ASTRONET: Public Outreach

Extract, with minor editorial changes, from The ASTRONET Infrastructure Roadmap[1] Chapter 7

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Summary

The infrastructures that are built and used for astronomical research are financed by — and therefore must be justified to — our society. Astronomy has an innate appeal for people of all ages, partly because it concerns the fascinating, great questions "of life, the Universe and everything" and partly because much of the data obtained with telescopes can be presented as objects of stunning beauty. These are key facts when considering communicating astronomy with the public.

This native advantage that astronomy has over many other sciences does not, however, relieve us of the obligation to explain what we are doing to the public at large. There are many reasons for doing this. They range from attracting bright young people into the subject to fuel future research endeavours to convincing decision-takers to allocate large sums of money to finance increasingly expensive and ambitious projects.

Introduction

The existence of the International Year of Astronomy in 2009, 400 years after the first use of an astronomical telescope by Galileo Galilei, provides a splendid opportunity to boost worldwide awareness of the subject. Organised by the International Astronomical Union (IAU) and endorsed by the United Nations, this global endeavour with over 125 national nodes will reach hundreds of millions of people who will have had little previous exposure to science. Occurring near the beginning of the Roadmap implementation, it should create a groundswell of public support for the ambitious plans we are making. It is certainly an important time for astronomy communicators, with numerous opportunities to promote how science can have a positive influence on society.

ASTRONET Panel E is concerned with these aspects of the relationship of our subject with society, from teaching in schools, training in universities and recruitment into astronomy-related jobs to the process of communicating astronomy to the public. It also considers the relationship between cutting-edge research infrastructures with the industries that help build them, hopefully to the benefit of the overall economy of the continent.

At the top level of research activity, where international teams of astronomers, including young post-docs, collaborate to utilise

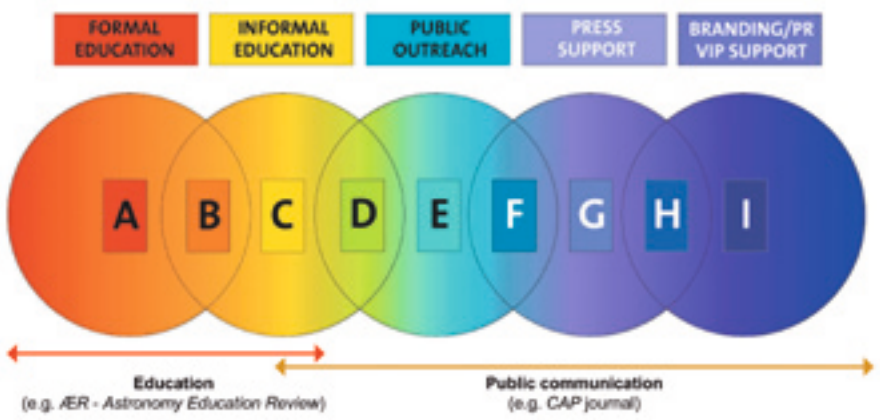

Figure 1. The entire science communication "space" from education to public communication including "PR"[2]. Credits: Christensen & Russo.

the world's most powerful instruments, there must be sufficient funding available to allow European astronomers to exploit the resulting observations on a competitive timescale, thus reaping the full scientific and training rewards of such large investments in facilities.

It is important that the organisations providing the facilities and also individual scientists recognise the importance of explaining what they do to the people who are, ultimately, paying them to do it. By ensuring that public communication is seen as an integral part of a scientist's job and that it is given clear recognition when done well, a culture of high quality communication can be encouraged.

A common theme among the recommendations we make in this article is an urgent need for steps to improve the organisation and the accessibility of the enormous amount of education and public outreach material in today's information mass market. Tools such as common portals to — and organised repositories of — media and materials for these purposes will bring a fruitful order to the existing rich, but widely dispersed, assemblages of data, images, videos and other information.

Background

People's innate curiosity about the world in which they live draws them towards astronomy, providing rich opportunities for outreach and education (see Figure 1). Our task is to gain maximum profit from this situation by stimulating the interest and imagination of people of all ages and backgrounds.

