

ASTRONOMY PROFESSIONAL COMMUNICATION

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Abstract. This chapter comments various facets of astronomy professional communication: publications in print, electronic ones, meeting and conferences, posters and demonstrations, education, managerial communication, as well as dealings with outside partners (other scientific communities, amateur astronomers, decision makers and takers, and so on). Numerous pointers towards further reading are provided.

1. Introduction

Astronomers communicate all the time, with colleagues of course, but also with managers and administrators, with decision makers and takers, with social representatives, with the news media, and with the society at large. Education is naturally part of the process.

Astronomers communicate nowadays via a large variety of means: voice and print, phone and fax, as well as via the now omnipresent electronic tools, both active (e-mail) and passive (web), in addition to the various graphical arts including movies, videos, DVDs, and so on.

The astronomy-related communication process can be structured as in Fig. 1. It is itself part of the more general concept of *information handling*¹ (Fig. 2) which strongly evolved in the course of the last decades (Heck 2003b).

Is communication in astronomy different from what it is in other communities? Basically not, with perhaps two significant differences though:

¹See e.g. the volumes *Information Handling in Astronomy* (Heck 2000a) and *Information Handling in Astronomy – Historical Vistas* (Heck 2003a) published in the same series.

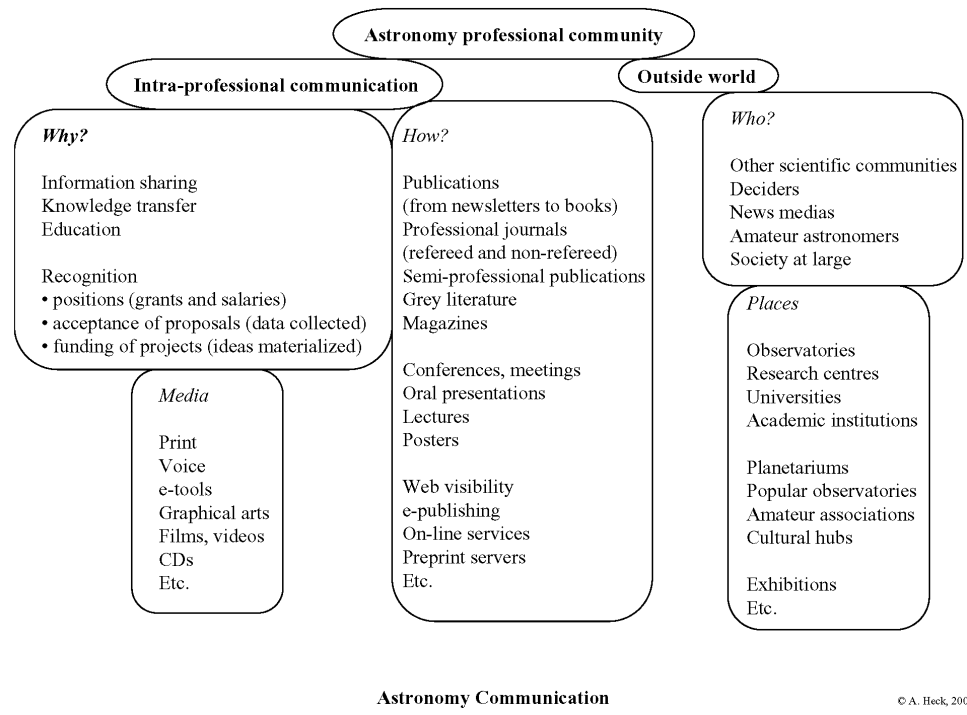


Figure 1. The astronomy-related communication process (adapted from Heck 2000e).

