

# C - GAPS AND BRIDGES IN COMMUNICATING PHYSICS TO THE PUBLIC

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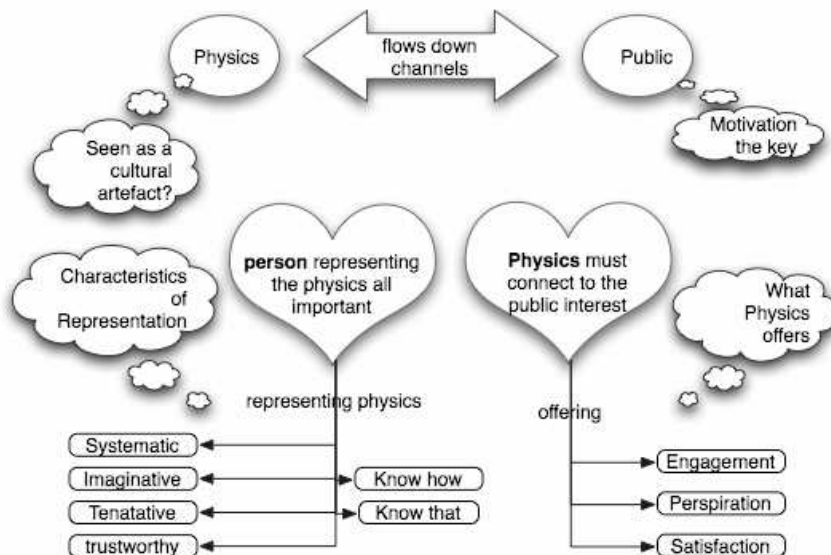
## Discussion Workshop C Report

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### 1. Summary

These were our recommendations:

- To connect with people go where they are. Make yourself available to the media and in locations where people have opportunities for being brought into contact with physics. Try to co-operate pre-emptively with the media, rather than criticizing afterwards.
- Consider and then recast the school curriculum as a basis for lifelong learning. Many negative views of physics have their basis here.
- In planning to present physics develop appropriate representations to promote curiosity and questions, having as a key focus the learners' interests and perspectives.
- Encouraging people to communicate physics to the public needs careful consideration. Think both about the training needed and about creating an environment where these actions will be appropriately valued.



**Figure 1:** A diagram summarising the thinking of the group

More detail and the chain of thinking that led to these is laid out below.

## 2. Illuminating anecdotes

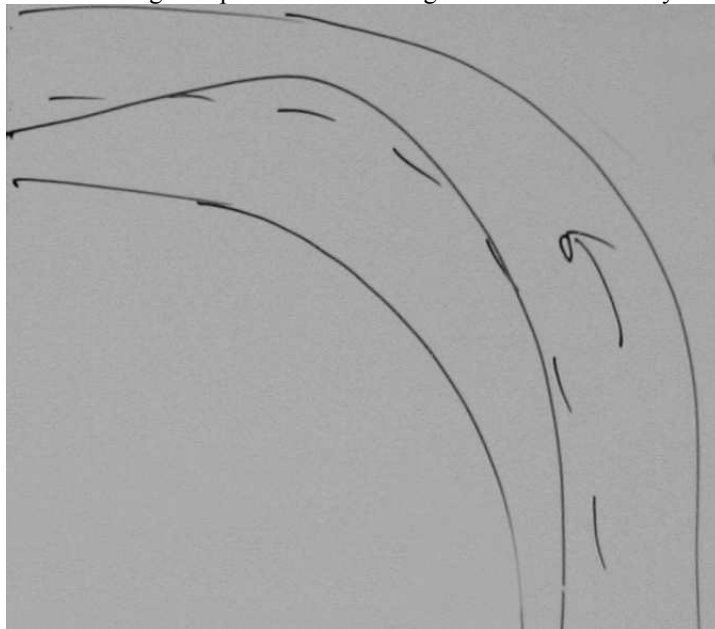
How to pick up girls - go where the girls are.

Moral: Physicists - go where the people are if you want to hook up with them. And not only geographically; locate their interests and connect with them.

How to drive - physicist style!

Always take curves in such a way as to minimise the accelerating force required to drive the car around the bend - never mind those silly white lines in the middle of the road. They are for lesser beings.

Moral: Physics is not enough - it provides a reliable guide to action in many cases