Panel E's report tackles two principal areas:

- **Education,** including primary and secondary schools, university education and research, and recruitment;
- **Communication,** aimed at several different target groups.

A set of recommendations has been derived from the Panel's investigations and they are given and described in the following sections. Each recommendation is supported by some background information, a summary of the work carried out by the Panel and, where possible, some pertinent example.

These recommendations can be divided into two groups: those that seek to change the cultural behaviour within astronomy and science education and those that will require some financial support provided by government education ministries, national or international funding agencies or individual research institutions. Effects of such spending might be expected to become apparent on timescales of two to three years. In this article we focus only on the communication side.

A note on terminology. In this document, we refer to both national and international organisations. Amongst the latter are pan-European organisations like the European Space Agency and the European Southern Observatory for which we use the generic term "agency".

Communication

Science museums and planetaria

The opinions of the museum and planetarium operators were polled with a questionnaire (reproduced in the Report Appendix VI.D) sent to addresses from the International Planetarium Society[3], the British Association of Planetaria[4], and the European Hands-On Universe network[5]. This list includes various government-funded organisations, non-governmental bodies and privately funded science outreach operations throughout Europe. From a total of 34 responses, the following general conclusions emerged:

- Formal links with the European agencies involved with astronomy and space are scarce. Less than a tenth of responders indicated that they had any link or direct communication with the agencies in Europe.
- The majority of responders would welcome a central repository of visual material relating to astronomy and space. They are especially interested in images and videos.
- The relationship between planetaria and local amateur astronomical societies is common and should be better understood and utilised. Regional astronomical associations and societies are a powerful dissemination mechanism of astronomy related literature and scientific endeavour. The valuable role that amateur astronomers play, both in the role within society as a communication conduit, and also in real scientific endeavour through observation, is recognised by the Panel. Established relationships with professional astronomers are less common.
- Problems with curriculum integration and the sustainability of formal programmes clearly exist.

The responses exposed a richly diverse programme covering many aspects of classical and modern-day astronomy. The interaction with the public clearly benefits from the stunning visual appeal that astronomy offers and there is some evidence that this has a direct effect on bringing pupils into science subjects in secondary school, although more tracking is required to verify this effect. Many of the facilities questioned offer a formal astronomy education package linked to the curriculum in their respective regions and it may be that the impact that these centres have on student choice should be further explored. It should also be noted that those that do provide formal stimulus also have difficulty in creating synergy with the curriculum providers and that this is partially addressed in Recommendations 1, 2, 3 and 4. See full report on: www.astronet-eu.org.

The planetaria and science centres in Europe are the natural conduits through which the flow of astronomical information is disseminated to the wider public. This leads to our principal recommendation in this area. Although the European Agencies (ESA/ESO) have worked in collaboration with some of the major planetarium associations

in Europe, a more systematic collaboration and coherent strategy may be required to further the impact of European astronomy communication to society.

Recommendation 5

Action. *Active steps should be taken to forge links between science museums/planetaria and the European Agencies (ESA/ESO), the principal providers of high quality media and related resources in astronomy.*

Institution. European agency (ESA/ESO) or other stakeholders.

Timescale. Two to three years.

Comment. This could take place via a central portal that could be the same as that referred to in Recommendation 8 below.

It should be noted that the European Space Agency has begun to create a network of European Space Education Resource Offices (ESERO)[6]. The primary task of the European Space Education Resource Offices (see Figure 2) is to encourage and inspire young people to learn more about science and technology by drawing upon their enthusiasm for space exploration. The ESEROs are intended to be the first ports of call for anyone in Europe requiring educational support related to space activities. A network could be created to promote a synergy between European agencies and science centres and planetaria.

Figure 2. ESERO logo. Credit: ESA.

Public communication and outreach

Here we focus on the astronomy communication activities that are not seen as "formal education", especially press support, public outreach and activities of a promotional nature (with the aim of elevating the visibility of a scientific organisation). In addition to using the substantial hands-on public communication experience within the Panel, we have distributed a questionnaire to over 40 of the major players in Europe (see Report Appendix VI.E) and also analysed the answers to the relevant question in the ASTRONET Questionnaire (see question 12 in Report Appendix IV.D and also Report Section 2.3).

