Communicating Science to Non-Scientists Idea Book

This Idea Book stems from a series of science communication workshops conducted in Thailand in September 2017, and is intended as a tool for researchers who participated in these workshops and for other scientists wishing to improve their communication skills.

The Thailand workshops were co-organised by EURAXESS ASEAN and Thailand's National Science and Technology Development Agency (NSTDA) with the support of the Thailand-European Union Policy Dialogues Support Facility

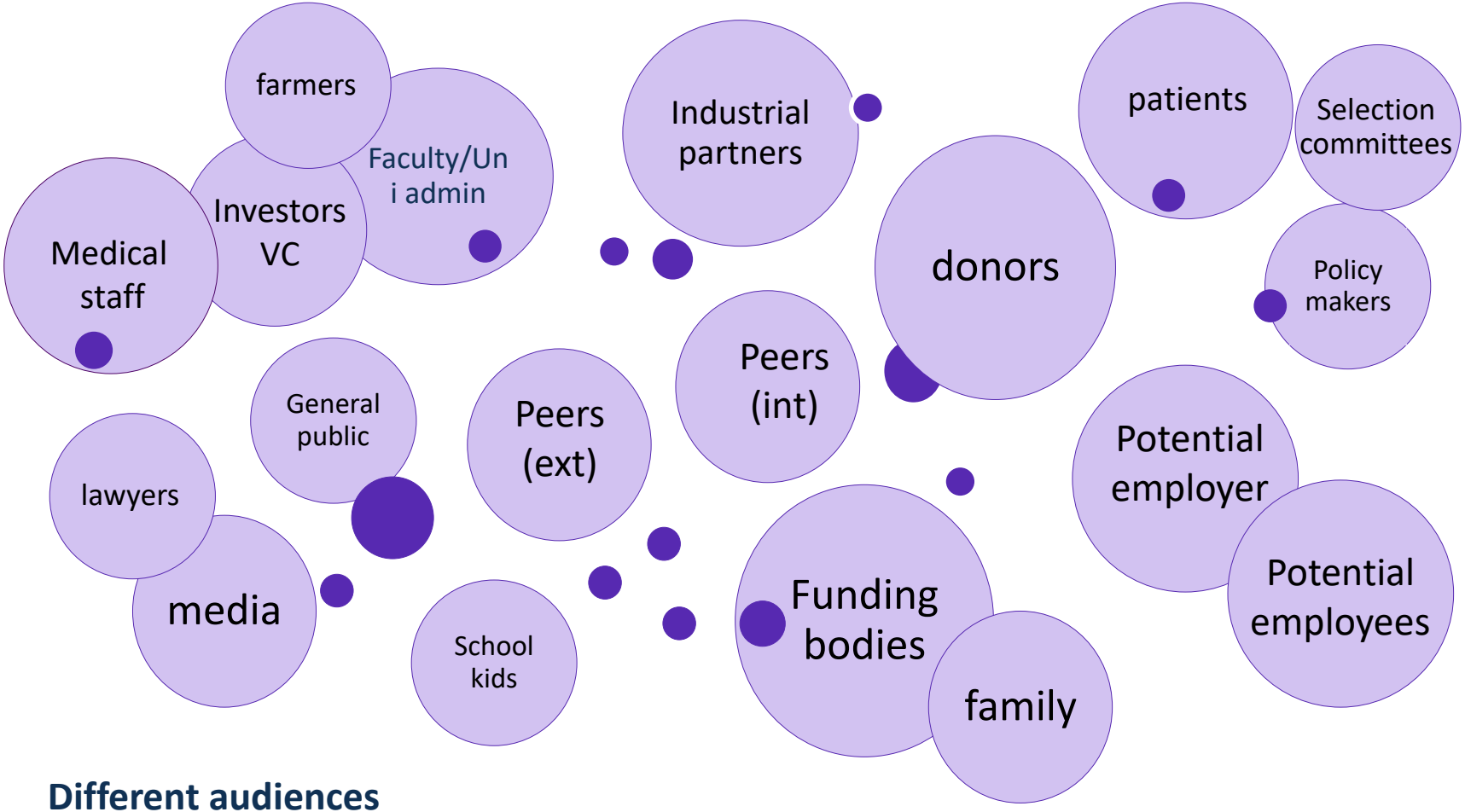
Author: Sanna Fowler

1. Understanding that communication is different from research

Science and communication are very different and understanding this is fundamental to being a good communicator.