**Picture 1:** Paths for taking a corner. Possibilities sketched on the board to illuminate an anecdote.

## 3. Development of the group's thinking

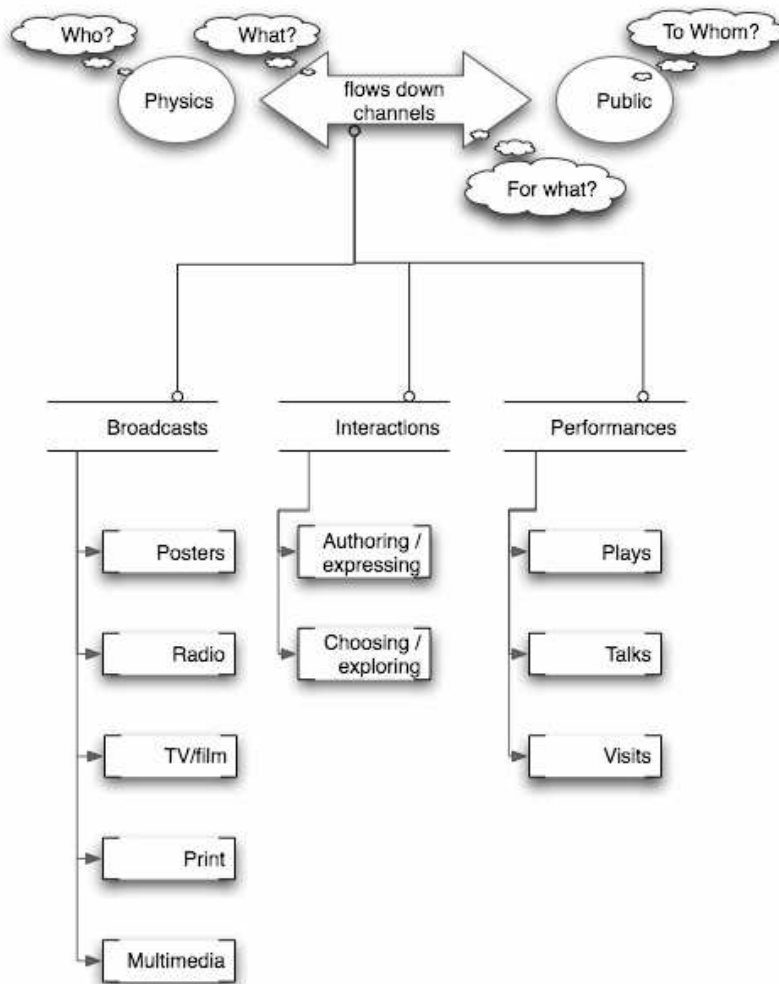
The original brief which mentioned bridges and gaps became clarified as a discussion of things which either impede or retard the bi-directional flows between physics and public.

The channels down which these flows occur might be subdivided into three groups: Those using broadcast media; those using interactive media; and those relying on performances. These channels are not themselves the members of these groups; but it seems likely that in the exploration of the processes that make up each channel there will be commonality between these different media in which the channels are grounded.

This formed a starting point for our discussion, with the key focus questions being;

- Who should do the communicating?
- What should be communicated?
- To whom should it be communicated?

- For what purpose might it be communicated?



**Figure 2:** The thinking on day 1, in diagrammatic form.

Members then contributed their general questions, to which they hoped to gain insight as a result of the discussions amongst the group.

Later we grouped these questions. Here they are presented with this order imposed, rather than in their original chronological order.

Those connected with motivation:

- Is it possible to redesign curricula to motivate students?

- How can we motivate children to study science? i.e. How can we encourage and allow them to retain their pleasure in exploration and discovery?
- Can we encourage a study of physics such that students do not lose their natural curiosity?
- To what extent can we personalise the communication of physics to support different interests?

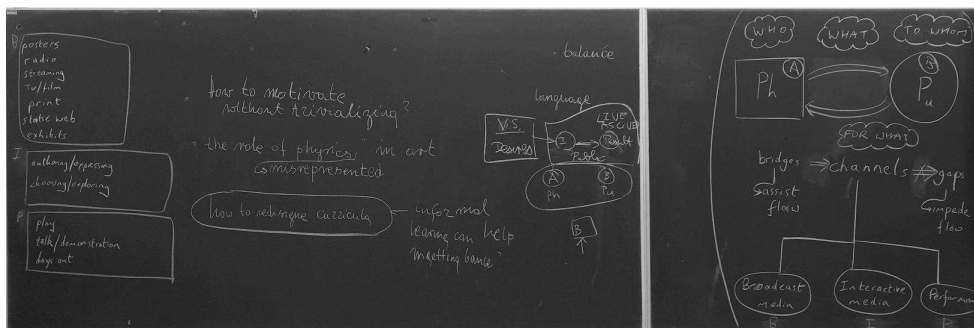
Those connected with seeing physics as a valued cultural artefact:

- How can we promote the place of physics in art and literature across three aspects: representation and misrepresentation; inspiration; communication.
- How can we encourage people to tap into the wisdom of science in their personal decision making?
- How can we ensure that the democratic process draws on the best available scientific wisdom?

Then the group moved to discussion, with people being asked to clarify their comments as personal experiences (E), Professional expertise (P), Suggestion/ Justification (S), or and example from the literature (L). Most of the discussion was based in categories E and S, with some from category P.