It is widely acknowledged that astronomy can play a key role in raising public awareness of science[7]. A vigorous activity in science public communication and outreach in Europe is an absolutely essential investment in the future health of the subject and, indeed, can significantly contribute to the economic and cultural life of the continent. Differences in the attitude towards public communication between scientists and science management in the US and in Europe are often stark. The Panel has identified a need to bolster public awareness of astronomy (and science in general), to convince the scientists of its importance and to equip at least some of them with the knowledge and tools to participate actively in the process.

The European landscape of public communication mechanisms is (not surprisingly) complex and rather fragmented. Different countries have different cultural backgrounds, political systems, technological and scientific levels, and level of general knowledge. The differences naturally make it more difficult to reach the entire continent in an easy way, but the diversity can also be an advantage if taken into account when communicating.

What, from a modern point of view, can only be described as an underdeveloped communication culture and identity in European academia is undoubtedly rooted in its history and linked to the way scientific research has traditionally secured its financial support. Indeed, systematic and sustained public communication about research has not been regarded as indispensable to ensure continued support by public research funders. Public communication is therefore still primarily regarded as a burden on the scientific institutions instead of being seen as a long-term strategic investment. In the US on the other hand the funding loop is much more closed (partly due to federal law) and depends highly on the visibility and results of the individual organisations and research groups.

The claim that Europe has a weak, or in some parts even absent, public communication culture, is strongly supported by the literature and personal experience. As an example Banda (2005) states[8]: "Despite several initiatives in recent years to improve Europe's performance, parts of the research community still do not believe that effective proactive media relations is a priority."

One of the consequences of the Europe/US asymmetry in communication, which is seen over and over again, is that European journalists most frequently quote US sources[9]. One response to the questionnaire states: "European science often appears as second class in the press, even in fields where Europe is leading. The basic communication-cultural differences between the US and Europe are to blame." There may be several reasons for this. Perhaps part of the reason is merely habit with journalists and editors? After all, the media know what they are getting from the US. Perhaps American science stories are more digestible and have a higher standard? Or there are more of them and they are simply more accessible and visible? Most likely all of the above apply, and the best strategy to improve the situation is to consistently produce interesting and high quality communication products in Europe.

This general trend is also apparent in the ASTRONET questionnaire, which provides evidence that there is stronger tendency to include extensive education and outreach programmes in US-dominated facilities. An example is the LIGO Science Education Center in the US (a similar one for GEO600, located in Germany, is not planned as far as we can tell). Naturally there are counterexamples (for instance nearly all radio telescopes in Europe and the US have visitor facilities, as claimed by the European VLBI network).

The lack of communication culture in Europe can also be detected in quite different areas from those discussed so far. An example is the lack of understanding, especially at higher levels, of the scientific hierarchy that astronomical data cannot remain in the ownership of individual scientists or teams beyond a reasonable period. The "ownership" of data streams of potential direct interest to the public by the Principal Investigator of a publicly funded instrument has a destructive impact on the public participation in the science to a degree that should not be underestimated. This is seen for instance for some space-based experiments, with the *Mars Express* High Resolution Stereo Camera data as a notable example (see Figure 3). Instruments operated as "facilities", like most (European) ground-based observatories, tend to have clear data-rights policies. Spacecraft operated as platforms for Principal Investigator experiments produce data that are more under the control of the Principal Investigator.

While most US scientists acknowledge communication as part of their business in order to foster support for future projects, most European scientists don't "get the message". NASA is communicating some of its space missions quite aggressively (actually also quite a few of ESA's and other space agencies' missions) while ESA is very often quite reluctant to communicate the results from its science missions and is sometimes essentially invisible to the press. Without