As researchers, the thing that gets us up in the morning is the unknown – we're constantly in search of answers, and for every answer we find we throw up 10 more! Our quest is to find the next missing piece of the puzzle.

When you communicate, especially with non-experts, your story needs to be simple, uncluttered and clean. Your audience need to know where you're starting from and where you're going to. It needs to be unambiguous and clear, with enough mystery and surprise to keep them interested.



Different audiences

Image: Mix&remix

2. Tailoring our message to your audience

It's one of the fundamental rules of communication, but pitching your content to your audience is key.

The people you have to communicate with are varied and will depend on your research area (see left for ideas of audiences created during the workshops) but the common feature between most of these groups so that they know less that you about your subject. This means you have the responsibility for pitching things at the right level.

Also remember that your immediate target audience might not be the end user of your information.

For example, if you're talking to a journalist, the end user will the newspaper readers. This means that you should make your messaging relevant to the end user when communicating to the journalist – you're setting in place a chain reaction in which your target can pass on the information further, widening your reach.

3. The difference between disseminating, educating and communicating

We need to get away of this idea that communicating science is the same as disseminating science, or educating. Disseminating is what we do with our peers – publishing papers, giving conferences etc. If you teach, then you may be thinking that communication is similar to educating – it's not!

If you try teaching non-scientists you risk turning them off from the start. Many people have negative memories of school science lessons and if they don't feel they can understand something, they won't be interested in listening.

Communicating should be about sharing your passion for your subject and explaining why it's interesting and important for your audience, rather than trying to get them to understand the mechanisms behind things (although sometimes that's possible too, but only after you've done the former)
For more reading check out this article from Slate.

4. The difference between goal-oriented audiences and ‘browsers’

Image: Mix&remix

Scientific audiences tend to be ‘goal-oriented’, that means they are coming to you for a reason – for example to find out the latest research findings in your area of expertise, or to figure out why they should fund your research.

They know what they want and all you have to do is to convince them that your research is the most innovative/interesting/promising.

In contrast, a non-expert audience tends to be ‘browsing’ – they’re not looking for any particular information/knowledge but they’re open to things that interest them.

In this case, your job is harder, as you’re competing for their attention with plenty of other things.

So how do you get their attention?

CERN, the European Nuclear Research Centre on the border of France and Switzerland, is tasked with understanding fundamental particle physics - not the easiest subject to communicate to a lay audience. But they play to their advantages, using the sheer size of their 27km long accelerator and the immense detectors to fascinate people, and draw them in.

In 2012, they proved the existence of the Higgs Boson – a breakthrough that might have gone unnoticed had someone not used the term ‘God particle’ to describe it.

This was provocative (unusually for science communication), and immediately gave people something they could relate to. Once people were sitting up and listening, they could start to explain what this particle is and how it’s fundamental to our understanding of the origins of the Universe.

