Public Engagement in science and Technology

Building a good story
Tricks and tips

FRANCESCA SCIANITTI - INFN Communications Office

Cogne – June 14th 2022

Talking about science | What we are talking about …

A. Communicating science

1. Publics & Language
2. Formats
3. Stories

B. Building a good story

4. The structure
5. Some examples

C. Around your PE activity

6. Communication
7. Budget
8. Evaluation

COMMUNICATIONS vs. OUTREACH|

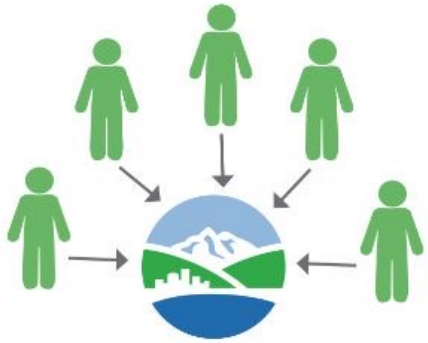
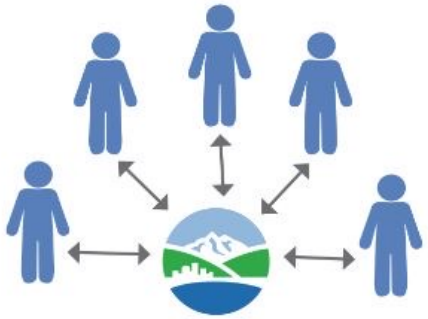
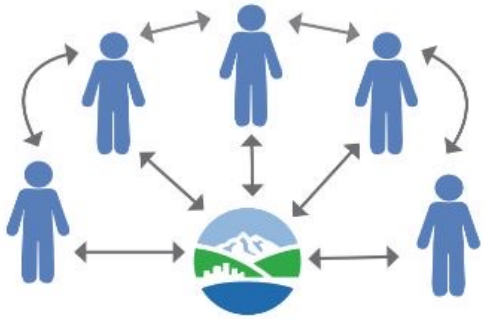
Not a simple matter of words

- **OUTREACH** implies an interaction between the sender and the recipient of the message, a commitment and a two-way communication between the researcher and the public

- **COMMUNICATION**, on the other hand, has only one possible direction, from the sender to the recipient.

