

## SPECIAL REPRINT

This article is an adaptation of a text taken from the Natural Sciences and Engineering Research Council of Canada (NSERC) site entitled *Why communicate* [<http://www.nserc.gc.ca/seng/how2en.htm>]. Examples in the field of education are taken from various texts printed in the publication *Pédagogie collégiale*.

You have completed a research project or related work and want to share the results with an expanded public (non-specialists in the field) by publishing a scientific article or communicating the data to them orally. To be successful you must be aware of some guiding principles.

Even if you are gifted in communication, there is no guarantee that you will be able to disseminate the results your work.

Scientific communication requires compliance with precise rules and the mastery of a certain number of tools and tricks of the trade. It is an art that is learned. And practicing this art can help you become a good communicator. Try out some of the suggestions and tools of the trade recommended in this article.

### BASIC RULES

#### TELLING A STORY

The first purpose of scientific popularization is not to teach, but to provide information to the public in such a way as to create a desire to learn. To do this

you must be able to tell a story and share an adventure, yours. Why are you interested in this field of research? Which questions remain unanswered? What is at stake? What obstacles did you encounter? Did you find the results astounding? What are the benefits, the repercussions? Will it influence people's lives? How? This is what the public wants to know.

#### CARING ABOUT THE GENERAL PUBLIC

In the field of popularization, the public's attention and interest are never a given. Contrary to situations involving your peers, the general public is under no obligation to read your writings or even listen to you. It is up to you to motivate them to do so! You must be concerned about your readership and your audience. Who are they? Why should they care about what you do? Your goal cannot be to toot your own horn by displaying your knowledge but rather to communicating your knowledge to them by taking into account, first and foremost, what it is they want to know.

#### DEFINING THE SCOPE OF YOUR SUBJECT

Perhaps you have already asked yourself how to go about summarizing your work within a few minutes or in a few pages. Make no mistake, to popularize knowledge does not mean to summarize it. Nobody wants to know every little thing about your research and you must define the scope of your subject, discuss only one topic and present only items that are the most relevant and most captivating. If you cover too vast a terrain, you will be seen as descriptive, tedious and uninteresting. In addition, if this were the case, the editors in charge of publishing and producing your work could pare it down to respect time and space constraints.

#### A BRIEF LOOK AT HOW TO POPULARIZE

- Your readers are already drowning in information. Why should they listen to you? Find out how to capture their interest by relating a story that reaches out and touches them. Try to make the subject matter topical.
- Always humanize your remarks. Talk about your successes but your failures also. Know how to transmit your passion when communicating.
- Do not try to communicate everything. Limit yourself to a few key concepts.
- Express yourself in simple language, using as few technical words as possible.
- Provide concrete situations: Give examples, clarify the information with figures and tables, and compare the data presented with other data better known by the public.
- Make your remarks colourful and bring them to life with analogies and metaphors, using formulas that interject humour, and intersperse your remarks with anecdotes.
- Do not hesitate to visually document (photographs, figures, videos) your research and take care over all the visual components you may use.



### STRUCTURING THE SUBJECT

In order to capture and maintain the interest of the general public when popularizing scientific information the format differs completely from scholarly communications (introduction, methodology, results, discussion, and conclusion). For example, instead of stating your results at the end, you present them briefly at the beginning. The results then serve as “bait” and tempt the reader with the relevance of your work and its innovative perspective. You can introduce your subject with outstanding facts and data to spur their imagination (to name some: Statistics on student success, data on the importance of general training, the increasing popularity of ICT and success ratio of girls versus boys).

In addition, instead of introducing a theory then illustrating it with examples, use examples to introduce the theory. A single specific situation holds the reader’s attention better than a general statement and is more readily understood. It is not by accident that journalists make use of this technique all the time (for instance, telling the story of one individual to discuss a problem that the community experiences as a whole).

Lastly, even if your approach interests your peers, it may have little meaning for the general public who want to know how your results will affect their everyday life.

### SAY THINGS SIMPLY

When communicating, the goal is not to play the role of scholar or expert. Before using technical terminology and expressions belonging to the jargon of your field, ask yourself if the term is absolutely necessary. Can the terminology and expression be replaced by a synonym that is more meaningful? For instance, why speak of *iatrogenic effects* of medication instead of *adverse effects*? Why call a *cougar* by its scientific name *Felis concolor*? Why not speak of the *many meanings of an idea* rather than speak of the *polysemy of a concept*. Only technical terminology and expressions that are essential for understanding should be used and they must be defined each time they are employed.

In addition, it is important to lighten your remarks as much as possible by avoiding unnecessary details and precisions. For example, why state that an internal clock is an internal *bilateral* structure of the brain, if the idea of *bilateralism* is not referred to again? A good exercise would be to reduce your writing by as many words as possible without altering the meaning. A revealing activity!

### AVOID ABSTRACTION

When popularizing, it is important to speak as concretely as possible. Vague sentences and generalities are to be avoided. How? Several methods are available. You can enhance the information with figures and tables and or you can compare the results to data with which the public is more familiar.

#### EXAMPLES

- Nanotechnology is defined according to a spatial scale, i.e. the nanometre or billionth of a metre. It is small, very small. One sheet of paper is 100,000 nanometres thick!