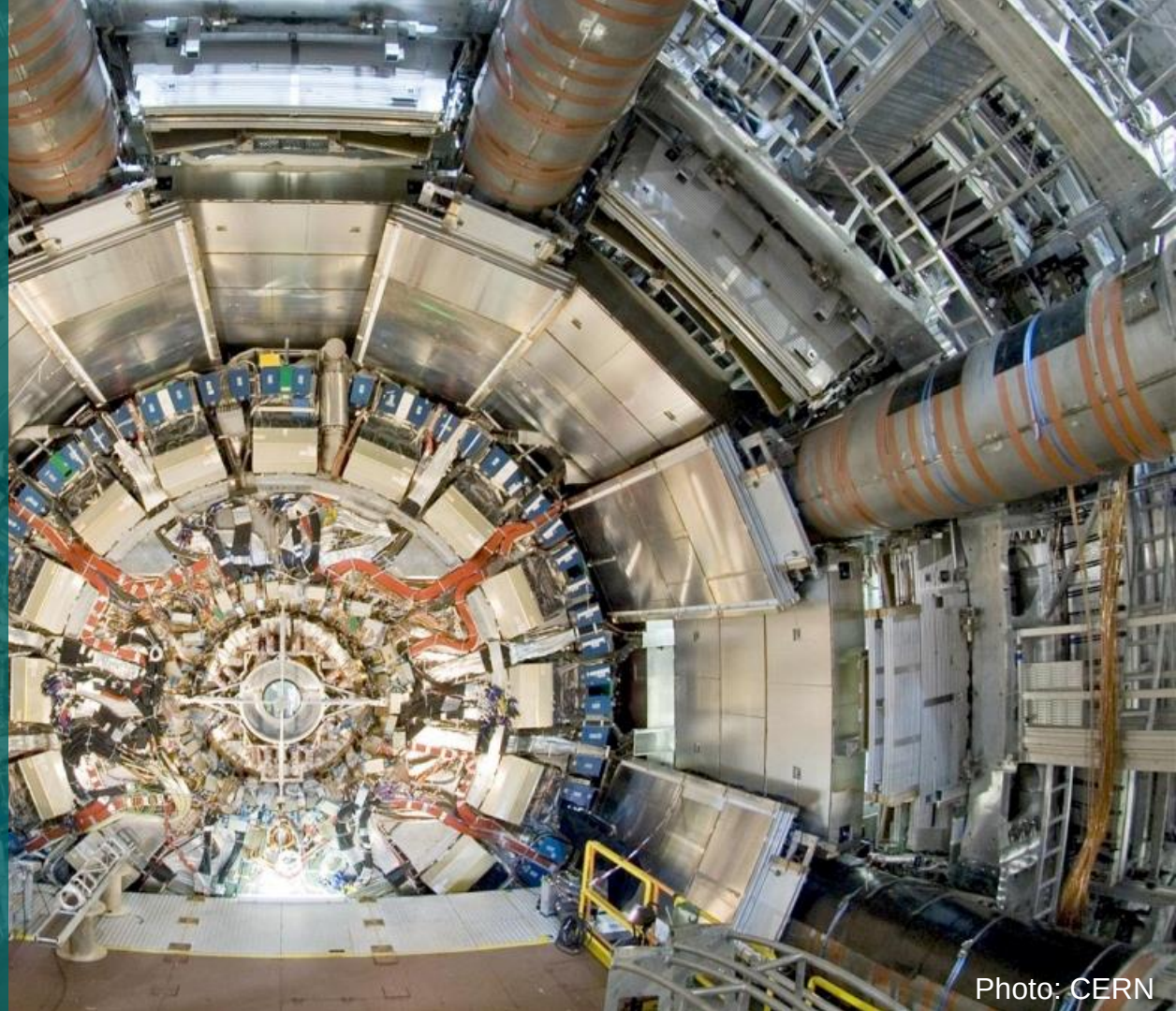
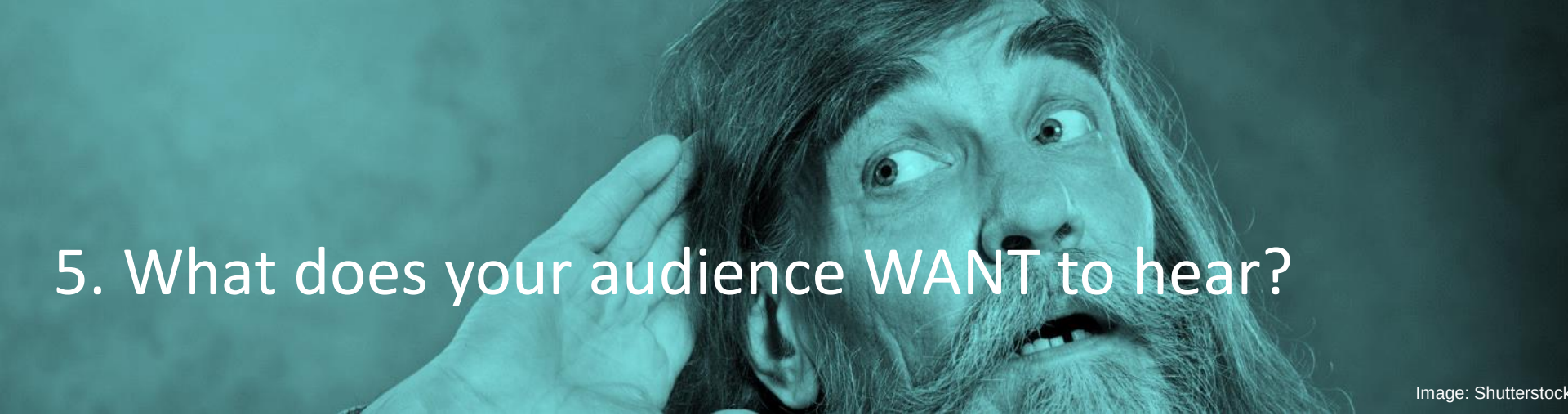


