the first science-fiction book in the modern meaning of the term, he even postulated the existence of gravity zero ... at the beginning of the seventeenth century!

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Strategies are naturally devised by people involved in research. They imply objectives. And the achievement of objectives, in turn, implies in turn strategies.

Shall we say that an *organization* is an association (of individuals, of institutions, of other organizations, etc.) with objectives and strategies? This is certainly a definition flexible and convenient enough for our purpose here.

An exhaustive history of astronomical organizations has still to be written. It will certainly illustrate when and how we shifted from personal strategies of isolated scientists, from academic teaching, from general policies of the first professional societies, from the first organized projects and expeditions, often with interested royal sponsors, to the realities of scientific research organizations as we know them today.

It has even become fashionable nowadays to study scientific organizations and research productivity. And this is generally done by specific bodies receiving *ad hoc* contracts and/or subventions from decision makers and takers relying on their conclusions for defining medium- and long-term policies and for motivating immediate critical choices on scientific issues with which they do not feel competent.

The drawback in this approach is that people investigating scientific organizations and research productivity are often not competent themselves in the corresponding fields and therefore their assessment can be seriously biased. Driven by their own internal modes of operation, the sociologists of science might also misevaluate the internal dynamics of the other communities they are investigating (see below) and therefore reach inadequately weighted or nuanced conclusions.

As a fresh member of the *European Association for the Study of Science and Technology (EASST)*, I attended last Fall in Vienna the 4S[1]/EASST

[1]4S = Society for the Social Studies of Science

Conference on *Worlds in Transition.* Let me share with you, as I did with the EASST members[2], a couple of recurrently observed pitfalls from otherwise generally quite interesting sessions at a well-organized and dense conference.

Science and technology are not monolithic

Sociological studies not rarely involve surveys on the perception of science (and/or technology) by layers of society or even by society at large. Science is however frequently presented as a kind of monolithic entity, which it is not, and therefore the corresponding survey results might be seriously polluted or at least might be blending a number of secondary effects. Thus there is a real danger of significantly wrong conclusions being derived, not only by the surveyors themselves, but also by the subsequent users of the survey, for instance science policy makers and deciders.

Running a survey on science in general is roughly equivalent to enquiring about transportation in general. And we do know there are some differences between a bicycle and a jumbo jet or a cruise ship. And those differences are not only effective at the level of the transportation means themselves, but also relevant to the context of specific travels, to the destinations aimed at, and so on. And the differences between scientific disciplines are as varied as between the transportation means above, even if all of them aim at the progress of knowledge.

Part of the problem might arise from the fact that the involved (teams of) sociologists are lacking expertise or enough insight into various fields of science and their respective potential perception (see also below). In any case, we would urge *anyone* enquiring about the perception of science or of scientific issues to record and to state the context in which the survey has been made (the landing of Man on the Moon, the AIDS problem, the 'Dolly affair' or whatever).

Even better, each surveyee should be asked about his/her perception of 'science', in the sense of what that person is thinking of when asked about science in general. It is obvious that some mediatic hype about a specific scientific event might seriously affect the global public perception of science nationally or internationally. For instance, the GMO debate has masked, for a significant number of people, the far-reaching consequences by the completion of the genome project while physics and space sciences remained basically unconcerned by those issues.

In conclusion, when speaking of science in general, the variety of science, the context of the time and the individual perceptions must be taken into account. Hasty generalizations should be avoided in the light of the complexity and nuances of the actual situation.

[2] Perceptions of Science, *EASST Review* **19** (December 2000) 8-9.

Perverse perceptions

Astronomy and space sciences are interesting fields in which to investigate public perception. Astronomy has penetrated society remarkably well with an extensive network of associations and organizations of aficionados all over the world. Some of them are well equipped for observing the skies and occasionally become involved with professional research. The deep human need to understand the universe has also led organizations and governments to set up public observatories and planetariums that fulfill academic requirements as well as public educational and cultural interests.

The distinction between professional and amateur astronomers is generally made nowadays on the basis that the former are making a living out of their astronomy-related activities, being paid by some official organization, carrying out some research or participating in some project linked to the advancement of knowledge.

