

# 10 Simple Rules to Improve your Science Communication

David Bickford



## The Evolutionary Ecology and Conservation Lab



- Autecology
- Behavior
- Conservation
- Emerging disease
- Evolution
- Science policy

Interdisciplinary research and Science communication

Science Communication  
is the most important process  
of the  
Scientific Method

Having Dinner

Doing Science

**Having dinner**

Decide what to eat

**Doing science**

Research objectives

**Having dinner**

Decide what to eat

Shop or forage

**Doing science**

Research objectives

Gather data

**Having dinner**

Decide what to eat

Shop or forage

Prepare (follow recipe)

**Doing science**

Research objectives

Gather data

Analyse data

**Having dinner**

Decide what to eat

Shop or forage

Prepare (follow recipe)

Eat

**Doing science**

Research objectives

Gather data

Analyse data

Communicate



A collage of news articles and website screenshots related to climate change and shrinking species. The articles include:

- DiscoveryNews:** "ANIMALS, PLANTS SHRINKING AS CLIMATE WARMS" with a sub-headline "Climate change spurs the incredible shrinking species".
- Ecocentric:** "Sinking body size as an ecological response to climate change".
- the ONION:** "Climate Change Causing Smaller Animals".
- AMERICAN VOICES:** "Climate Change Causing Smaller Animals" featuring portraits of three individuals.
- Global Warming News:** "全球变暖导致动植物个头变小" (Global warming causes animals and plants to shrink). Sub-headline: "研究发现,全球平均气温每上升1℃,植物个体减小3%-17%,动物缩小6%-22%" (Research finds that as global average temperature rises by 1°C, plant individuals decrease by 3%-17%, and animals decrease by 6%-22%).
- GREENHOUSE:** "Climate change is shrinking species, raising sea levels".
- Earth (地球):** "Climate change is shrinking species, raising sea levels".

The collage also features images of a striped fish and a frog next to a ruler, illustrating the concept of shrinking species.

## Science Communication

- Existing knowledge
  - *Teaching*
- New Knowledge
  - *Science*

## Science Communication

Two parts:

- New knowledge
- Existing knowledge

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**Two players:**

**Communicator**

**Receiver**

# Science Communication

Two parts:

- New knowledge
- Existing knowledge

**Two players:**

**Communicator**

is **A**ccurate, **B**rief, **C**lear

**Receiver**

has a frame of reference (YOU have to adapt to)

## Kinds of scientific communication

1. Written - journal articles, proposals, theses, posters, books
2. Oral – speeches, interviews
3. Visual - figures, graphs, animation
4. Performance - slide presentations (oral + visual + performance)

## Comparison

Component	Conference talk	Journal article
Ideas		
Repetition		
Length		
Humour		
Style		



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Ideas Repetition Length Humour Style	One every 2-3 minutes	No limit

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Ideas	One every 2-3 minutes	No limit
Repetition	Highly desirable	Very little
Length	Within timeframe	As short as possible
Humour	Desirable, not essential	Inappropriate
Style	Conversational, simple	Formal, concise

## Science Communication

## Effective Science Communication

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### **Who ?**

specialists in your field, friends, peers, public, family, committee,  
funding agencies, government officials, industrial partners

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take-home messages, novel information, foundation knowledge, expectations, questions, insights

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### **Why ?**

to contribute to society, to teach, to persuade, to develop, to get a job

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### **How ?**

## Rule 1: Target your Audience

- Know your Audience

## Rule 2: Less is More

- Be Concise

### Changes in direct drivers of Ecosystem dysfunction Impacts of Excessive Nitrogen Flows

- |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> <li>• Environmental effects:           <ul style="list-style-type: none"> <li>– eutrophication of freshwater and coastal ecosystems can occur</li> <li>– contribution to acid rain because of atmospheric pollution</li> <li>– loss of biodiversity both directly and in more indirect forms</li> </ul> </li> <li><i>Contribution to:</i> <ul style="list-style-type: none"> <li>– creation of ground-level ozone that ties into loss of biodiversity (above)</li> <li>– destruction of ozone in the stratosphere</li> <li>– contribution to global warming</li> </ul> </li> </ul> | <ul style="list-style-type: none"> <li>• Resulting health effects:           <ul style="list-style-type: none"> <li>– consequences of ozone pollution on asthma and respiratory function</li> <li>– increased allergies and asthma due to increased pollen production</li> <li>– risk of blue-baby syndrome</li> <li>– increased risk of cancer and other chronic diseases from nitrate in drinking water,</li> <li>– increased risk of a variety of pulmonary and cardiac diseases from production of fine particles in the atmosphere</li> </ul> </li> </ul> |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

Source: Millennium Ecosystem Assessment

## Changes in direct drivers of Ecosystem dysfunction Impacts of Excessive Nitrogen Flows

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    - eutrophication of freshwater and coastal ecosystems can occur
    - contribution to acid rain because of atmospheric pollution
    - loss of biodiversity both directly and in more indirect forms
  - Resulting health effects:
    - consequences of ozone pollution on asthma and respiratory tract
    - increased allergies and asthma due to increased pollen production
    - risk of blue-baby syndrome
    - increased risk of cancer and other chronic diseases from nitrate in drinking water,
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- Contribution*
- creation of ground-level ozone that ties to loss of biodiversity (above)
  - destruction of ozone in the stratosphere
  - contribution to global warming

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## Rule 3: Make it a Story

- You are a person; Your audiences are people
  - share your stories
  - successes
  - failures



## Rule 3: Make it a Story

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  - failures
- Convey why this matters to *you* and why it should matter to *them*