Photo: CERN



5. What does your audience WANT to hear?

Image: Shutterstock

The renowned US author, John Steinbeck said that people only want to hear what is ‘deeply personal and familiar.’ So, if you can, pitch your science in a way that people can see the personal link with their own lives, they’re more likely to identify with it.

It’s fairly easy to do this with subjects like health, transport, energy, climate change and education for example. These subjects touch all of us in some way, at some point in our lives. But what do you do if your working on less applied or fundamental science?

Steinbeck was only half right – there’s another way, especially in the age of social media. People love what is new, unknown, even a little wacky or crazy. This kind of content is very ‘shareable’ – and if you can give your audience something that will stick in their brains because it challenges their perceptions, they are more likely to listen and to pass it on.

See opposite for a great example of communicating fundamental science

Here's another example of good communication of fundamental research. The paper focused on new methods for protein folding – again, not the most relevant to most of us at first glance!

But they pitched the story as 'how to unboil an egg', and the media picked it up. Why?

1. It's **personal** (everyone has boiled an egg)

2. It's **wacky** – unboiling an egg seems useless but sounds like fun!

3. The story came out just before **Easter** – the media snapped up a story they could link to a calendar event.

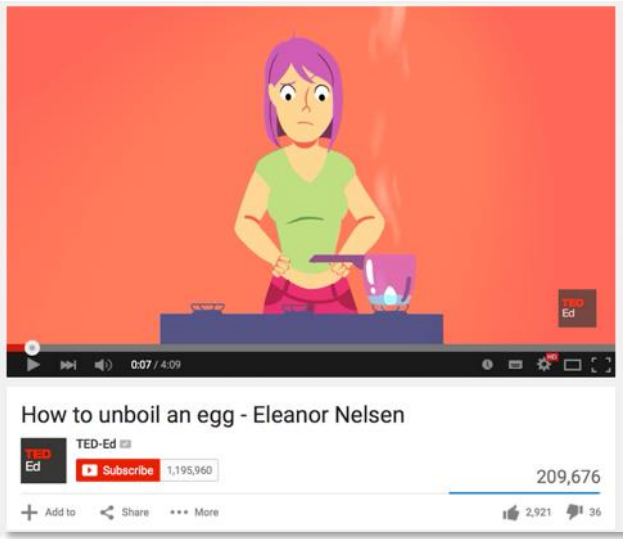
Once the reader was hooked, the authors then showed how the new discovery could be useful for cheese making or vaccines (relevant to the audiences).

ChemPubSoc Europe
DOI: 10.1002/cbic.201402427
CHEMBIOCHEM Communications

Shear-Stress-Mediated Refolding of Proteins from Aggregates and Inclusion Bodies

Tom Z. Yuan,[a] Callum F. G. Ormonde,[b] Stephan T. Kudlacek,[c] Sameeran Kunche,[d] Joshua N. Smith,[a] William A. Brown,[c] Kaitlin M. Pugliese,[c] Tivoli J. Olsen,[c] Mariam Iftikhar,[a] Colin L. Raston,*[e] and Gregory A. Weiss*[a, c]

Image: The Guardian



From this…

From Ice to High Seas: synthesis report of ice2sea

Posted on May 14, 2013

Final meeting of ice2sea highlights sophisticated new modelling techniques to measure ice-melt contribution to future sea-level rise

PR No. 07/2013

On Wednesday, 15th May scientists from the major European Union programme ice2sea met in London at the Royal Institution of Great Britain to discuss four years of research into how to better understand and model ice-melt and its contribution to sea-level rise.