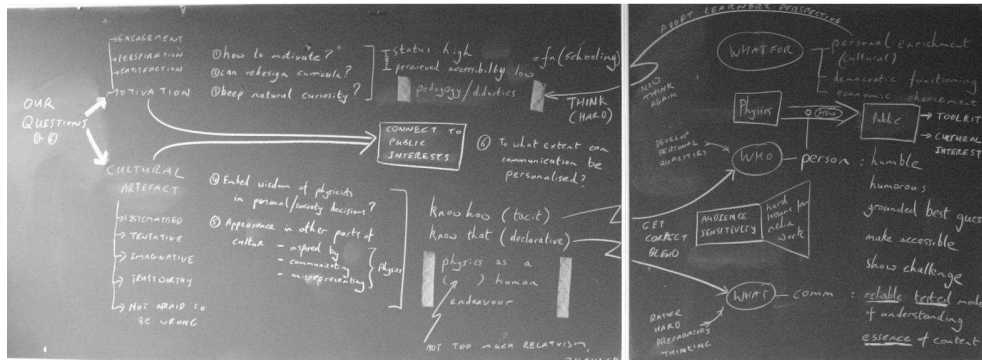
A good fraction of the discussion focussed on the effects of compulsory schooling and what could be done to change the views of physics embedded there. Another continuing thread was the interplay between physics and wise decision making - making our decisions based on the best available information. Some lively and heartfelt comments ensued, with more than one participant moving to the board on which our outline appeared in order to make their points clear. It was particularly useful to have experiences of people from all over the globe on which to draw. We were warned of the particular constraints of working with the media, particularly television.

Here is what the board looked like at the end of the first session:



**Picture 2:** The board at the end of session 1.

In the second session we focussed on trying to bring order to the, starting off with a structured view of what had been discussed in the first session. Here is that summary:



Picture 3: The board at the start of session 2.

We decided that part of the “what for” answer lies in the human interest; part in a necessary support of democratic processes. Both aspects of the cultural view of physics depend on a rather philosophical view of the place of science in the world. Against this we were reminded that Physics is highly valued but not liked. Perhaps this could be countered by science is a guide for action only; there are still choices to be made; and these choices do not have their roots in science.

Is formal learning per se a problem - do school structures necessarily turn learners off - perhaps doing lifelong damage? More phenomenology and less systematic exposition might help; so more formal and less informal. But one would need to be happy with less clear learning outcomes if dealing with experiential learning.

Being probably more important than doing in seeking to communicate: What you show is probably more important than what you assert as physics is people -centered: you are exemplifying what people are interested in and how the discipline of physics can support them in making decisions.

Much of this discussion concerned the public’s perceptions of the physics that was being communicated, particularly the personal traits that those engaged in physics were expected to show. Also discussed extensively was a characterisation of what was distinctive about physics, particularly with respect to its appearance in settings where informal learning might be expected to dominate. Inevitably this led to discussion of the nature of formal and informal learning. Is this simply, perhaps, the difference between learning done in voluntary and involuntary settings? Or more connected with the difference between knowing how and knowing that? Or characterised by the absence of tests and quizzes, whilst seeking to stimulate curiosity?

So to summarise these discussions, which were not channel specific - words of advice for those working in / designing channels:

- displaying humility and saying I don’t know are both good strategies.
- avoid jargon: but take care - translating jargon is hard work
- physics by itself may not be all that important - you have to make the connections: what is it for? So do show that physics can solve problems - but is not simply a provider of answers
- Do use a sense of humour: Don’t be aggressive, arrogant and aloof
- move between what is known and how it is known to illuminate physics as a reliable, tested way of finding out about how the world works

- introduce physics as a live tentative but trustworthy subject which is still developing and going further. We could be wrong - this is just our best effort so far.
- Make physics seem accessible - so that you can understand a bit.: the learner can use the knowledge; can predict and then observe with confidence; develop a sense of control.
- Keep those doing the learning involved
- Exemplify ways of thinking that are fruitful: both useful and stimulating further thinking.
- Develop and maintain a sense of hard fun.

Ian Lawrence

Marko Budisa tragically and unexpectedly died shortly after the end of the GIREP conference to which he had contributed so much: not least as a lively member of discussion workshop C. Marko was not afraid to ask the difficult questions. He was not afraid of controversial answers. Marko was concerned to share his love of the natural world and the creative explanations of it that make up Physics. He was not afraid of what others thought of him if only that helped others to see his enthusiasms and might serve to re-ignite their lost child-like enthusiasms for physics. Marko Budisa will be sorely missed by the members of the working group and the wider physics education community for his honesty and commitment to his ideas. We should leave the last words to Marko, in a poem that he was brave and kind enough to share with us in the working group:

### Strong

Strong  
 I crush a cracker  
 Hard as rock  
 With my bare hand  
 The crust disintegrates  
 Into smallest crumbles  
 I spend a lot of energy  
 Breaking apart chemical bonds  
 Between matter consistent  
 Yet I know nothing of the little atom  
 And when I merely poke it  
 It answers  
 Joyfully  
 With a single energy packet  
 With a single photon  
 Only then I realize  
 The power of Weakness  
 The nucleus decays  
 Emitting a fast electron  
 And a neutrino  
 How strong Weakness is  
 How weak Strongness is



That which I am looking for  
Is hidden  
In the last neutron  
Just about to decay  
In the last corner of Universe  
Where you are waiting  
For your prince  
And facing passing bandits  
Sorry  
But I was busy  
Discovering the truth  
That the Weak force  
Caused a nuclear explosion  
While I was being  
Strong.