Amateur astronomers are themselves classified in two categories: the active and the armchair amateur astronomers. While the latter have generally a passive interest in astronomy (reading magazines, attending lectures, and so on), the former ones carry out some observing, often with their own instruments, and such activities can be useful to professional astronomy.

Many amateur astronomers have however a limited knowledge of how exactly professional astronomy is carried out and what are the requirements on the professional astronomers themselves. (This is also the case for many potential students in astronomy.) For good amateur astronomers, the 'nec plus ultra' of the achievements would be to know the major stars, the constellations and the visible planets in their share of the sky; and they would expect at least the same from professional astronomers.

Not at all. Many professional astronomers do not know anything about the nightly sky patterns because they conduct theoretical investigations. And those who do carry out observations do not need to be able to point the finger at their pet objects (most of these would be invisible to the unassisted eye anyway): professional observers simply need to know the coordinates of their targets and to enter them into the computers piloting the ground-based and space-borne telescopes.

If such a hiatus already exists between professional astronomers and amateurs who are supposed to know something about the science, one can imagine the breadth of the gap with the public at large. And this gap is again potentially bigger for sciences with less impact on the society. What then can be said on the validity of public understanding of science?

The solution here is education, not through hype and sensationalistic broadcasts or interviews, but through attractive but detailed and informative lectures by patient and non-publicity-seeking experts.

The sports car effect
Car makers (and other manufacturers) know how important it is to have a luxury item in their line of products. Few people will buy it, but most purchasers of the standard items will get something out of it, be it only through the image associated to the brand name – somehow like dreaming (or getting friends and colleagues to dream) of an unaffordable expensive lover.

In that perspective, something interesting can also be pointed out, and again involving astronomy and space sciences. In reader surveys conducted by popular science magazines, subjects such as astronomy and space sciences regularly receive the top rankings in terms of *interest*. Medicine, generally thought as being the primary subject of choice by the public, reaches lower scores.

The difference is that, when it comes to the time of distributing the pennies, the public opinion, and then the policy makers and politicians, go down to pragmatic issues, in line with the fact that – after the end of the Cold War and long after the landing of Man on the Moon – society at large now has other priorities (such as health, environment, security, unemployment) than space investigations or cosmological understanding.

This is when and where the biosciences come first. And this is another reason why public surveys on science perception must be extremely carefully worded, analyzed, interpreted and put into the proper perspective.

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Pushed by the increasingly competitive situation for 'selling' projects and ideas to decision markers/takers, scientists have also felt the need – identified since long by marketers and advertizers – to use imaginative ('sexy') buzzwords. One of these – that we consider most unfortunate – recently appeared in the professional literature world-wide as a label for a number of projects: *virtual observatory*.

The origin and acceptance of the term is in itself an interesting example of sociology and how communities respond to funding systems and to fashion. As explained elsewhere [3], the label is wrong on both counts: 'virtual' and 'observatory'.

Virtuality is indeed nothing new to astronomers.

With the exception of experiments carried out in situ by solar-system spacecraft, our knowledge of the universe is totally derived from photons reaching us from the outer space. And because of the finite speed of light, we do not observe the objects the way they are, but the way they were when the photons we are collecting actually left them.

[3]Virtual Observatories or Rather Digital Research Facilities?, *American Astron. Soc. Newsletter* **104** (March 2001) 2.

What we have thus in our data files is nothing other than a huge and complex virtuality of prior stages, differentiated as a function of the distance in space and time of the various sources. Thus the job of astronomers is to work on that space-time mosaicked virtual universe in order to figure out what is exactly the real universe and to understand the place and role of mankind in it.

While highly desirable and commendable, the structures proposed under the label 'virtual observatory' will be quite far from the classical function of an observatory (astronomical or other) devoted to the collection of new data. The label could thus be seriously misleading since additionally a fundamental feature of the actual universe will be disregarded: its omnipresent variability with time.

For instance, the project known in the US as the 'National Virtual Observatory (NVO)' is basically the aggregation of complementary multi-wavelength surveys (of course frozen in time).