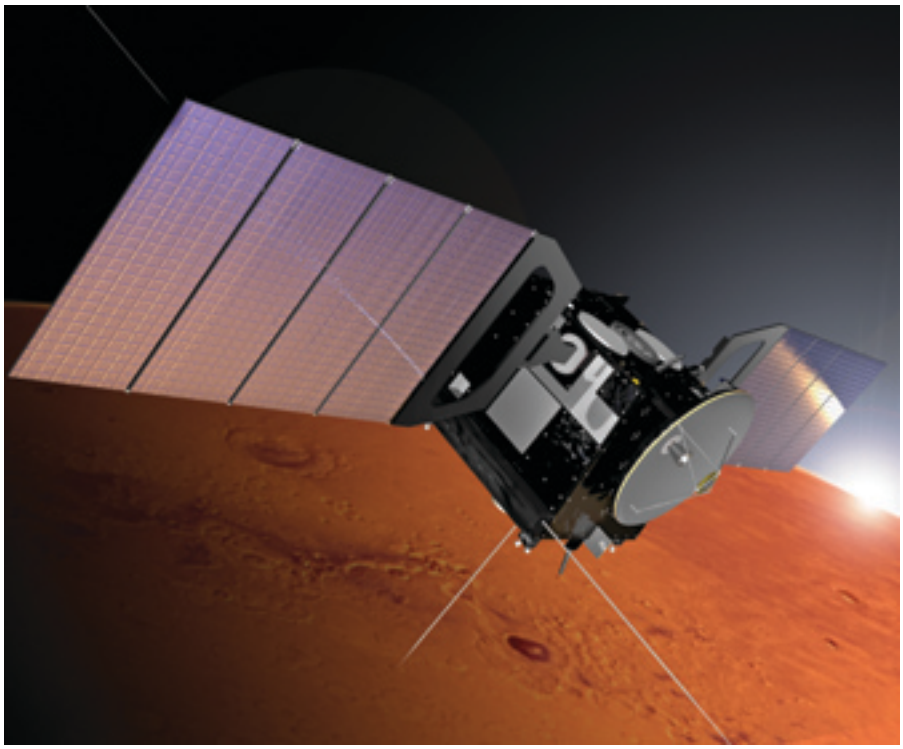

Figure 3. Mars Express. *Credit: Alex Lutkus.*

speculating about the detailed reasons for this finding, one conclusion is unequivocal: the difference in the level of funding for public communication per mission between NASA and ESA can be as much as an order of magnitude or more.

Communication could have a huge impact on the general public and on the decision-makers. The fifth servicing mission to the *Hubble Space Telescope* was saved because of the strong public support, resulting in intense political pressure. The same is true for the *New Horizons* spacecraft en route to Pluto (see Figure 4). NASA's cancellation because of budget problems was withdrawn within months. Could European scientists expect similar public support for their next projects?

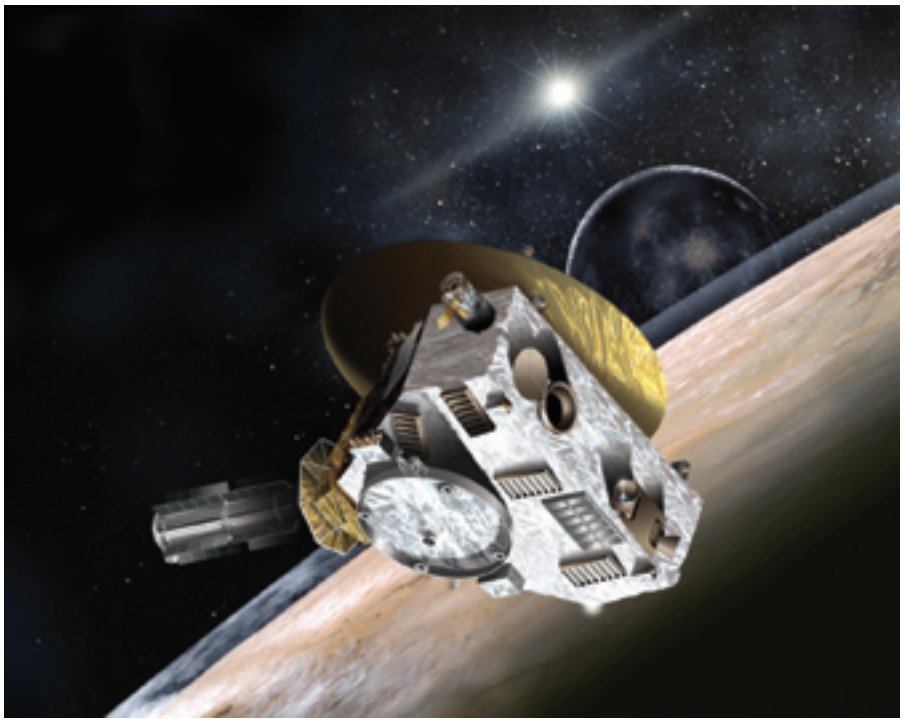

Figure 4. New Horizons *Spacecraft. Credit: NASA.*

The message here is that proper spending on public communication should not be seen as a "cost" but as an "investment" for the future. Returns on this investment may be high. The consequences of not making the investment may be disastrous!