Credits: Apre, Agenzia per la Promozione della Ricerca Europea -www.apre.it

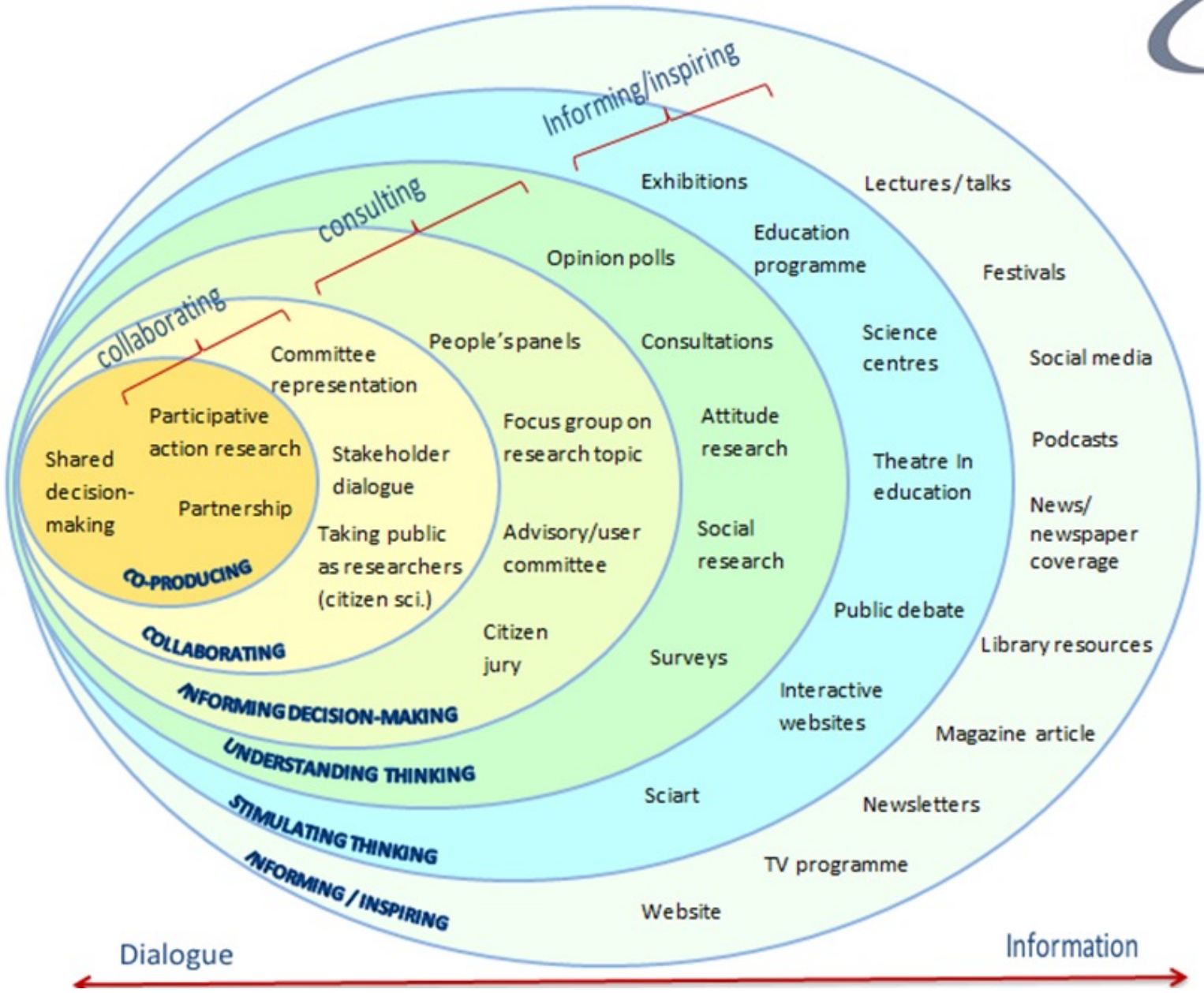
OUTREACH | Levels of engagement

 CONSULT	 INVOLVE	 COLLABORATE
Researchers informing and inspiring the public about their research	To better inform researchers on the publics' views and concerns about their research, and also an opportunity to hear fresh perspectives and insights	Whereby researchers and the public work together on particular projects or help define future research direction, policy or implementation of research outcomes
participation in festivals; talks and presentations; digital engagement	public debates; online consultations; panels and user-groups	citizen science; co-production of knowledge; Patient and Public Involvement.

© University of Oxford – Public Engagement strategic plan

FROM OUTREACH TO PUBLIC ENGAGEMENT |

formats vs. engagement's level



MEETING SCIENCE | *what opportunities for the public?*

To meet **researchers**

To enter research **infrastructures**

To **know** about science **ideas and perspectives**

To **understand** science **ideas and perspectives**

To make part, as a citizen, of the **process of research**

To know about the relationship about **science and other cultures**

MEETING SCIENCE | *what opportunities for you and your research institution*

To strengthen the **institution public image** and a positive perception of research in general
To engage in science an **ever-growing audience**
To raise people's **knowledge on fundamental research ideas and goals**
To raise people's capability in **taking decisions about research strategies** and funds
To raise people's awareness about the **good fall of fundamental research on society**

Never forget to explain who you are, what the institution you work for is, and to underline its peculiarities and positives

Talking about science I *stories for various format*

- Seminar talk for the **public** in your laboratory
- Seminar talk to **students** in their school
- Outreach event hosted in **cultural venues or festivals**
- Outreach activity during **Open Labs** or the European Research Night
- Guided **visit to laboratories** and infrastructures

BUT ALSO

- Seminar **talk for your colleagues**
- Presentation of your activity to **institutional representatives or stakeholders**

STORIES| *why not a simple speech*

Human beings organize and manage their knowledge of the world following **two main ways of thinking:**

1_ The narrative thinking **i**s *the way people use to structure their own immediate experience.*

*2_**The logical-scientific thinking***: is the way in which human beings aim to clarify their knowledge to remove ambiguities.