Stakeholders have been presented with a document that summarises the work done and key findings from more than 150 ice2sea scientific papers published since 2009 in respected scientific journals around the world.

…to this:

Ice melt, sea level rise, to be less severe than feared: study

The great flood of London: Experts warn risk to Capital from rising sea levels 'worse than feared'

The end of London as we know it? Floods could destroy our city in 85 years

6. Benchmark your results

Image: William A. Clark. Flickr Creative Commons

Climate scientist Tamsin Edwards, from the University of Bristol held a press conference to announce a new model for climate change (see opposite). You can see the resulting news clippings – they vary from better than expected to catastrophic! How could this happen?

When you're communicating something new, it's important to relate it to what exists already – What is the state of the art and why is your research changing that?

The problem in the case opposite is that there were already several existing models and the media compared the new research to different ones, hence the variable headlines.

When you communicate your research, make sure you benchmark it against the current standards – If you don't, your audience may make up their own conclusions .

7. Remember you're an expert

Image: Shutterstock

Many scientists are fairly humble and don't want to stick their neck out. If asked for comment on a certain subject, many have a tendency to say 'I'm not the expert on that particular area – you need to speak to Prof X.'

The problem is that Prof X is usually white, male, over 60, working in a UK or US lab. The consequence of this is that we give the impression that good science is only done by these guys, which isn't true – great science is done everywhere!

So, be prepared to voice an opinion, position yourself as the expert you are and help shift the preconceived idea of where the best scientists are!

How to get yourself out there?

- Create a twitter group on the theme of your research or join an existing one (and post regularly!). People will find you more easily
- Make sure your profiles on webpages & social media are up to date, with contact info
- Reply to inquiry mails immediately (if not, people go elsewhere)

8. Widen your scope of expertise

Image: Roger McLassus, Creative Commons

Leading on from the last point – sometimes, we're afraid to communicate on things that are outside our direct field of expertise. This is understandable for an expert audience but for communicating with non-scientists, you need to be able to put your research in context.

For example, a researcher who is working on signal transduction in TB should also be able to talk about signaling pathways in general, the immune system, infectious diseases, vaccines and so on.

This may mean you have to fill in some gaps in your knowledge but it will be you a one-stop shop for information and also help you communicate your research better.

10. Explain it to your parents

Have you ever tried explaining what you do to your family? Talking about science to your parents, grand parents or children is the best test of your communication skills, and it might help them understand why you spend so many hours at the lab!

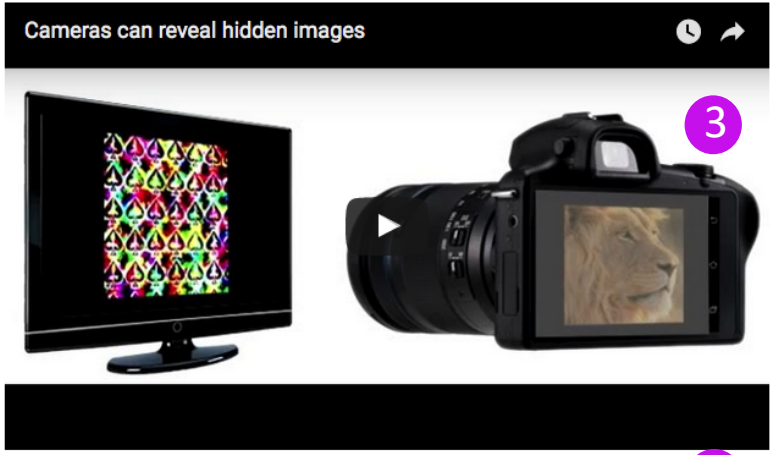
But they're also a super non judgmental audience who will tell you clearly if they understand or not. When you have your pitch worked out, and you think you've taken all the technical stuff out, try it on them to see if it works!

You may also have opportunities at your university or research institution, to participate in science outreach activities. It's hard work but one of the most rewarding experiences and will substantially improve your communication skills.