There is no doubt that with efficient access and manipulation of immense volumes of data stored at distributed sites, with sophisticated search and cross-correlation methods, and with evolved data visualization tools, results can be obtained if investigations are driven by well-defined science initiatives.

But still, we are not speaking of an observatory per se, but of an advanced digital research facility, well in line with the evolution from data files to information hubs that we have seen over the past decades.

Other projects currently in the air are putting more emphasis on the methodological ways of tackling the existing – and largely dormant – amount of data, not only in astronomy, but also in Earth and environmental sciences.

A related project with a less questionable label (only the 'instrument' here is virtual) has been launched recently: *AstroVirtel* [4] aiming at making accessible the ESO/ST-ECF archive that currently contains more than 7.0 Terabytes of scientific data obtained with the NASA/ESA Hubble Space Telescope (HST) and with several ESO large ground telescopes.

Buzzwords are useful when well introduced and justified. They summarize ideas and projects in an imaginative way and can be excellent vectors to 'sell' them to decision makers and takers, to the community, and to society at large. Some of them might even make it into history. Their semantic substance must however be representative of what they are labelling and not be sources of confusion.

Is there still time for hoping a reversal of usage when wrong labels are already widespread? Probably not and, once again, language might have

[4] See for instance `http://www.stecf.org/astrovirtel/` .

to adapt to usage, rather than reason – unfortunately. Even in astronomy now, we'll have to teach kids and students not to believe always what they read ...

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This book is the second volume under the title *Organizations and Strategies in Astronomy (OSA)*. These OSA Books are intended to cover a large range of fields and themes [5]. In practice, one could say that all aspects of astronomy-related life and environment could be tackled in the spirit of sharing specific expertise and lessons learned.

This volume starts with two chapters on astronomy-related research institutions. Marcel Golay shares his experience of the challenges for bringing Geneva Observatory to its current position at the forefront of astronomical research in Europe, while Jayant V. Narlikar details the quite different context of the creation and operation of the Indian Inter-University Centre for Astronomy and Astrophysics.

Then Hans J. Haubold reports on the decade-long activities in the framework of the UN/ESA Workshops on Basic Space Science.

Two European contributions follow: one by Anthony Mayer carefully explaining the complexities of European research and the other by Gerard Gilmore dealing with an ongoing European coordinated project, Opticon.

The next four chapters are devoted to practicalities of astronomical observing. First, Karla A. Peterson and collaborators describe the challenges for coordinating campaigns involving ground-based and space-borne instrumentation, a result of our current panchromatic approach of celestial objects. Second, modern methodologies for efficient observing are analyzed by Ian Robson. Third, Ofer Lahav discusses several sociological issues related to large surveys and associated experiments involving large amounts of collaborators. Finally, the detailed working of the ESO Observing Programme Committee is carefully explained by Jacques Breysacher and Christoffel Waelkens.

Complementing the above series, a chapter by Keith Shortridge pleasantly recalls how the evolution in computing and networking dramatically changed, over the past decades, the way we work and interact.

We then move to evaluation aspects with two chapters. András Schubert introduces both scientometry as a scientific field *per se* and the journal *Scientometrics* he is editing. Next Helmut A. Abt shares his long expertise as Managing Editor and Editor-in-Chief of the *Astrophysical Journal*, offering guidelines for efficient and fair handling of refereeing.

This introduces the subsequent group of chapters centered on publications and astronomical information. Uta Grothkopf and Marlene Cummins

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

remind us how astronomy librarians dynamically work and cooperate nowadays, while Paul Murdin presents the way the monumental *Encyclopedia of Astronomy and Astrophysics* has been brought to existence. Noël Cramer then details the "tightrope-walking" publishing of a multilingual magazine for amateurs and public at large in a multilingual and multicultural country (Switzerland).

Jacqueline Mitton then describes her work as Public Relations Officer of the Royal Astronomical Society.

The following chapter by André Heck is devoted to creativity in arts and sciences, offering novel insights from a specific survey showing both similarities and diversity of cases.

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

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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 first volume.

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 Adriaan Blaauw for writing the foreword of this book.

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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