[Jerome Seymour Bruner, psychologist and education scientist]

They are both involved in the process of meaning making.

STORIES | *Why?*

Storytelling is based of four main stages:

- The willing to know
- The knowledge process
- The capability to make choices
- The capability to make or design any further step

→ Reorganize the experience → Scientific Method

Why stories about science?

Storytelling → advantages

Emotional link

Easy way to memorize

Engagement

Science

Different levels of complexity

Science going off the laboratory

Open to personal interpretations

THE STORYTELLER KNOWS THE STORY

Who better than its protagonist can tell the story?

- Authoritative
- Directly involved
- Doubts carrier

BUT…

The potential of the story largely depends on its AUDIENCE

→ IDENTIFY YOUR TARGET

to modulate your story

ADULTS I

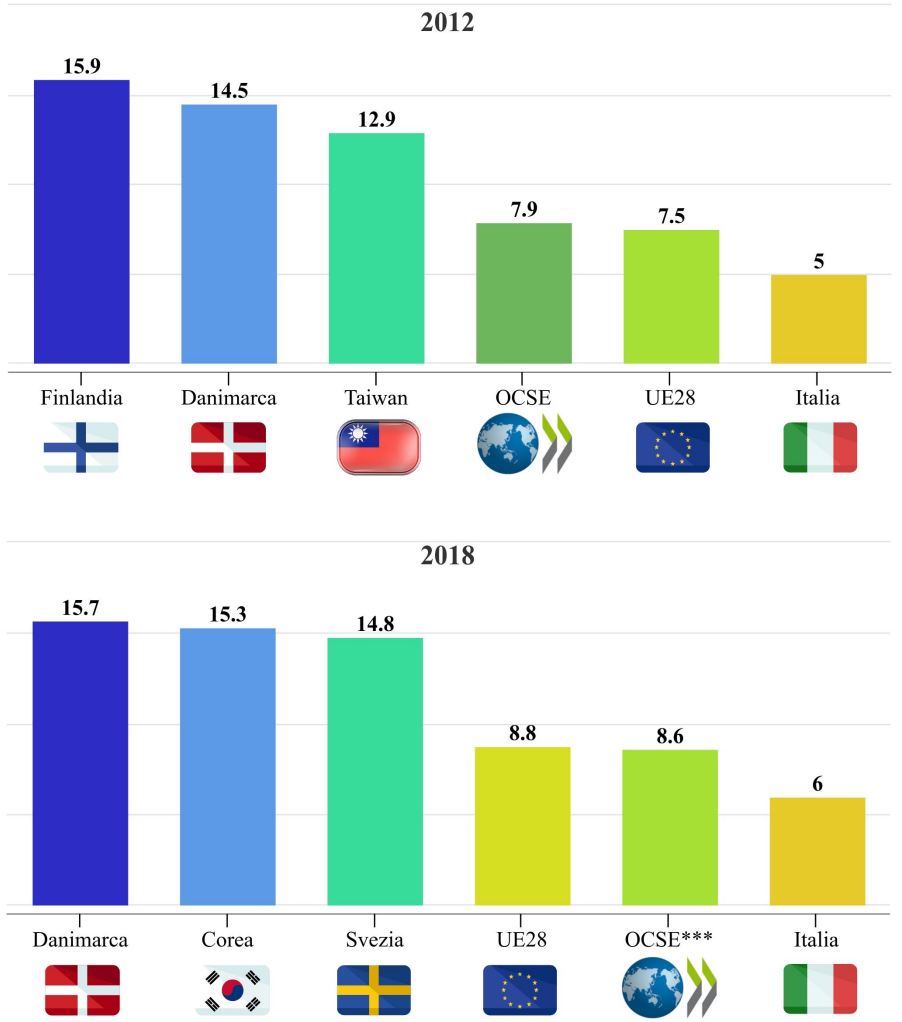
Contact between researchers and other workers

Percentage of researchers among employed nationally.