What happens when we don't understand something? We feel bad about ourselves or frustrated – whatever our level of intelligence or background. You don't want your audience to feel that way – help them to feel good by making science understandable and interesting!

Share:

Cameras can reveal images that are hidden to the naked eye



***20.04.17* - EPFL researchers took advantage of the limits of human vision to hide an imag video. The image is invisible to the human eye, but not to a camera.**

Human visual perception works well and is very effective at seeing what's important to us. But our eyes are not capable of averaging video images that last longer than 40 milliseconds. This is something that a camera can do, however, thanks to its adjustable exposure time.

EPFL researchers used this fact to hide visual information. They modified an image over time through temporal masking, eventually turning it into a video. They tweaked a number of the image's techni components to make it invisible, but without changing the underlying image. This temporal variati ot be detected by the human eye, which is busy watching the resulting video. But a camera can reveal hidden image.

The researchers started with a simple observation: if you spin a disk with two different colors, they start to meld. "You have two pieces of information – red and green colors – but when the human eye sees them over time, it stops detecting two colors and just picks up yellow," said Sami Arpa, from EPFL's Image and Visual Representation Lab (IVRL). Arpa wondered if this method could be used to hide an image within an image and trick our brains. So he designed a disk where the second image can only be seen by syncing the speed at which the disk rotates with a strobe light. "From there we thought we could produce the same effect with video," Arpa said.

LINKS

- *All Mediacom news*
- *All EPFL news*

SUBSCRIPTION

- *Receive an email for each new article*
- *Unsubscribe*

IMAGES TO DOWNLOAD

A camera can detect the hidden information

The researchers took advantage of the temporal limits of our visual capacity to design an algorithm that creates special video seals. They came up with a "tempocode," a video made of moving patterns that can mask the varying frequencies of an image.

Only a camera or smartphone app can reveal the hidden image. They have a feature that the human eye lacks – adjustable exposure time – which can be used to temporally average the images. It's as if these devices were viewing all the superimposed photos at once, since video is nothing other than a series of images.

"We turned an image into a video, but to make sure that human eyes couldn't see it, we had to juggle a number of constraints – it was really difficult," said Roger David Hersch, who helped develop the method. "We can choose an exposure time of 8, 10 or 15 seconds, which isn't possible with the human eye."

The results of their work were just published in the *Journal of the Optical Society of America A*. https://www.osapublishing.org/josaa/abstract.cfm?uri=josaa-34-5-743

SAMI ARPA, SABINE SÜSSTRUNK AND ROGER D. HERSCH

***Author:* Sandy Evangelista** **Source: Mediacom**

11. How to structure an article

Image: A. Birkan ÇAGHAN, Creative Commons

The article opposite, taken from the EPFL webpage (and also issued as a press release) shows how to lay out a written article.

1. Include social media buttons if you can
2. Title should state the contents or by ‘catchy’
3. Include photos and/or film (see page 25)
4. The tagline should summarise in 1-2 sentences
5. 1 paragraph per idea/concept/message (<5/6)

People tend to read in an ‘F’ shape – all the way across the first part of the article and then scanning down the left hand side. Adding different content and breaking up the text helps bring people back in as they read.

6. Links or contacts if people want more info
7. A call to action (eg. Subscribe)
8. More images/film if you have them
9. Break up the body of text with subheadings
10. Credit the author

1

The 'James Bond' holiday snaps: New printing technique can hide hidden pictures which you see by simply turning the image

- **Could be used in passports and money to prevent fraud**
- **Images are printed on special metallic sheet to create effect**

By MARK PRIGG FOR DAILYMAIL.COM
PUBLISHED: 18:15 BST, 28 December 2015 | **UPDATED:** 19:31 BST, 28 December 2015

2

Share 30 shares 5 View comments

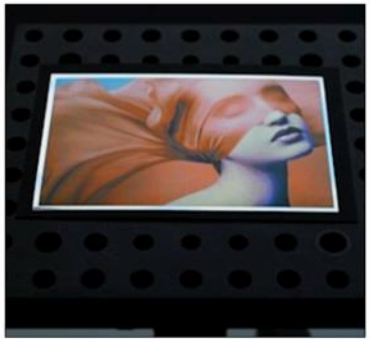
Researchers have revealed a new type of inkjet printing that can 'hide' a second image.