Recommendation 6

Action. *Adequate strategic long-term support must be provided for public communication and education in Europe. Firstly, observatories, laboratories and all facility-funding authorities should allocate sufficient resources for public communication and education.* As a useful benchmark, this would amount to at least a few percent of the overall budget (1–2% is sometimes quoted as a good starting point). For smaller institutes, it should be understood that a threshold investment must be reached to enable a successful communication effort. *Secondly*, public communication of science is subject to the same competitive pressures as all other kinds of public communication. Hence *communication departments must be organised and operated in a professional fashion,* i.e., by professional science communicators, working with active scientists (see Recommendation 7). *Thirdly, as strategic management tools, communication departments must be placed at or directly linked to the highest levels of the institutional scientific hierarchies.*

It goes without saying that results from taxpayer-funded experiments must go into the public domain and be accessible as soon as possible. Where research data are subject to proprietary time rights (typically one year), carefully selected elements of the data should be available for presentation in a suitable form for direct public communication at an earlier stage.

Institution. Agencies.

Timescale. One to two years.

Many of the European projects that have answered the ASTRONET questionnaire aim relatively low in their strategy and mainly target science centres, museums, and teachers' organisations. There is a lack of planning of communication targeting press/journalists, stakeholders, political and industrial opinion formers, etc. Furthermore some European education and outreach programmes lack full-time/professional communicators. As one questionnaire responder says, "There is a lack of professionalism and effectiveness in Europe as compared to the US. We need to learn how to get there 'on time' and 'with a splash'."

In terms of recognition of the importance of public communication in general the Washington Charter[10] is a good starting point and we recommend adherence to it at all levels. The questionnaire confirms the claim that the role and importance of public outreach is still not properly understood in many institutes across Europe. This includes assessing and recognising these activities when young people apply for astronomy positions.

Recommendation 7

Action. *Ensure clear career-relevant recognition for scientists who become involved in public communication. Provide, and encourage scientists to utilise, media training courses.* The Washington Charter should be promulgated at all levels. Proper public communication of astronomy entails the allocation of sufficient resources to secure an adequate, sustained effort executed by professional science communicators.

Institution. Employers of research scientists.

Timescale. One to two years.

Public astronomy communication has to develop apace with the other players in the mass market for electronic information (gaming and entertainment industries, etc). The problem today is not so much the availability of excellent astronomy multimedia resources for use in education, outreach and the like, but rather *access* to these (often digital) materials.

Even for an expert user, locating a particular image invariably requires going to a known resource or relying on the vagaries of existing multimedia search engines, such as Google images or YouTube. One questionnaire respondee said: "Even a simple web page with links to the existing outreach material would be a good start."

Another respondee said: "A central repository with illustrations of any kind in astronomy would be very useful. There are a lot of interesting illustrations on the internet. If these were collected in an archive and allowed to be used for talks etc. it would be very helpful!"

Lately, press release portals such as EurekAlert[11] or AlphaGalileo[12] (see Figure 5 and 6) have emerged and seem to have some success amongst journalists. This kind of syndication service, or one-click portal, seems to be favoured in many parts of the community and is a valuable step in the right direction.

In summary, access to digital education and inspiration materials is getting increasingly difficult due to data management issues, not lack of material. The data management issues can be split into standardisation, metadata tagging, and data exchange/communication. Briefly put, we need standards to know how, where, what, etc. to exchange. We need metadata tags to describe the context of the products (images, videos, etc.). And we need well-described methods for exchanging the products. Some of the existing archives, such as at AthenaWeb[13], rely on physical repositories, where the archive centrally stores and distributes the material. Others advocate an aggregator approach where the material stays with the producers (similar to iTunes) and only the metadata and the location of the data is stored centrally. This method has huge advantages over the former as it is community and needs-driven and hence is more efficient once the archive works. The method is however more cumbersome to set up in the initial phase.