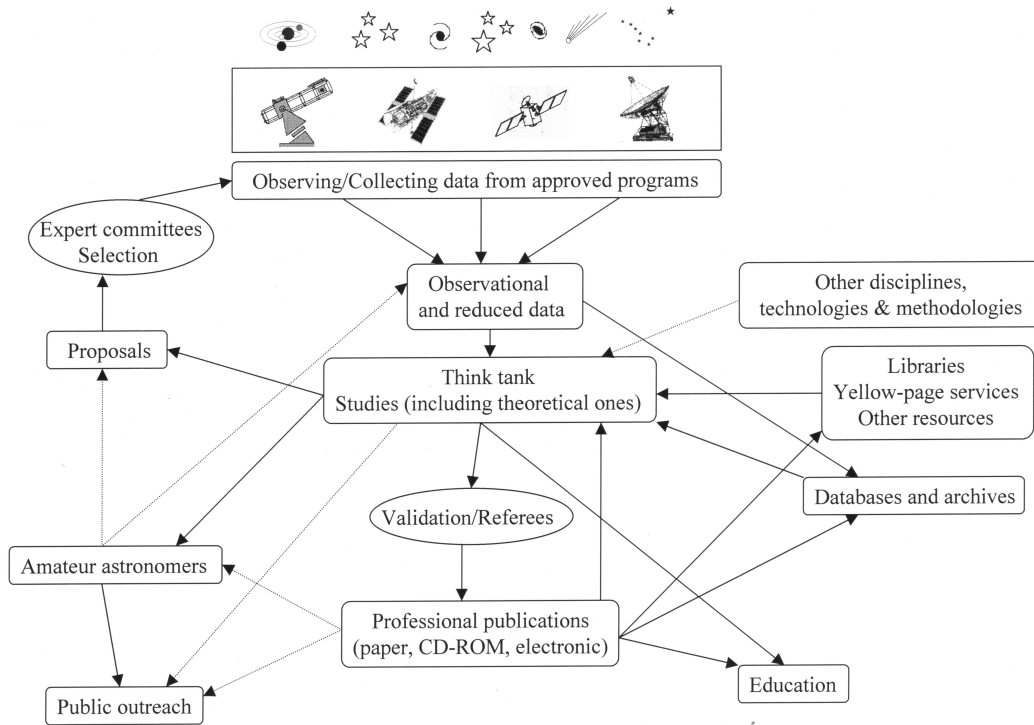


Figure 2. A schematic view of the astronomy information flow (from Heck 2000b).

the astronomy community is rather compact and well organized world-wide; astronomy has penetrated the general public remarkably well with an extensive network of associations and organizations of aficionados all over the world.

Also, as a result of the huge amount of data accumulated, and by necessity for their extensive international collaborations, astronomers have pioneered the development of distributed resources, electronic communications and networks coupled to advanced methodologies and technologies often much before they become of common world-wide usage.

This chapter will be centered on professional intra-communications. As in all scientific communities, these obey to their own (sometimes unwritten) rules and to some border conditions. Professional astronomers reading these lines are practicing intra-professional communications to some degree. Not communicating at all would be equivalent to isolation and to stagnation of career, if career at all.

It will not be possible to deal in this chapter with all sociological aspects of the professional communication. Interested readers are encouraged to refer to the cited literature as well as to the volumes of the series *Organizations and Strategies in Astronomy* (OSA Books²) edited by the author and published within Kluwer's *Astrophysics and Space Science Library*.

2. Motivations and Means

Professional communication in astronomy – as in other sciences – is not only motivated by the noble aims of educating and of information sharing. It is also strongly conditioned by career constraints involving *recognition*, a necessity that should not be underestimated. Recognition is sought for getting positions (*i.e.* grants and salaries), for obtaining acceptance of proposals (*e.g.* leading to data collection), and for achieving funding of projects (allowing materialization of ideas).

The pressure for recognition has contributed to the strong increase of professional papers (cf. Fig. 3), together with other factors such as the expansion of the professional astronomy community itself (especially after the beginning of the space age³), the multiplication of large instruments and spacecraft equipped with always faster, more diversified and more efficient detectors. Commercial publishers have also put on the market more journals which are as many additional communication outlets.

But knowledge sharing and recognition seeking are carried out also through other means than just publications in print. Meetings, colloquia, and conferences of all kinds are places for oral exchanges, possibly with the

²<http://vizier.u-strasbg.fr/~heck/osabooks.htm>

³See for instance Figs. 10 & 11 in Heck (2000d).

