CONFERENCE SUMMARY

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I have summarised the talks that we have heard in tabular form (Table 1), using Ian Robson's model for astronomy communication:

Astronomy > Mediators > Media > Audience.

Table 1 also includes features of some of the processes in the chain of communication—the arrows in the above chain. Between the Scientists and the Mediators, of whom there are many representatives at this conference, there are issues of culture, ethics and credibility. Together we have explored some of these in open debate. Between the Mediators and the Media are the Gatekeepers, of whom there are very few here this week. They have their own ideas about what science they can let through to the audiences. And of course between the Media and the Audiences there are issues of language (I mean not only whether the language is English, Spanish, French etc, but also the clarity, and the inclusion of difficult concepts and technicalities.) I have inserted these issues between the appropriate columns.

I have added into Table 1 estimates of the size of the potential audience and the cost of reaching them (in universal monetary units—US$ or euros, it makes no difference to the accuracy given), including the unit cost. Sometimes I have taken these numbers from the talks and sometimes I have made estimates myself, so they are guesses perhaps uncertain by factors of ten. The resultant numbers should not be taken too seriously. Table 1 is ranked by audience numbers, more or less.

My first impression is that we are doing well. Of course we can always do better, but I am very struck by the variety of the modes of communication in Table 1—a dozen main classes. The number could be expanded to twice that many by treating my subclasses separately; and maybe I (or the conference organisers) forgot some altogether. We are lucky that astronomy is so universal a topic, sought by audiences and thus by the media, and of almost universal interest. I will not mention by name other sciences that find it difficult to access any of these channels of communication, even one. But I think we are getting more practised and more successful at communicating our science.

Another striking feature is that the unit cost varies a lot, usually in a way that is anti-correlated with audience size and correlated with the 'quality of the experience'. In general, but not always, the bigger the audience the lower the unit cost. Obviously it is a matter of judgement how these two factors are played into an evaluation of what to set out to achieve.

I have added a subjective assessment of the degree to which a member of the audience has to engage with the communication—this may be a measure of the impact on the individual of the communication. In general the mass media are lower on engagement than the media to which an individual has to make a commitment of time, effort or money. I expect that the less the engagement, the less transformational of the experience to the individual. On the other hand, lower impact mass communication may be highly desirable for those wanting to publicise a current facility in order to generate support to obtain resources for the next, certainly if this is partly a matter of popular vote.

Table 1. Communicating Astronomy 2005

			Communication					
	Astronomy	>	**Mediator**	>	**Media**	>	**Audience**	**No. per year**
		Culture Ethics Credibility		The Gatekeepers		Language and Difficulty		
1	**A space event**		Astronomer		All		Global	1 billion
			Space scientist					
2	**Pictures**		Archive/VO/NVO		All visual media		Global	Very large
			Picture Library					
3	**Wow! Science**		Astronomers > PIOs		TV		Viewers	100 million
					Newspapers		Readers	
4	**Facts &**		Planetarian		Planetaria		Visitors	100 million
	Enchantment							
5	**Astronomy for**		Writer		Magazines		Readers	
	amateurs &							100,000
	novices							several 100,000
6	**Experience**		Demonstrator		Telescope		Novice to	1 million
	the sky						amateur	
7	**Experience**		Guide		Real place		Visitors	100,000
	the observatory		Writer & programmer		Virtual reality		Home viewers	10,000
8	**Taught**		Teachers		Activity Centre		Students	huge
	science				Mobile planetarium			
					Class room			
					College/Uni			
9	**Elementary**		Presenters		Radio		Listeners	Millions
	science				Podcast			
					Rap music			
10	**Elementary to**		Writers		Books		Readers	1000s to millions
	advanced science				Distance learning		Students at home	tens of 1000s?
11	**First hand**		Astronomer		Lecture Q&A		Audience	100s
	account							
	('Ask-an-astronomer')							
12	**Science**		Astronomer		Robotic telescope		Students	10-100s
	investigation		Engineer		Lab			

	Cost		Unit Costs	Audience engagement
	Capital	Recurrent		
	High	High	cents	Low
	High	High	cents	Medium
	Small	1 million	cents	Low
				Medium
	High	1 million	1 to 10	High
	Moderate	millions	10 to 100	High
	100 - 10,000 ea	Nil	Dollars	Very High
	Nil	10,000 up	10	High
	Small	100,000	1	Medium
	High	High	10 to 100	Medium
				High
			Lower than we would like	
				Medium
	Moderate	Low	cents	Medium
				Medium
				Very low
	Low	Low	10 to 100	High
				High to medium
	Low	Low	10	Medium to high
	Moderate to high	High	100 to 1000	Very high
				Very high

Cost is an impediment to carrying out communication. Communication modes vary in their capital cost and their recurrent cost. Buying a telescope for your own use, for example, has a high (but affordable) entry cost and virtually no running cost thereafter. Experiencing an observatory through visits may be essentially zero capital cost if you show people just what is there, but higher if you have to build a visitors' centre, possibly very high. The running costs may be significant in either case if you have to hire people to show visitors around. Virtual observatories may be cheaper in both respects but the audience experience is probably of lower impact, in general.

I found it difficult in the time I had to think about this summary to make any clear diagram of how to interpret Table 1—the correlations are not clear to me. In any case, there is no one best method of communication because the aims of the communicators vary so much. What does seem clear is that there are unquantifiable factors involved —particularly the quality of experience, the talent of the communicators, their enthusiasm and skill. The individuals concerned are very important to the success of the communication process. We are lucky as astronomers to have such individuals on our side.

There was less discussion here than I remember in Tenerife about the role of the Gatekeepers. Does this mean that they are no longer so important, or that they have less fixed ideas about what they will let through? I did get the impression sometimes during the talks that some of us are Gatekeepers—we have our own prejudices about what we can communicate and what we cannot. It is a kind of self-censorship. However, the number of modes of communication and the number of channels within each of the dozen modes of Table 1 are so large that we may be getting better at wriggling through some open gates, even if others are firmly shut against us.

During the conference we identified other impediments or modalities to communication, including language and ethical issues. I get the impression that we are better than we used to be at moderating our own language and explaining ourselves more clearly—certainly we should be better now after the workshops at this conference. Europeans have more of a problem in communicating than our North American colleagues, given the large number of languages spoken in Europe. Catherine Cesarsky mentioned the proposed European Union Science Translation Centre. This is an idea worth looking at to see if we can facilitate science communication in this large and well-educated subfraction of the global population. One manifest failure by us is to communicate astronomy through non-European languages. I think there is no one present at this conference from Asia or Africa (apart from one English-speaking South African). We may be reaching four out of the six inhabited continents but

we may be underachieving our reach to the world's population—1.6 billion out of 6.4 billion. Except for pictures.

So far as the ethical issues are concerned—we explored the concepts, but I felt we did not crystallise our discussion. Perhaps this could be a topic pursued at the next conference in the series—suggesting standards of ethical communication without impedance.

What is communicated of astronomy covers a broad spectrum of science. But I felt concern before I came here that we are not being ambitious enough, and I retain this concern at the end of the conference. Wow! is not enough. I saw encouraging evidence in some of the presentations, for example from the HST, Spitzer, and the robotic telescopes that we are pushing the envelope of science communication, testing to see how far we can go.

Perhaps the theme of the next conference should develop this further—'Communicating astronomy behind and beyond the image.'