These hidden elements become visible by simply rotating the print.

3

Experts say the breakthrough could be used to prevent fraud, and even be used in money and passports.

Scroll down for video



4

Experts say the breakthrough could be used to prevent fraud, and even be used in money and passports.

'Elements can only be seen upon rotation, ' says Hersch of EPFL's Peripheral Systems Laboratory.

'This rotation effect has never been done before.'

The EPFL scientists have developed a printing algorithm that does just that onto metallic sheets.

The two images are printed together using an inkjet printer so that only one image can be seen at a time from a given angle.

HOW IT WORKS

Currently, the software supports standard inkjet prints onto metallic sheets.

Their algorithm essentially superposes two images during the printing process, creating a print with visible and hidden elements.

By changing the viewing angle, and hence the way light casts shadows, hidden elements literally come to light.

5

The technique could one day be used as a security element in passports and printed money to prevent counterfeit.

12. Simplifying is NOT dumbing-down

On the left is that same article picked up a daily newspaper – in this case, the Daily Mail in the UK (tabloid press). You'll notice a few things have changed.

Some people might see this article as 'dumbing down' their research – this is not the case! It's been simplified and adapted to appeal to a wider audience.

You can call out journalists if they get their facts wrong but their job is to simplify things – and they're doing you a favour. More people read about this research thanks to the newspaper article - people who might never have looked on a university website, and this can only be a good thing!

1. The title is catchy, relating to things people know
2. Social media buttons are more prominent
3. The text has been reduced to a minimum
4. The photo is less technical, more visually appealing
5. A summary for those who want to know more

13. Adapt your article to the right media

Blog 4,000 characters

400 characters

140 characters

0 characters

Even if you don't intend to share your article on social media, reducing it to the bare minimum for twitter is a good exercise in focusing in on what your main message is.

Images are even more important on social media – make sure they're worth sharing!

14. Search Engine Optimisation (SEO)

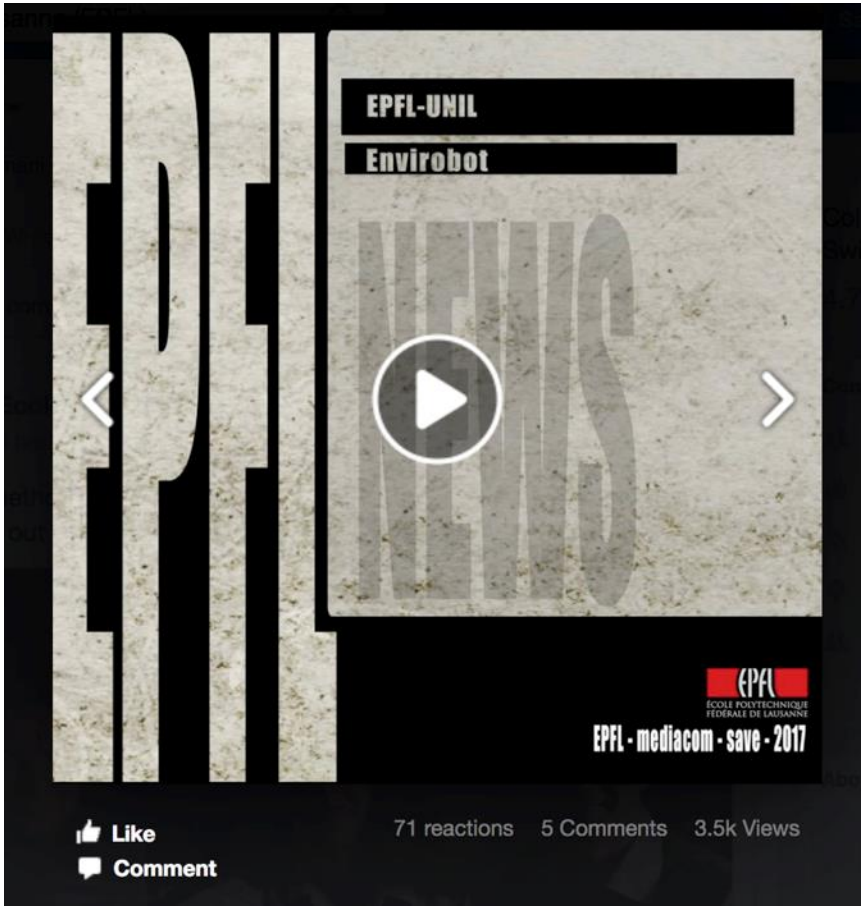
All search engines use algorithms to determine what to put at the top of a search list. Google's is a constantly changing and closely guarded secret with marketeers constantly trying to second-guess what will push content up the list.