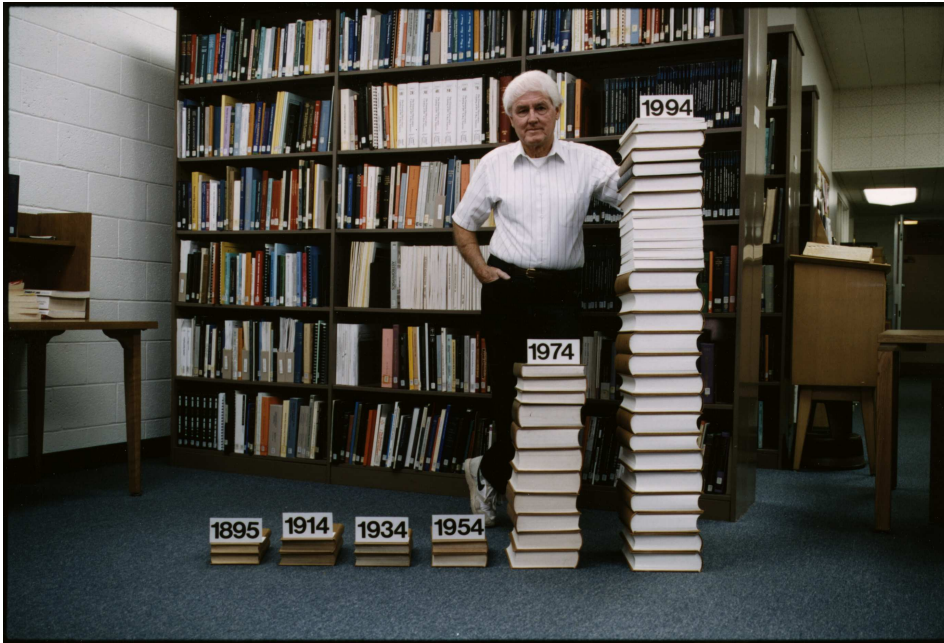


Figure 3. An illustration of the dramatic increase of astronomical literature over the past decades. Helmut A. Abt, Editor-in-Chief of the *Astrophysical Journal*, is standing next to stacks of that leading professional publication (courtesy the *National Optical Astronomy Observatories, NOAO*).

help of ‘posters’. Education, supervision of students at various degrees are definitely part of the knowledge-sharing process. In some countries, they are even a condition to career progress

3. Outlets

The major professional journals use the peer-review procedure (‘refereeing’) for accepting, amending or rejecting submitted contributions (see *e.g.* Pottasch 2000 & Abt 2001). Albeit a matter of regular debates (on its principle itself as well as on the way it is conducted), the refereeing process has been so far the best one (or the less questionable one) to publish contributions with validated content, *i.e.* an assurance of good quality, novel results obtained by reproducible experiments, calculations or analyses on which enough details are provided.

The most important general professional journals constitute what is sometimes called the ‘gang of five’ including the *Astrophysical Journal*⁴

⁴<http://www.journals.uchicago.edu/ApJ/>

(founded in 1895) and the *Astronomical Journal*⁵ (first founded in 1849, revived in 1896) published by the *American Astronomical Society*⁶, the *Publications*⁷ (founded in 1889) of the *Astronomical Society of the Pacific*⁸, the *Monthly Notices*⁹ of the *Royal Astronomical Society*¹⁰ (UK, 1827), and *Astronomy and Astrophysics*¹¹ resulting from the merging in 1969 of several European professional journals (Pottasch 1999).

Other journals should however be mentioned such as *Astrophysics and Space Science*¹², *New Astronomy*¹³, the *Publications of the Astronomical Society of Japan*¹⁴, *Icarus*¹⁵, *Celestial Mechanics and Dynamical Astronomy*¹⁶, *Solar Physics*¹⁷, and so on.

Astronomers communicate also via a whole spectrum of publications ranging from informal newsletters to books gathering together review papers by the best specialists on specific topics. Proceedings of meetings of all kinds (see hereafter) are published by commercial publishers, by learned societies, by research institutions, or even by individuals, reasonably soon after the events.

Professional astronomers are also contributing substantially to less specialized publications, mainly directed towards amateur astronomers and the public at large. Many countries have their own such national journal, but *Sky & Telescope*¹⁸ is probably the magazine with the larger audience world-wide (see *e.g.* Robinson 2002).