- Arid regions occupy between 33% and 37% of the total land area, that is to say a surface of approximately 45 million square kilometres or five times Europe.

*... to popularize knowledge does not mean to summarize it. Nobody wants to know every little thing about your research and you must define the scope of your subject, discuss only one topic and present only items that are most relevant and most captivating.*

### GIVE EXAMPLES

Using examples is another highly effective way of making information concrete and facilitating its comprehension. In fact, all general information and theoretical statements should use examples.

The example can be used to clarify the meaning of certain concepts, rather than a detailed definition.

#### EXAMPLES

- The material acquired has exceptional properties. For example, it is approximately 100 times more rigid than steel.
- In peat bogs, the moss creates a thick vegetable carpet from which various other plants emerge, such as labrador tea, black spruce and certain insectivore plants.
- All courses have a mandate to integrate intercultural education into problem situations or in practical exercises; for example, using fictitious names of children taken from a variety of cultures.



## TOOLS OF SCIENTIFIC POPULARIZATION

### ANALOGY

The analogy makes it possible to elaborate on a complex and technical component by comparing it with another more familiar component. It embellishes the subject, making it come alive.

### METAPHOR

The metaphor is a literary technique that adds “colour” and style to remarks due to its evocative nature. It consists in transferring the meaning through the use of an analogical substitution. Its use is strongly recommended, but be careful not to misuse it.

### CATCH PHRASE

Using catch phrases means summarizing thoughts in a few words in an eloquent and pleasing way. A good formula always produces winning effects. Some have even become famous such Simone de Beauvoir who said “you are not born a woman, you become one”.

### HUMOUR

A bit of humour never hurt anyone. So why not use it occasionally? Your remarks will be lighter and therefore easier to integrate. They will also come to life and be all the more appealing.

### ANECDOTE

Have amusing or astonishing events ever taken place in your lab, in the field or elsewhere? These anecdotal stories can make your remarks seem more personal, less abstract. Remember in scientific popularization, the important thing is to tell a story.

### ANALOGY EXAMPLES

- This system of cellular routing connects in the same way as “postal codes” do: The presence of one or several key molecules on the membrane of the cells allows these cells to be directed with the same precision as a six digit postal code on the mail.
- Cartilage is soft and elastic and creates a kind of cushion at the end of bones that prevents friction when the articulation bends or undergoes a shock.
- The defence system of social insect colonies functions along the same lines as our immune system. Just like our own cells, these insects can discriminate and reject any foreign object.
- For students, courses are like pieces of a puzzle that have yet to be fitted together.
- In everyday life, all information is limited to sterile data if it is not based on judgment. For instance, a patient can know his cholesterol level or an investor the performance of his stock, but they must understand the meaning behind the data and may have to call upon specialists to interpret the information. Given this, we know that quantifiable results on performance are facts that require interpretation.
- The professor is a gardener who does not grow in the stead of his plants. (U. Alwin)

### METAPHOR EXAMPLES

- The concept of large centralized computers accessible exclusively to specialists has given way to mobile personal computers. Seeds of contemporary nomadic computer science have thus been sown.
- Mad cow disease spread like a stable fire among the British cattle population.
- Lashes of the ctenophore capture larvae and any other imprudent hitchhikers.
- When the first marine organisms protected themselves with shells to fight predators, the enemy grew pincers that were effective in overcoming the protection used by their prey. A true arms race!
- Plant-cells originated from a host cell that had squatters, algae with photosynthesis that transformed themselves into chloroplasts.
- Students ingest knowledge “bite by bite”.
- There is a kaleidoscope of obstacles to learning that limits students and prevents them from integrating and transferring acquired knowledge. immune system. Just like our own cells, these insects can discriminate and reject any foreign object.

### CATCH PHRASE EXAMPLES

- When we lie down in bed with an elephant, it is wise not to take sleeping pills (formula highlighting the dangers of living in a flood zone).
- We have transitioned from catholic religion to catholic regions (formula that denounces the preponderance of computer science in our lives).
- From technological transition to technological dizziness (after having integrated new technologies, we are now overrun with them).
- Young people delve into their studies with their “eyes wide shut” (Their eyes are wide because they wish to succeed in their studies and commit themselves to this purpose but their eyes are also shut because they have difficulty projecting into the future).

### HUMOUR EXAMPLES

- These animals consume meat courses that contain all sorts of delicious things, like carcasses.
- To instill abstract knowledge using sterile concepts is the best way to isolate oneself in an ivory tower and teach in a cosmic void incarnated by the haggard faces of pallid youth.



## ▶ SIMPLE TOOLS OF THE TRADE

- When you elaborate on your research, picture yourself speaking to an educational advisor or someone who teaches a discipline other than yours. Picture yourself speaking to your mother, cousin, or your neighbour. This technique will help you identify the most important and most captivating data.
- Use the active tense when possible, (for example, it is better to say students integrate knowledge, rather than knowledge is integrated by the students). This technique is more direct and alive.
- Put your popularization skills to the test with those in your immediate environment rather than your peers and experts in your field of research. Ask non-specialists to read your work and listen to your presentation; you will quickly see whether they show interest or tend to disconnect.
- Read writings and articles on today's pedagogical implications. In the same spirit, watch popularization shows on television and listen to radio shows on the subject. This is an excellent way of familiarizing yourself with popularization techniques.

