

THE ROLE OF THE OBSERVATORIES

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ABSTRACT

Observatories are the engine room of astronomical outreach. They provide the tools that allow research discoveries to be made in addition to employing many of the research astronomers and public information officers (PIOs). Where accessible, they provide a natural venue for public visits and centres of excellence. They engage in a wide variety of outreach activities in their own right with varying degrees of success, often linked to funding. In all of this, the enthusiasm and high calibre activities of individuals can never be overestimated. We review the above and report the results from a 'health of stock' survey conducted of a large sample of mainly ground-based observatories reflecting their overall activities and experiences.

INTRODUCTION

When considering astronomy outreach in the broadest context, three categories can be identified:

- Producers, comprising astronomers, observatories, facilities etc
- Mediators (sometimes termed distributors), comprising PIO professionals, PR departments, planetaria, etc.
- Deliverers, comprising astronomers, enthusiasts (including amateur astronomers) agencies (through sponsored programmes), planetaria, etc.

Of course, in reality, many of these boundaries are blurred and individuals can switch through all the categories as part of their normal working day—this kind of flexibility is a good thing and is to be encouraged.

We must all realise that observatories are the bedrock for the production side of outreach material. Even though it is the individual astronomer or team of astronomers who makes a discovery, then the basis is an observation, and that requires facilities and instruments (unless the work is in theoretical astronomy). [One can always argue about the standing of a theory without experimental verification, but one way or another it can generate significant public awareness through spectacular press releases.]

It is important to realise just how fundamental the observatories are in the overall astronomy outreach process. Naturally space platforms and satellites/missions are included in this context, but throughout this talk I will focus on the long-lived, ground-based observatories that serve the very widest astronomer base, rather than the one-off space mission that is limited to the instruments carried up on launch (the HST being the notable space-based example that can update its instrumentation and hence prolong scientific excellence).

Observatories provide the necessary infrastructure that allows observational astronomers to produce the exciting scientific results in the first place. They also provide employment for many people in the second category—the Public Information Officers. Many observatories provide a local focus for direct outreach in the immediate geographical area and a venue for members of the delivery category—especially enthusiasts and amateur groups. Finally, although perhaps not directly linked to outreach, but certainly a valuable resource, they are often the repository of the history of observational astronomy.

We acknowledge that ground-based observatories span a wide range of capability in terms of their delivery of ‘outreach’. This may be dictated by a variety of reasons, including, for example, the standing of their competitive research activity, funding, location, and mission requirement. Let us take a look at each of these in turn.

Research activity for an observatory can range from a cutting edge, state-of-the-art, cut-throat occupation in a highly competitive environment, whose very reason for existence is to maximise the scientific impact, to old, ‘historical’ observatories that essentially undertake no research with the observatory equipment (although they may employ astronomers who pursue fine research using modern facilities worldwide). My own observatory in Edinburgh is a prime example of the latter. And there is of course everything between these extremes. It is not clear if there is a correlation or an anti-correlation between different types of research activity and deliverable outreach, where each is competing for staff time and resources. Many, if not most of the major observatories in the world have very active outreach programmes and there are excellent examples of high calibre outreach from the older and non-research driven facilities. The one thing that does seem necessary is that for a major observatory to maximise outreach commensurate with its ‘status’, PIO professionals need to be employed, given the competition for research staff time.

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RESEARCH ACTIVITY

LOCATION

Location matters greatly when considering outreach in the context of public visits and lectures, a venue for gatherings and meetings of enthusiasts, provision of public viewing nights, or a visitor centre and shop. Telescopes that are close to major conurbations have obvious advantages in terms of visitor attraction and a potential public market, in the optical waveband light pollution tends to limit these to older observatories with conventional telescopes (e.g. Mt Palomar). However radio observatories can do well in this situation—Jodrell Bank is a prime example, with the major cities of the northwest of England close by. Jodrell has an extremely active visitor centre and planetarium and has become a local attraction featured on tourist maps. A few observatories happen to be adjacent to popular tourist destinations, especially ski resorts. Notable examples of these are the Observatoire du Pic du Midi in the French Pyrenees, Nobeyama Observatory in northern Japan and the two telescopes (TIRGO and KOSMA Telescopes) at the spectacular Gornegrat location on the ski slopes surrounding Zermatt. However, in most of these cases, other obstacles prevent or limit visits by the general public.