Publishing is also increasingly done electronically nowadays (Fig. 4). Or, better said, there is more and more of *diversified publishing*, *i.e.* of information available on different media (paper, CD-ROM, web sites, and so on). These media are not excluding, but completing, each other.

Several journals have an electronic counterpart, but no astronomy journal is practicing electronic publishing in the full sense of the medium. What they do is to put on line digitized files still basically along the lines of linear structure of a document on paper, since the first thing most users of such

⁵<http://www.astro.washington.edu/astroj/>

⁶<http://www.aas.org/>

⁷<http://pasp.phys.uvic.ca/>

⁸<http://www.aspsky.org/>

⁹<http://www.blacksci.co.uk/products/journals/mnras.htm>

¹⁰<http://www.ras.org.uk/ras/>

¹¹<http://www.aanda.org/>

¹²<http://www.wkap.nl/journalhome.htm/0004-640X>

¹³<http://www.elsevier.nl/locate/newast>

¹⁴<http://www.tenmon.or.jp/pasj/>

¹⁵<http://astrosun.tn.cornell.edu/Icarus/Icarus.html>

¹⁶<http://www.wkap.nl/journalhome.htm/0923-2958>

¹⁷<http://www.wkap.nl/journalhome.htm/0038-0938>

¹⁸<http://www.skypub.com/>



Figure 4. The web pages of five main astronomy professional journals. Many other journals and resources are used by the astronomy community (see text).

‘electronic’ journals want is ... to print the ‘papers’! And what we still have largely is a system equivalent to TV news bulletins zooming on newspapers.

A fully electronic resource would make use, per definition, of all the degrees of freedom of the medium, such as the hypertextual structure, the colors, the sound and motion, the applets and whatever might come next.

Certainly e-specificities are progressively introduced in electronizing the journals, such as advanced integration in databases and forward referencing. The possibility of shipping quickly the papers forth and back between authors, editors, referees, and publishers have strongly modified the dynamics of publishing (see *e.g.* Lequeux 2000 and Abt 2003).

The rôle of librarians has also substantially evolved as having to deal now with a diversification of media (see *e.g.* Grothkopf & Cummins 2002 and Corbin 2003). This was echoed by the creation of an Astronomy Digital Library (see *e.g.* Eichhorn *et al.* 2003).

4. All electronic?

After all the initial hype that took place with the popularization of networks and especially with the advent of the World-Wide Web, people now generally accept that the electronic medium will not replace the paper one, but will be a complementary source of information just as, for instance, television compare to newspapers (see *e.g.* Heck 2000c).

Most professional astronomers are intensive users of the electronic medium, either actively (e-mail) or passively (web sites). The World-Wide Web knocked at our door with an immediate success: astronomy users and servers were, by the end of 1993, the largest group on the web (Hardin 1993).

In fact, as a result of the huge amount of data accumulated and by necessity for their extensive international collaborations, astronomers had already pioneered electronic communications and networks much before they become of common world-wide usage.

Among on-line services of immense interest for professional astronomy information, it is appropriate to mention here

- the *Strasbourg astronomical Data Center (CDS)*¹⁹, a long-time pioneer nowadays recognized as the world leader;
- the *NASA/IPAC Extragalactic Database (NED)*²⁰;
- the *Astrophysics Data System (ADS)*²¹;
- the *National Space Science Data Center (NSSDC)*²².

¹⁹<http://cdsweb.u-strasbg.fr/CDS.html>

²⁰<http://www.ipac.caltech.edu/>

²¹<http://adsabs.harvard.edu/>

²²<http://nssdc.gsfc.nasa.gov/>

Yellow-page services such as the *StarPages*²³ complement the previous resources, being also an example of diversified publishing with their equivalent available on paper (Heck 2003c).

It is worthwhile to point out that authors are more and more responsible for their end product in the communication processes (writing, typesetting, graphism) which often means a significant amount of time spent struggling with macros and/or languages with restricted capabilities. There has been so far a large failure in getting user-friendly tools and *ad hoc* training from publishers for such an important communication activity.

5. Grey communication

Grey literature²⁴ has never been identified as an important issue in astronomy, perhaps because of the small size of the community allowing to identify well and quickly the persons involved, as well as the relevance, importance and degree of seriousness of the corresponding grey paper.