Italy is below the European average and far from the values of the countries of central and northern Europe which record the highest presence of researchers among the active population.

Observa ScienceInSociety, Annuario2021
Fonte: OECD 2020

Ricercatori impiegati in R&S per mille occupati

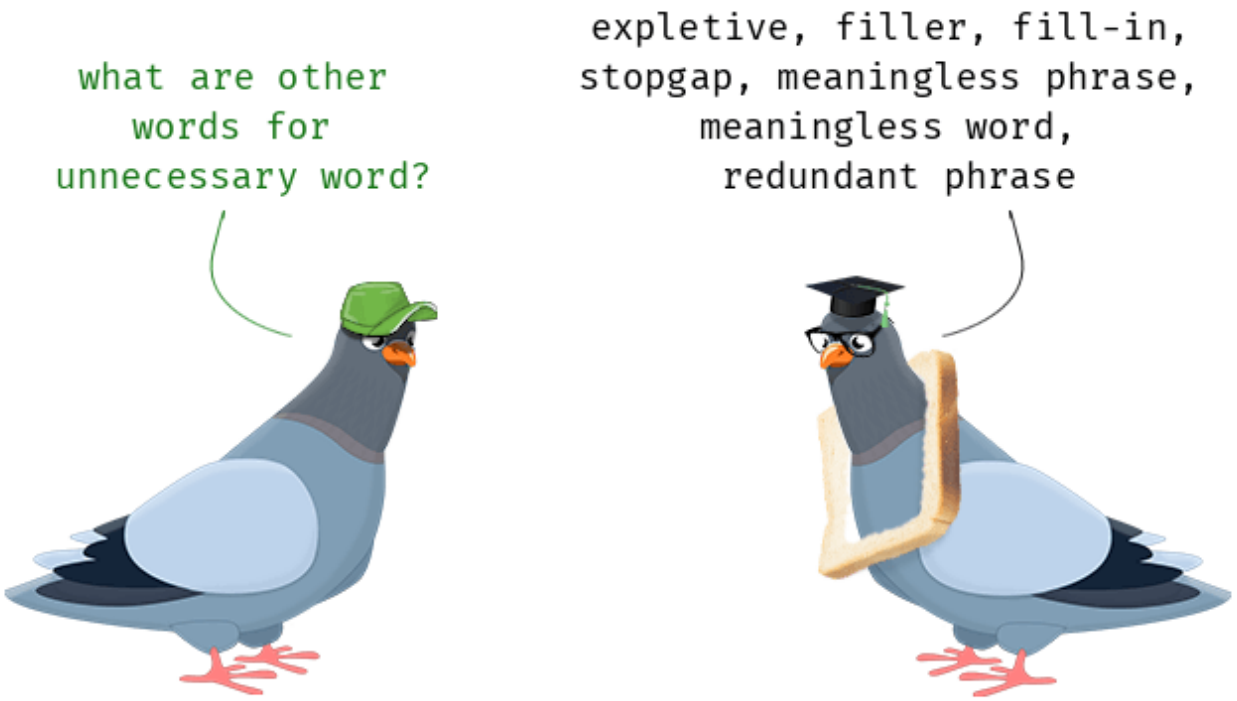


Fonte: OECD database, *Main Science and Technology Indicators,* sito web ufficiale, settembre 2020. Dati riferiti al 2018 e al 2012 o all'ultimo anno disponibile: ***=2017

THE LANGUAGE | *the style of the communication*

First question:

Who I'm talking to?



Any audience has a specific attitude to understand/to be engaged/to appreciate

- The use of words, technical terms, concepts has to be weighted on the target, as to the style (formal/informal)

Building a good story

Understandable, engaging and persuasive

Independently from the PE format you choose

ORGANIZING YOUR CONTENTS| How?

In a way that makes it…

- Comprehensible
- Fascinating
- Persuasive

STORIES | *the non-storyboard*

"At this point in the meeting we'll open a discussion of whether or not we needed to have this meeting."