Figure 1. The Lovell Telescope at Jodrell Bank provides a spectacular magnet for attracting visitors to this popular location. (Image courtesy of Ian Morison)



Kitt Peak is probably one of the best examples of a modern observatory located relatively close to a major population centre and continuing to do frontline optical research. Tucson has been very careful with light pollution, but it is noticeable that the city has grown enormously since the blossoming of Kitt Peak in the 1970's. Where public access is readily accessible and there is either a major local centre or good reason for a financial subsidy (for more rural environments) visitor centres spring up and flourish, acting not only as tourist attractions, but as educational centres (e.g. Greenbank Radio Observatory). Something to remember is that ground-based solar

astronomy is done in the daytime and so in principle provides a ready-made possibility for an 'easy' visitor attraction, as visitors can see observations made in real time. While many of these solar observatories are in remote locations, a number of them have realtime webcasts of observations for public viewing.

For the more modern optical/IR/submillimetre facilities, very high and remote mountain tops or high and remote dry plateaus are the name of the game. These are typified by La Palma, Mauna Kea and the sites in northern Chile (with Antarctica at the extreme). Access can be difficult because the sites are remote, or because they are so high that there may be serious health and safety hazards for the general public, or both. In such cases, visiting the actual telescope is very difficult, and where it is possible special care needs to be taken to ensure that members of the public are forewarned of possible hazards and dangers and that the observatory is protected from resulting lawsuits in case of incident. This is not a trivial question when weighing outreach and openness against business liability. In this context the Subaru Observatory deserves special mention for recently instigating a visitor programme for the general public (see poster by Ishida). It will be interesting to see how this develops.

Most of these very remote facilities have operational bases at a sea-level (or lower altitude) site, and this provides the potential for engaging in similar ventures to the more urban observatories in the previous category (e.g. the talk by West). It also enables 'remote' visits to the telescope, where the general public tour in cyberspace with various levels of interactivity. We will see a prime example of this in the Gemini Virtual Observatory talk by Peter Michaud later.



Figure 2. High and remote observatories like Mauna Kea pose a variety of challenges for public viewing and tours of telescopes. Nevertheless, a number of commercial tour companies have cottoned on to the observatory as a tourist attraction and many vanloads of visitors are taken to the summit of Mauna Kea to see the sunset each evening.

The challenges are different for facilities in space as there is no opportunity for public visits etc, but these observatories and facilities have produced an explosion of material for astronomical outreach and educational purposes through webpages, special events, promotions and control centre visits. One special case to be remembered is the Kuiper Airborne Observatory, which did such a lot for outreach/education by allowing teachers to fly in the airplane during observing sessions and produce lesson plans and generally excellent educational outputs from their experiences. The same is currently planned for its successor, SOFIA.

Some space missions work in wavebands that are alien to the general public and many have done a splendid job of education through some amazing innovations on their websites. We'll see examples of this during the meeting. Finally, there are the astroparticle experiments, some of which are buried deep underground. These have even greater problems at trying to explain the science to the members of the public, let alone confronting the access problem. I wish them the best of luck. Cosmic ray telescopes also have limited opportunity for public access, while not needing to be on extremely high sites, they do need very dark skies and so tend to be very remote by nature.