Additionally, the rather fast publishing procedures (compare to other disciplines), through well-established and validated media, is limiting the need and volume of grey literature.

The number of observatory publication series has dramatically decreased over the last decades, as did the stacks of preprints, reprints and irregular newsletters that were often sources of headache for our librarians. Most of this material is now available electronically.

However, and with all the consideration and appreciation due to preprint servers such as the LALN one²⁵ (see *e.g.* Ginsparg 1996), one must recognize that the system is somehow heavy and little time-efficient (files need often to be compressed, possibly to be uuencoded, plus ftp-ed and/or e-mailed before the paper is up and available).

Again for all its value at the time it was set up, such a system could certainly be simplified nowadays by taking advantage of the web structure and by pointing to papers residing at the authors' sites. The maintenance would be lighter (especially in case of paper upgrade) and the validation procedures could remain very similar to the current ones. An abstract and a bibliographical reference could always be included in the main database together with the paper URL.

²³<http://vizier.u-strasbg.fr/starpages.html>

²⁴Grey literature can be defined in various ways. I like the following one: an extensive range of materials that cannot be found easily through conventional channels, such as publishers, "but which is frequently original and usually recent" (Delabachere 1995).

²⁵<http://xxx.lanl.gov/>

6. Meetings and conferences

Conferences, colloquiums, workshops and meetings of all kinds provide efficient ways of exposing oneself to both excellent review talks and presentations of investigations in progress (Fig. 5).

Most conferences now allow participants to present briefly their works and results through “posters” or displays on panels. Bigger projects can sometimes afford booths where they can welcome visitors and/or run demonstrations.

The largest annual astronomy meetings are organized by the *American Astronomical Society (AAS)*²⁶ (see Alexander 2003). Many other conferences are organized world-wide, either locally, nationally or internationally, often centered on specific topics and sometimes sponsored by the top representative body for professional astronomy, the *International Astronomical Union (IAU)*²⁷.

That professional association, structured in divisions and commissions, is itself organizing a triennial world-wide General Assembly and carries out many informational activities (see *e.g.* Andersen 2000 and Batten & McNally 2003).

Meetings and conferences are probably the best places to realize that communication skills are not equally shared by scientists, and by astronomers in particular. Indeed most of them never received any kind of training in that respect.

The dynamics of a talk, the proper preparation of documents (also true for posters), a speech properly structured and worded (no slang!), the way to address adequately – sometimes in a foreign language – an international audience, the discipline of timing, the handling of questions and comments, the general courtesy and modesty of a presentation, these are some of the many oratorical qualities to be assimilated and put in practice quickly.

We are very lucky that, in astronomy, virtually all speakers are actually *talking* to the audience rather than reading notes as it is too often the case in other disciplines.

7. Education

No astronomer will question the need to increase astronomy teaching at all levels. See Percy (2000), the chapters by Bacher, Rijdsdijk, Wagner & Ros in this volume, as well as Bishop (2003) for US-specific astronomy education.

Important educational activities are also carried out round the world in places such as planetariums (see *e.g.* Petersen & Petersen 2000) and

²⁶<http://www.aas.org/>

²⁷<http://www.iau.org/>



Figure 5. Colloquia, education, demonstrations and posters at conferences (from top to bottom) – several of the many facets of astronomy professional communication.

popular observatories as they are called in various countries. Associations and societies of all sizes are also carrying out a lot of work at that level, as illustrated in this volume by Fraknoi for the *Astronomical Society of the Pacific*.

The difficulties encountered in some countries with lobbies such as the creationism-related ones should not be underestimated, but they should also be carefully treated to avoid that actions taken backfire through some propaganda in favor of such groups.

Describing what is the best communicator as educator is out of the scope of this note, so different are the educating systems round the world. However one cannot but be worried by the significant devaluation of educational values and degrees, even at higher levels, in some countries. Highly regarded until a couple of decades ago, educating is now becoming a perilous profession because of the violent context existing in some places. Let's hope that such a society phenomenon is only transitory.

8. Managerial communication

The professional communication also includes that dialog between managers and people of their groups, departments, institutions, ..., as well as the dialog between those managers and their administrative bodies and funding agencies.