STORIES | *the non-storyboard*

The non-storyboard is made of what is essential and interesting FOR YOU but not FOR OTHERS and not for your story

- Deep or unnecessary **details**
- Very **technical** aspects
- **Difficult** concepts
- **Autoreferential** details

(merits should come out from the story)

… even if you find them fascinating:

Stories | *the storyboard*

The storyboard is made of:

- Structure

the sequence is not improvised and include **narrative key elements**

- Logic line

one concept **logically** follows the other (a good rule is: “never anticipate”)

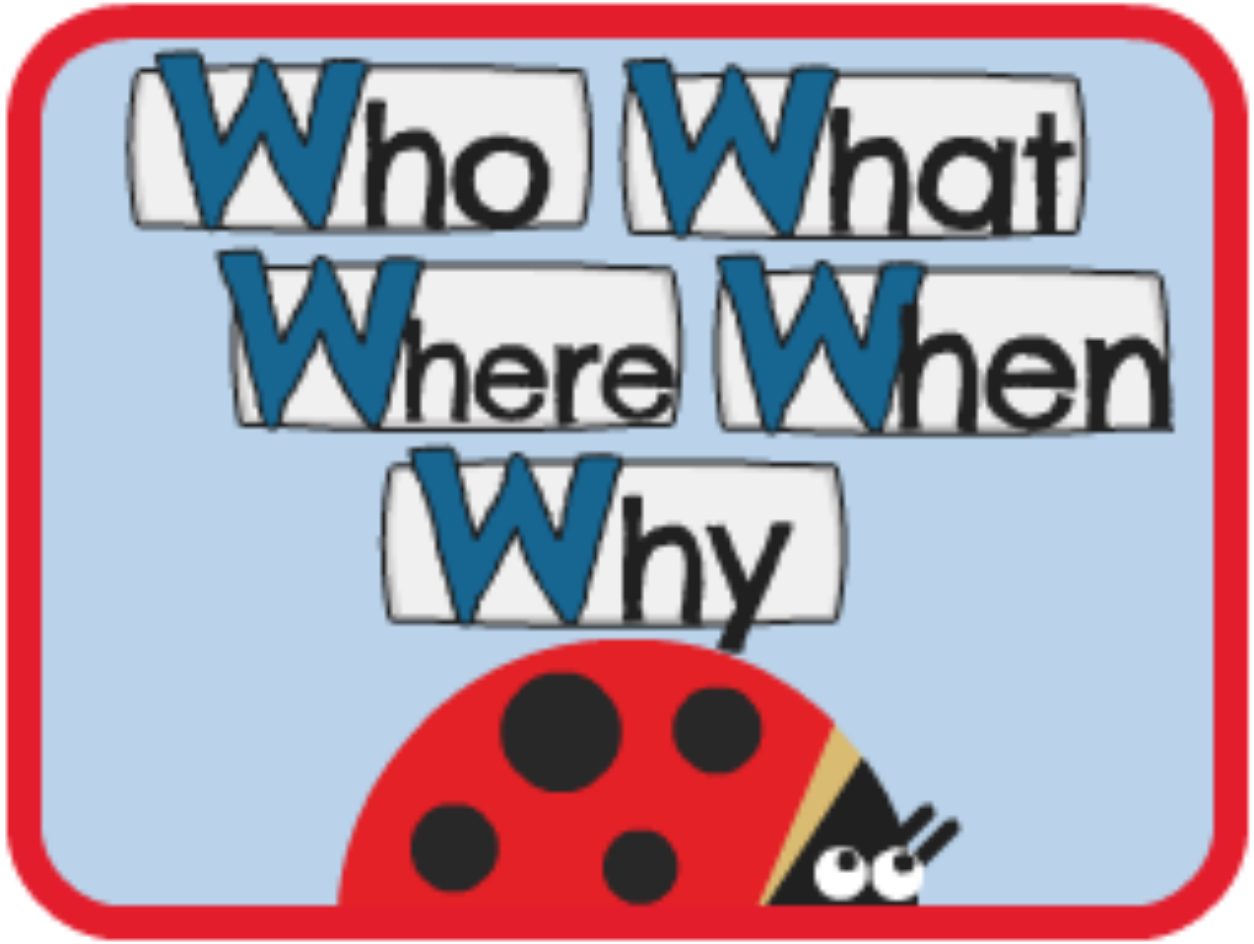
- Time line

The quantity and complexity of contents respect the **time window** at your disposal

ORGANIZING YOUR CONTENTS|
Ingredients to inform

- Your message

What are you communicating?