FUNDING

In many respects funding is the key to outreach success in terms of global reach. However, we should also remember that while funding may be necessary it is far from being sufficient. There has to be the 'added-value' provided by the key professionals and enthusiasts, many of whom are present at this meeting. Funding can be from the national government as part of a clear policy on outreach and education and/or from foundations and donations. In these cases funding is often generous. Many government agencies now require that all new major projects must devote a fraction of their total budget specifically to outreach. This is often manifested through webpages and activities (especially for the space missions). On the other hand, many observatories spend a significant amount of time applying for funds and grants just to be able to maintain a barely adequate level of outreach activity, and often at a level far below that which the individuals would like to be able to offer the public.

MISSION

Many observatories and facilities undertake outreach as part of their 'mission requirement'. This is to be greatly encouraged and is an example of good practice from sponsoring agencies. Being in such a situation is clearly a great asset for fundraising. The opportunity to subsequently increase this funding through demonstrable outcomes tends to be built into this model. I know of at least one major research facility from personal experience that has had a very significant increase in outreach funding over the past few years by demonstrating the need in the community and the effectiveness of their delivery methods and outputs.

On the other hand, many observatories operate outreach because of their inbuilt mission, rather than as an externally imposed mission. They do this because the observatory staff themselves feel that they should be and would like to be providing outreach. This is a highly altruistic viewpoint and is almost always driven by individuals. It is incumbent on all professionals and organisations to encourage and support this wherever possible. A key message of this entire talk is that INDIVIDUALS MATTER, whether it is the enthusiastic staff members who do the organising, the charismatic front-people, the fund-raisers or the volunteers. Key people make a difference. Cherish them wherever you can.

It needs to be recognised that many observatories undertake educational programmes that are directly linked to their local or national school curriculum. This is of tremendous benefit to the usually hard-pressed teachers and provides an 'out of classroom' experience for pupils that all of those who have been involved in such events know works extremely well. This is another aspect of good practice, but it has to be recognised that to do it well it is extremely labour intensive. And frankly, if it is not done well then it is almost certainly better not to do it at all. So for those thinking of such ventures, it would be well worth learning from those who are already successful, or maybe even better, from those who have tried and then given up.

Because of limited resources (usually staff time) some observatories have focused their efforts not on teaching the pupils, but on teaching the teachers—the continued professional development of teachers. If this is done well then the overall payoff is very high, as cascading knowledge into the teaching profession means that many more pupils can be reached with the same amount of staff input resource.

A number of observatories have visitor centres that have introduced clear educational themes that are either directly related to a curriculum, or, have very clear educational aspirations. Most observatories participate in the general educational theme by giving lectures to school children with a clear educational content rather than merely 'gee whiz' shows. So, all in all, it is clear that observatories are playing a notable role in helping science education at a time when it needs all the help it can get.

When assessing all the above factors in terms of sizing up observatories, they all have one thing in common; the ability to reach out to the public through the web. Because this is so obvious the question arises as to why I even mention it. And the reason is that web-browsing is similar to television channel surfing. As we have already heard, research shows very clearly that unless the TV audience attention can first be captured and then continually stimulated, it will be lost to surfing for all but the dedi-

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cated viewer. Just translate this to web-browsing and you will see the drift.

Anyone who has ever been responsible for maintaining webpages knows only too well that it is extremely demanding in terms of staff time. Maintaining content so that it is always fresh and up-to-date with links that always work when pages are moved or linked to external sources and changing names of staff to contact is a nightmare and very resource intensive if done well. Even with the resource in place, the next question is how the general surfer views the webpages. As part of the questionnaire that I will discuss in the next section I visited the webpages of over 70 observatories and facilities to get an overview of what was 'out there'. The results were very varied, from the excellent to the 'I give up' syndrome. I should be clear in this statement: I was looking for outreach and information about astronomy or the observatory for the public and nothing else. The question for me was, how easy the information was to find, and did it inspire further reading or investigation. There were some excellent sites with abysmal public outreach pages, and vice versa, but the good news is that most were making a decent stab at informing the public about what they were engaged in at least.