There are all kinds of managers: open, secretive, pure researcher, administrative freak, hierarchical bootlicker, public-relations maniac, cocktail-addicted, permanent traveller, ghost, ectoplasmic, Pontius Pilate (leaving all decisions to council meetings), and so on²⁸.

Discussing this issue in details is again out of the scope of this chapter, but, in the same way astronomers are not necessarily born communicators, they quite legitimately might not be the best administrators or the best managers either, most of them learning on the job. Again here organizations might be well inspired to plan for some adequate training.

9. The outside world

9.1. THE DECISION MAKERS AND TAKERS

The communication with decision makers and takers is largely unorganized, except in the USA where the *American Astronomical Society (AAS)*²⁹ opened years ago a bureau in Washington, DC. As recalled by Boyce (1999),

²⁸Or should we rather parody that famous comment on orchestra directors? Then there would be managers getting people to work, others letting people work, and those preventing people to work ...

²⁹<http://www.aas.org/>

“as the last quarter of the twentieth century approached, it was clear to the forward-looking officers and councilors of the AAS that the traditional ways of funding science had changed and that the astronomical community could benefit from maintaining a closer contact with the government in Washington.” The AAS is thus lobbying directly the US Congress while instructing also adequately its membership via its newsletter and its electronic announcements for concerted actions at appropriate times with adequate arguments.

Each decade in the US too, an *Astronomy and Astrophysics Survey Committee (AASC)*³⁰ surveys the fields of space- and ground-based astronomy and astrophysics, recommending priorities for the most important new initiatives.

In Europe, international institutional coordination is largely left to European organizations such as the *European Southern Observatory (ESO)*³¹ or the *European Space Agency (ESA)*³², or to international consortia such as the *Institut de Radioastronomie Millimétrique (IRAM)*³³ or the *Nordic Optical Telescope (NOT)*³⁴. Down to a national level, the responsible bodies and the decision-making procedures are of course much more varied, and it is not really useful to enter a detailed description here.

Communication with decision makers and takers is directly linked to the communication with news media and the public (see below), as politicians are frequently influenced by the taxpayers’ opinions.

9.2. OTHER SCIENTIFIC COMMUNITIES

The interactions with other scientific communities are multitudinous and generally based on collaborations between individuals or groups in a number of fields ranging from physics and chemistry to space law and biology via instrumentation technologies, computing and information handling.

As mentioned already, the astronomy community is rather compact and is well structured within the *International Astronomical Union (IAU)*³⁵. IAU itself belongs to the *International Council of Scientific Unions (ICSU)*³⁶ together with some 95 multidisciplinary bodies and 25 other scientific unions.

ICSU is a non-governmental organization set up to promote international scientific activity in the different branches of science and their ap-

³⁰<http://www.nas.edu/bpa/projects/astrosurvey/>

³¹<http://www.eso.org/>

³²<http://www.esa.int/>

³³<http://iram.fr/>

³⁴<http://www.not.iac.es/>

³⁵<http://www.iau.org/>

³⁶<http://www.icsu.org/>

plications. It supervises a number of interdisciplinary scientific committees such as the *Committee on Data for Science and Technology (CODATA)*³⁷ (where IAU is also represented) and the *Panel on World Data Centers*³⁸.

The *Committee on Space Research (COSPAR)*³⁹ is furthering, on an international scale, the progress of all kinds of scientific investigations which are carried out with space vehicles, rockets, and balloons.

Such organizations and others are forums where astronomers can officially be heard and share experience, as well as concerns, with colleagues from the whole spectrum of fields.

On another level, and to be complete in this section, it is fair to say that, because of the general reduction of funding for fundamental research, astronomy round the world is increasingly competing for pennies with disciplines currently more favored.

9.3. AMATEUR ASTRONOMERS

Some aspects of the relationships with amateur astronomers have already been dealt with elsewhere (Heck 2000d, Sect. 2.5) and therefore we shall be rather short here. Specific colloquia have also been organized and could be usefully referred to (see *e.g.* Dunlop & Gerbaldi 1987).