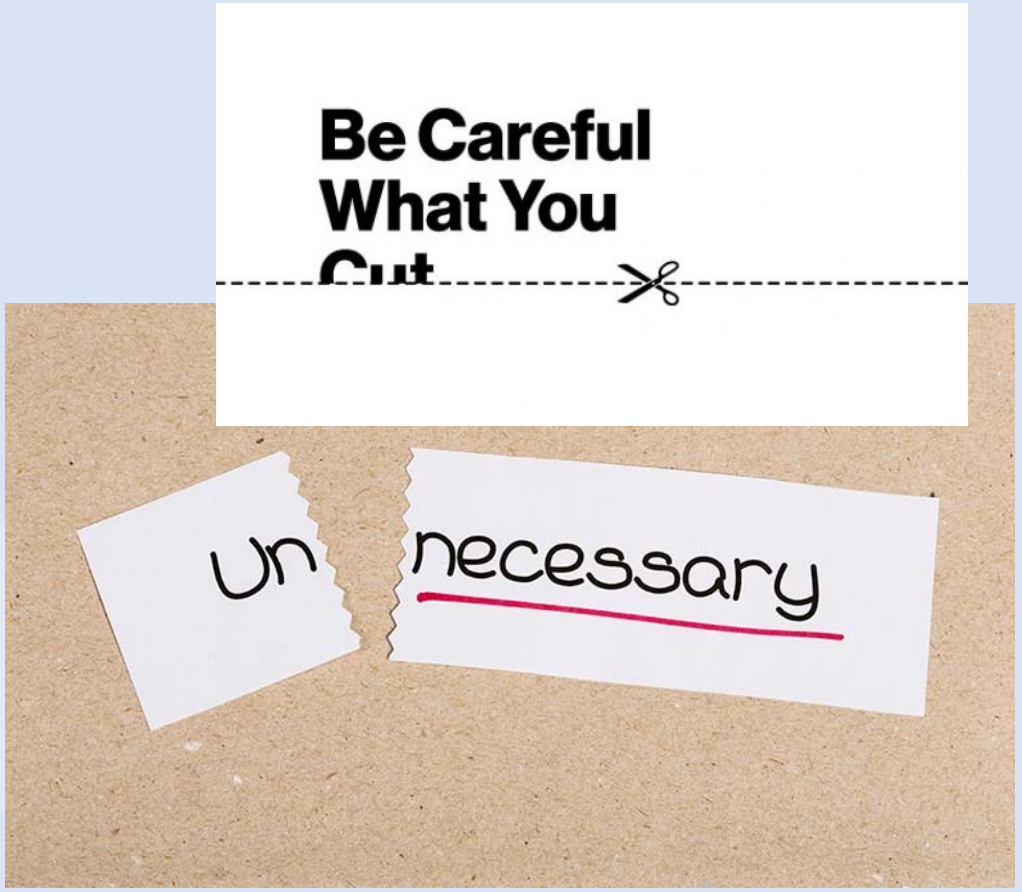


ORGANIZING YOUR CONTENTS| |

talking about your project

Your story is based on the five W's you have in mind … thus you have in mind the story

- ***Why*** are you doing what you're doing
- ***What*** is the plan, the scheduled process
- ***Where*** will you conduct your research
- ***When*** do you expect to gather results
- ***Who*** is part of your team or sustains your project