Recommendation 8

Action. *Support the creation of a standardised European science communication portal for media, educators, interested laypeople and others.* This portal should promote best practices and requirements for public communication with a particular awareness of the spectacular image material produced by astronomical research activity (and whose production is currently dominated by the US), on multimedia products (animations, video podcasts, etc.) and engage the community in its continuous growth.

Institution. Agencies.

Timescale. Two to three years.

Comments. Involve IAU Commission 55[14]. This could take place via a central portal, which could be the same as that referred to in Recommendation 6.

Summary and implementation

Following an initial collection of some seventy items, Panel E were able to reduce and condense their deliberations to just ten recommendations directed toward the appropriate European and national bodies. A reasonable time to implement these recommendations is considered to be from one to three years. Note that, due to its somewhat broader nature, Recommendation 10 is considered to be an issue of concern to all the Panels and is not addressed further in this section.

It is recognised that in order for the recommendations in this chapter to be realised, they will need to be carried forward and monitored by a "champion" who has strong connections with funding agencies and other relevant high-level bodies in Europe. The need for continuity over at least two to three years, suggests that this is an activity for ASTRONET to follow beyond the current roadmapping exercise.

The recommendations generated by Panel E divide naturally into two categories. The first of these demand a change in mental attitude and methodology — basically a change of culture — and can be implemented at little or no cost over a period of one or two years. Recommendations 1, 2, 3, 6 and 7 fall within this group.

Given appropriate advice, it is possible for the national bodies responsible for school education to implement changes in a relatively simple way at little if any additional cost (Recommendations 1, 2 and 3). Each country has its own structure for teacher training and it is necessary to ensure that these provide opportunities to instruct teachers to present astronomy to their pupils in an exciting and stimulating manner. If this happens, we can be confident that future European citizens will have an appreciation of the Universe around them and can feel excitement about the progress of science in general. Also, the fact that observations of the sky, while being free of financial cost, do require low levels of light pollution, will contribute to an awareness of the need to care for our planet.

The employers of research scientists need to ensure that there is a clear and effective recognition of the efforts that these researchers make to communicate to the public what they are doing and to convey the excitement they feel about the discoveries they make (Recommendation 7). Such recognition should be significant factor in assessing career development.

A general guideline reached by the Panel is for funding agencies to arrange to invest some 1–2% of their overall project expenditure into public communication and education and also to ensure that the research results are clearly represented and illustrated in the public domain (Recommendation 6).

The second category, including Recommendations 4, 5, 8 and 9, will require a somewhat longer period (two to three years) to realise and carry some requirements for funding. The development of new capabilities such as portals and repositories needs the clear identification of resources and responsible groups charged with their provision and maintenance. It may be that existing groups with short-term funding can be extended in a way that makes full and continuing use of their existing expertise and capabilities.

Although many professional Europe-wide activities can be effectively carried out in

Figure 5. EurekAlert[11] home page.

Figure 6. AlphaGalileo[12] home page.

English, the resources aimed at school education have to be made available in the relevant languages. This is particularly pertinent for the portal for primary and secondary schools and for teacher training (Recommendation 4).

A second portal/repository is necessary for non-formal education as recommended in Recommendations 5 and 8. This portal should offer media (including images and videos) for the public and also tailored for science museums and planetaria. While there are already many excellent sources of material, a "one-stop-shop" or aggregator, would greatly increase the efficiency and effectiveness of dissemination.

Many of the contracts offered as part of the development of the cutting-edge facilities in astronomy today are of considerable interest and value to industry in Europe. Some of them can elevate small industries to large ones and/or create new capabilities of relevance to other fields — for example the fabrication of large, high precision optics. The tracking of this process and the recognition of opportunities for technology transfer requires the establishment of an expert group that will increase the visibility of the process (Recommendation 9).

With thorough planning and proper support, astronomy communication throughout 2009 and beyond will be more successful than ever before.

Notes

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