Amateur astronomers are generally classified in two categories: the active and the armchair amateur astronomers. While the latter ones 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. For instance, Mattei & Waagen (2000) beautifully exemplify how a well-organized and hard-working organization can efficiently contribute to the gathering of data and thus to the expansion of cosmic knowledge. See also the historical review by Dunlop (2003).

Inversely the sharing of knowledge with more passive amateur astronomers and with the society at large has many facets. Professional astronomers should be encouraged to share their work more often with the open world. Beyond the world-wide audience of a journal such as *Sky & Telescope*⁴⁰, there are many national journals which deserve more attention and support from our community.

Public observatories and planetariums are other outlets where professional astronomers should be seen more often.

³⁷<http://www.codata.org/codata>

³⁸See *e.g.* <http://www.ngdc.noaa.gov/wdc/>

³⁹<http://cospar.itodys.jussieu.fr/>

⁴⁰<http://www.skypub.com/>

More generally, professional astronomers should be encouraged to better ‘coach’ amateurs (possibly within public outreach activities) with a number of possible benefits:

- improving dissemination of correct scientific information,
- focussing on effective scientific aims⁴¹,
- participating usefully to professional activity (observational campaigns, public outreach offices, light pollution control, debunking pseudo-sciences, and so on).

Our own experience of interacting with amateur astronomers has generally been a gratifying and human-enriching one, even if it is definitely time-consuming. One must however be prepared to handle an unavoidable fringe of weird and crackpot characters attracted by our science.

9.4. NEWS MEDIA, THE PUBLIC AND THE SOCIETY AT LARGE

These topics are discussed elsewhere in this volume and it is not necessary to detail them here again.

Refer to the chapter by Madsen and by Maran *et al.* for the interactions with the news media, as well as to Mitton (2001) for the *Royal Astronomical Society (RAS)*⁴² experience.

More general dealings with the public have been tackled in the chapters by Madsen & West and by Catapano (on public communication of science and technology in general). The chapters by Taylor and Henbest are focussed on television programmes, while the contributions by Fraknoi and by Griffin discuss public outreach (and education) from respectively a large astronomical society and a leading research institution. More on this can also be found in Finley (2002).

A historical perspective on astronomy and the general public is available in Meadows (2000).

10. Additional comments

Communication implies common language and language has sometimes been put forward as a source of difficulties in professional exchanges. This issue was discussed elsewhere (Heck 2000e). According to our experience, confirmed by other editors (cf. Lequeux 2000), language is often used as an excuse for other shortcomings. See also the comments and recommendations by Sage in this volume.

⁴¹Even if they make no harm, there are still too many romantic deviations in amateur astronomy. Too many young students still approach us with flights of poetic celestial oratory and are then really disappointed when they realize what actual research is.

⁴²<http://www.ras.org.uk/>

Communication towards the outside world implies a resulting image for a scientific community. This matter has also been discussed in Heck (2000e). Not only “a better image of scientists and engineers could lead to more people entering those fields and to greater public support for projects ranging from space exploration to particle accelerators” (Pollack 1998), but it has also a direct impact on funding – something to be kept in mind especially at a time when the society at large has other priorities (such as environment, health, security, unemployment) than space investigations or cosmological perceptions.

11. Final remarks

Most astronomers learn to communicate professionally on the job, *i.e.* by doing it and observing what others are doing, sometimes copying poor examples. As there is currently virtually no training in communicating nor in interacting with news media, any improvement in that direction would make a significant difference.

Astronomers need to learn how to communicate properly and it is true that, in general, this is not part of their education. And narrow-minded, often personally-motivated, initiatives have sometimes ended in disastrous results for our community because outsiders generally believe that we are all talking with the same voice.

However fascinating it can be, the communication process needs to be carefully planned: the formulation of a message (*i.e.* an information set), its conveyance, and its reception by targets who will each perceive it differently.

In a scientific context, the matter is not only to deal with ‘true’ information (*i.e.* authenticated, verified and validated), but also for each scientist to get the recognition he/she deserves among his/her peers, as well as for a scientific community to position itself adequately compared to other disciplines and to society at large.

And in astronomy, as already mentioned, we are not only ‘selling’ products (our research results) or ourselves, but also the fundamental understanding of mankind’s position in the universe.

Acknowledgments

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