So, for the PIO audience present, take a look at your webpages as if you were a complete stranger and member of the public—or have your non-astronomy friend/partner do it for you. Questions you could ask include: is it attractive or exciting on first viewing? How easy is it to locate the 'information for the public' section? Is the directory tree sensible or just confusing? Are the images all much bigger in size (pixels) than they need to be and is the download time is just too long (think of those who are not on broadband)?

The web is a huge and valuable tool; we all use it to promote our institution as well as a means of conducting much of our work. But we also need to be aware that it needs to be customer-focused, much more so for members of the public than for research scientists. The latter are committed, the former may just be curious, so make sure that their curiosity is stimulated, not stunted at the first opportunity. Here endeth the sermon on the web for the morning.

In trying to get a handle on where astronomers stand worldwide in terms of communicating with the public through the role of observatories, I attempted to contact most ground-based observatories and offer them the opportunity to answer a simple questionnaire. As noted above, I started by viewing a large number on the web. Some then were rejected as the web-content was in a language that I could not translate (altogether reasonable if the focus is on the local populace), some had contact points that never worked, and some were so complex to navigate that I got fed up and called it quits before getting to where I might have found a contact name.

OBSERVATORIES—THE BIG PICTURE

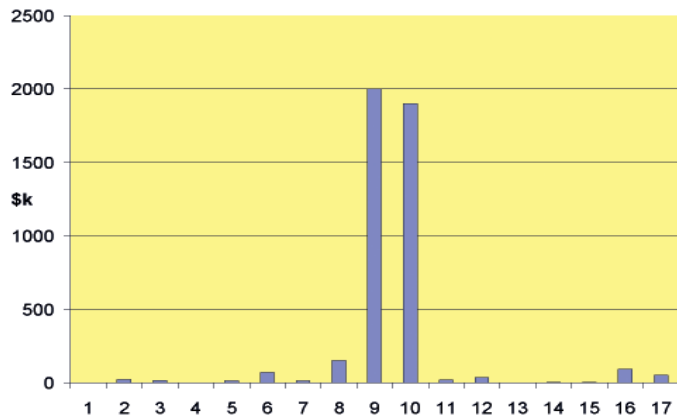
The final list comprised 58 ground-based observatories plus 2 space-based facilities (STScI and ESA Hubble). Their prime contact information (web) was taken from the Strasbourg data centre on: <http://cdsweb.u-strasbg.fr/astroweb/telspace.html>. I attempted to locate each observatory from the web and then contact their PIO or named contact person, as well as obtaining primary information (health of stock) and a 'gut feeling' for how well we are doing in terms of outreach to the public. This method also served to test the effectiveness of the webpages, and subsequently, the level of customer service in responding to the questionnaire. Up to the time of this meeting, 18 replies have been received so far. While in some quarters this could be seen as a high ratio of reply, I suspect most of us find this rather disappointing. A number of non-respondents are represented in this audience, and you should know who you are.

The questionnaire was as follows:

- Total Outreach Funding per annum:
- Major source of funding:
- Number of 'permanent' staff employed on outreach:
- Number of part-time helpers:
- Number of visitors per year:
- Number of school children visits:
- Do you have a formal programme of education?
- What are your attractions?
- What do you feel has worked well in terms of outreach success?
- What has not worked well?
- Number of research press releases per year:
- Do you have good contacts with the local media?
- Do your stories get well covered and if so, what is the secret?
- What proportion (%) of research workers actively participate in outreach?

As might be expected, the answers revealed the wide range of activity that is undertaken. In what follows I should note that the statistics are rather small and a number of the major players in the game are so far in the 'non-respondent' category. Nevertheless, given these caveats, the picture is that the total outreach funding ranges from \$2M per year to zero, the straight average being \$290k. As might be anticipated, the major source of funding is government and state. The replies are shown graphically below, where two large and famous observatories dominate the funding picture. It should be pointed out that some of this funding comes from visitor centre income as these are run on strict business lines:

Figure 3. The annual gross income in \$k as reported by 17 ground-based observatories from the survey sample of 58.