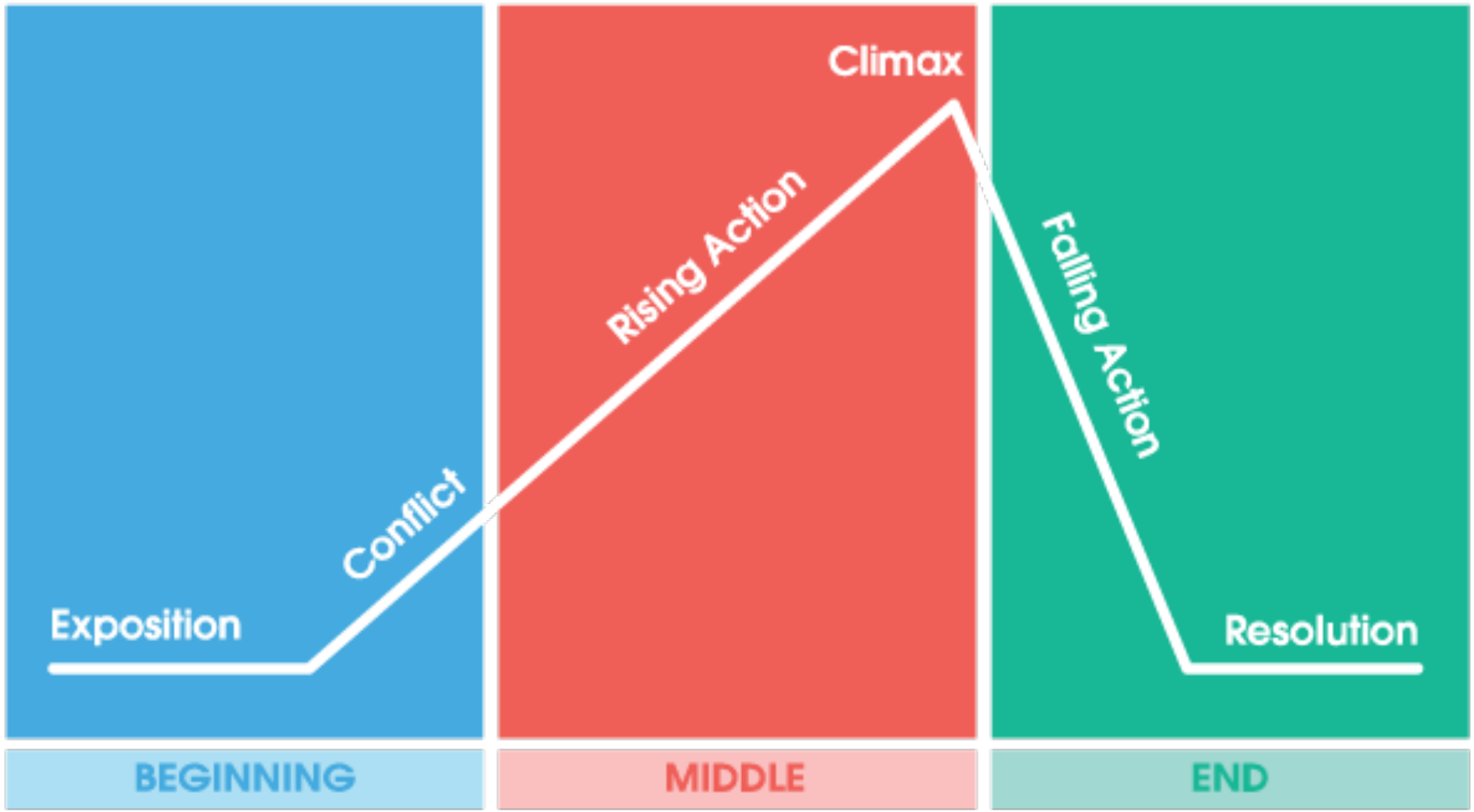
Three elements have to be added to build a good story:

1. *The storyboard (a logical sequence)*
2. *The non-storyboard (what would be illogical in the sequence)*
3. *The language (words to use or to not use)*

ORGANIZING YOUR CONTENTS|
Ingredients to build a story

- Protagonist
- Topic/question/problem
- Obstacles
- Trip/Process/Adventure
- Paradigm/frame change