As a researcher it's important to know that Google considers some university websites as trusted sites. Social media sites like facebook, linkedin and specialised networks like researchgate are also considered as trusted. This means that if you are going to put content on the web, it's best to use existing sites that are high up on the ranking.

You should also make sure that your profile on these sites is as you want it to be and that people can get hold of you.

If you're creating your own site, you will need to optimise it to make sure it comes up when people google key words related to your research. This is a whole topic in itself, so for more info, check out the articles on:

Forbes
Hobo-web
Searchenginewatch



https://www.facebook.com/pg/epflcampus/videos/?ref=page_internal

https://www.youtube.com/watch?v=IcsZxJiy5Cg&feature=youtu.be

These two films were created for the same story: The square format for social media (square film uses more screen space) and the horizontal format for the website. The social media version is only 43 seconds long, half the length of the other version. Which do you think has more impact?

15. Using Video

Videos are processed by the brain much more quickly than text (an estimated 60,000 times faster!!). They are the quick sugar fix compared to reading, which activates much deeper cognitive functions (like imagination).

Video is the best tool for captivating the ‘browser’ audiences. Some research suggests that it’s a better activator of mirror neurons so it taps directly into the emotional centres of our brains.

Social media prioritises video content and also means that lower quality video is acceptable. With simple Apps or software like iMovie, you can edit movies to communicate your science.
You can also use simple animation on still images, with text overlays, or get cheap stock images from sites like VideoBlocks

For some good example of simple science movies (in new square format, optimised for social media), check out:
EPFL and New Scientist

FameLab
TALKING SCIENCE

euraxess
RESEARCHERS IN MOTION

อพวช.
NSM

สวทช
NSTDA

16. Get out there and communicate!

Theory is fine but if we don't put ourselves out there and practice, we can never call ourselves science communicators.

Make yourself available for campus visits and presentations at your university. Sign up to take part in events in your local area – for example TEDx or FameLab Thailand. Not only will you gain experience but you also get coaching and video footage of yourself.

If you're interested in improving your communication skills, make sure you read, watch and listen to great science communication. Do you commute to work? Why not use that time to listen to a podcast? Here are some favourites:

TED and TEDed
The Naked Scientists podcast
The Guardian Science
60 second science podcast (from Scientific American)
Technologist

About the Workshop Organisers

EURAXESS-Researchers in Motion is a unique pan-European initiative delivering information and support services to professional researchers. Backed by the European Union and its Member States, it supports researcher mobility and career development, while enhancing scientific collaboration between Europe and the world.
For more information on EURAXESS please contact Simon Grimley and Susanne-Rentzow-Vasu at asean@euraxess.net

The National Science and Technology Development Agency (NSTDA) is a semi-autonomous government agency under Thailand's Ministry of Science and Technology. NSTDA is committed to achieving four strategic missions comprising: 1) research & development 2) technology transfer 3) human resource development and 4) S&T infrastructure development, through its four main national research centers; the National Center for Genetic Engineering and Biotechnology (BIOTEC), the National Metal and Materials Technology Center (MTEC), the National Electronics and Computer Technology Center (NECTEC), and the National Nanotechnology Center (NANOTEC). For more information on NSTDA please contact Phawika Rueannoi at Phawika.ruennoi@nstda.orth

The Thailand-European Union Policy Dialogues Support Facility (PDSF) is a programme funded by the European Union to further advance Thailand's cooperation with the EU towards achievement of sustainable economic and social development goals and global integration.

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