The number of ‘permanent’ staff employed on outreach varied from 20 down to zero and the number of part-time helpers varied enormously. Taken overall, the number of direct visitors to the observatory locations was around 300,000, which, when you think about it, is not that many at all, in fact ridiculously small, and I’m sure will be completely dwarfed by numbers from museums/planetaria as we’ll hear later. It is not clear that when the remaining figures are in, this total will increase significantly.

I was very keen to tease out ‘what worked’ and more importantly, ‘what didn’t’ in order to pass this on to the community. While this generated a wide range of replies, some specific themes could be identified. ‘Ask the Astronomer’ was definitely top of the pile, and all those observatories that ran this commented very favourably on it. This is a hint for those that have not yet embarked along this line, it always seems successful and even those astronomers who might not be very good at standing up in front of the public and giving a talk, seem to do better at just answering questions and being available. It was also noted that it was not only the professional astronomers that were in this top category, but the keen amateurs as well. The public seem very responsive to meeting those who actually ‘do’ astronomy.

Open days/nights and opportunities to look through telescopes also rated highly, although a number of responses noted that the weather was a damper and that planning was fraught with problems—finding things to do when it turned cloudy was challenging. The general use of and hands-on interaction with telescopes also scored highly, even when cloudy—just seeing the enormous magnification that even a small telescope provides when focused on a terrestrial scene was a positive experience. I remember many years ago my university had a science exhibition in the local shopping centre and we took a number of telescopes. I had one set up and focused on the solitaire diamond on a ring in a jeweller’s shop some 200 feet away and

one floor up. Asking people to look and identify what they were seeing turned out to be an amazing turn-on. Virtually all could just not believe that something they could not even make out with their unaided eye (some could just about see the trays that the rings were on) could be revealed in such huge detail. It was just mind-blowing. The moral: simple things work.



Figure 4. Staff from Jodrell Bank with their portable planetarium at a local school.

Finally in this section, everyone who had portable planetaria reported excellent feedback. This is clearly a worthwhile venture, although success was very dependent on the quality of the presenter. Last in the list of common agreements was that visits to schools worked well, although once again, the quality of presenter was the key to the success.

And now, to the ‘what didn’t work well’ category. While this was even more varied than the previous list, top of the pile was ‘talks that went on for too long’. Presenters who lost empathy with the audience and did not have the ability to change pace or content were a clear turn-off for the public and need to be guarded against. ‘Enthusiasm and entertainment’ virtually always score over ‘thorough but boring’. Following this in the list were what might be termed management issues. These centred on issues such as always having to fight for resources, along with not knowing the place of outreach in the management train, or, where the place was far removed from the action or the Director. Next was the difficulty of obtaining high quality exhibits for visitor centres, and even when funding was available, actually getting exhibits that were attractive, robust and that worked were all problems. Finally, and not unex-

CONCLUSIONS

pectedly, completing the list, was the perennial problem of the unpredictability of the weather for many locations.

We have seen that observatories make a huge input to astronomical outreach. The scale and scope of their activity varies widely; from very large organisations with flourishing visitor centres run on business lines to small observatories that occasionally open their doors to the public. All have their place and it is important that all are encouraged to do what they can in fulfilling the mission for astronomical outreach. Better to undertake a small number of activities well than to try and extend too much at the expense of quality. The public are discerning and competing markets for attention are huge in this day and age. Remember this when designing or updating web-pages. Observatories are doing a great job, but it is certain that they can do more. Funding will always be an issue, but astronomy is incredibly fortunate in having highly enthusiastic staff engaged in outreach and a general public that is receptive to the message. We need to capitalise on this by whatever means possible and encourage observatory directors, funding agencies, sponsors and the like to continue to invest capital and time to this part of the mission, to both repay what we have enjoyed in our professional careers and to ensure that scientific literacy is not only continued but enhanced for the coming generations.