## Rule 4: Think about Presentation

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- Improve without Obscuring

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- Visual Information
- Writing is an art
- Movement - Be Animated

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*Don't let technology dictate what or  
how you communicate*

## Rule 6: Use Visual Displays

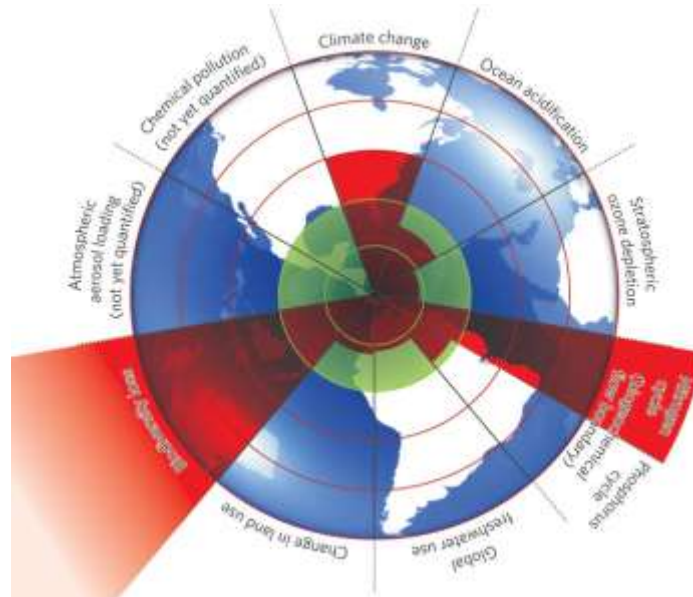
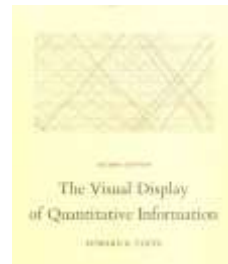
- Figures are your Friends

## Rule 6: Use Visual Displays

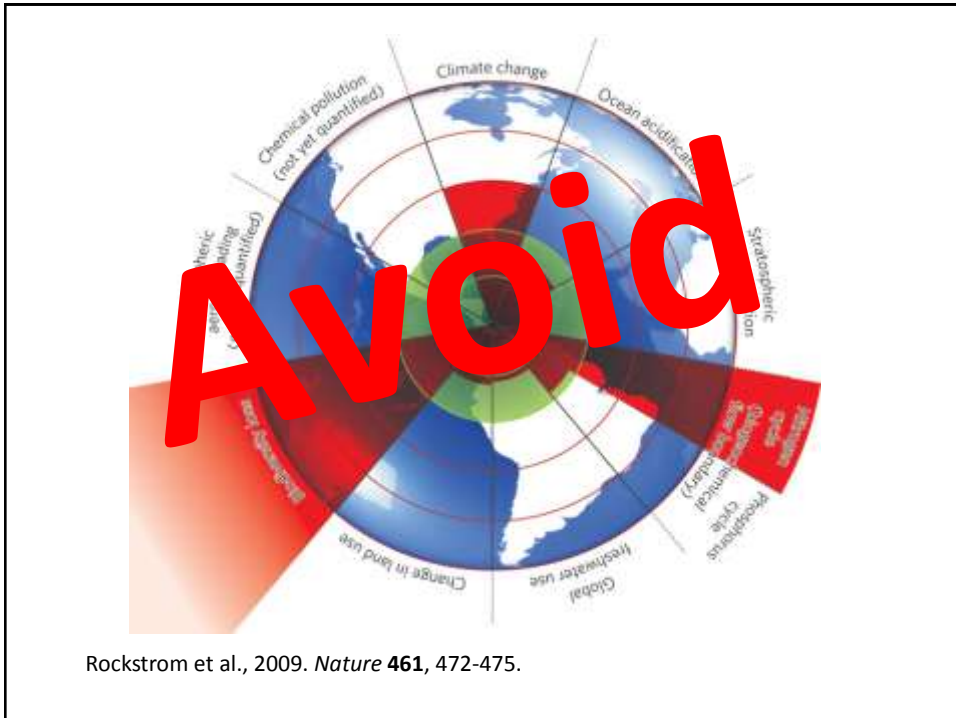
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- Elegant

## Rule 6: Use Visual Displays

- Figures are your Friends
- Elegant
- Edward Tufte
  - Maximize information:pixel
  - Minimize ambiguity
  - Avoid “chartjunk”



Rockstrom et al., 2009. *Nature* **461**, 472-475.



## Rule 7: Don't forget the Context

- Background Information
- Appropriate Conceptual Framework

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Audience-driven

Ensure effective understanding

## Rule 8: Seek Advice

- *Capture* Diverse Viewpoints
- *Be Open* to Suggestions
- *Collaborate*

## Rule 9: Take Responsibility

- Be a good listener
- Available and helpful

## Rule 10: Acknowledge Help

- Nobody succeeds alone
- Make the *Team* part of your story
- Be humble – not condescending



## General Science Communication Rules

- Know your audience, know your subject, know your purpose
- Accurate, Brief, and Clear
- Take responsibility

## Also see:

- “10 Simple Rules” series in PLOS Computational Biology by Philip Bourne and many colleagues
- Edward Tufte’s “Visual display of quantitative information” and “Visual Explanations”

## Acknowledgements

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# Thank You

## Summary: 10 Simple Rules

1. Target your audience
2. Less is more
3. Make it a story
4. Think about presentation
5. Medium is part of the message
6. Use quality visuals
7. Remember context
8. Seek advice
9. Take Responsibility
10. Acknowledge help