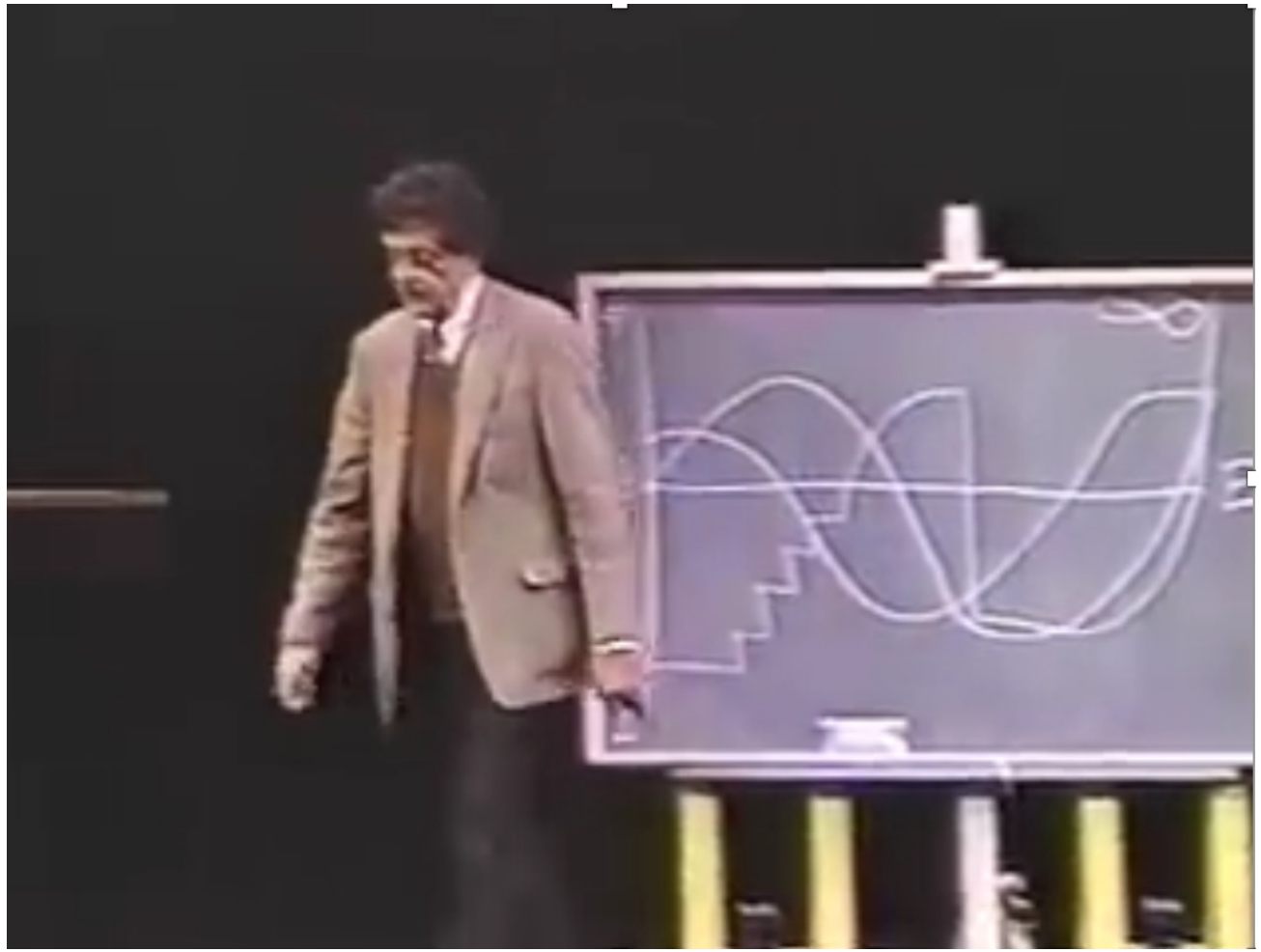
Structure of a story| … three acts?

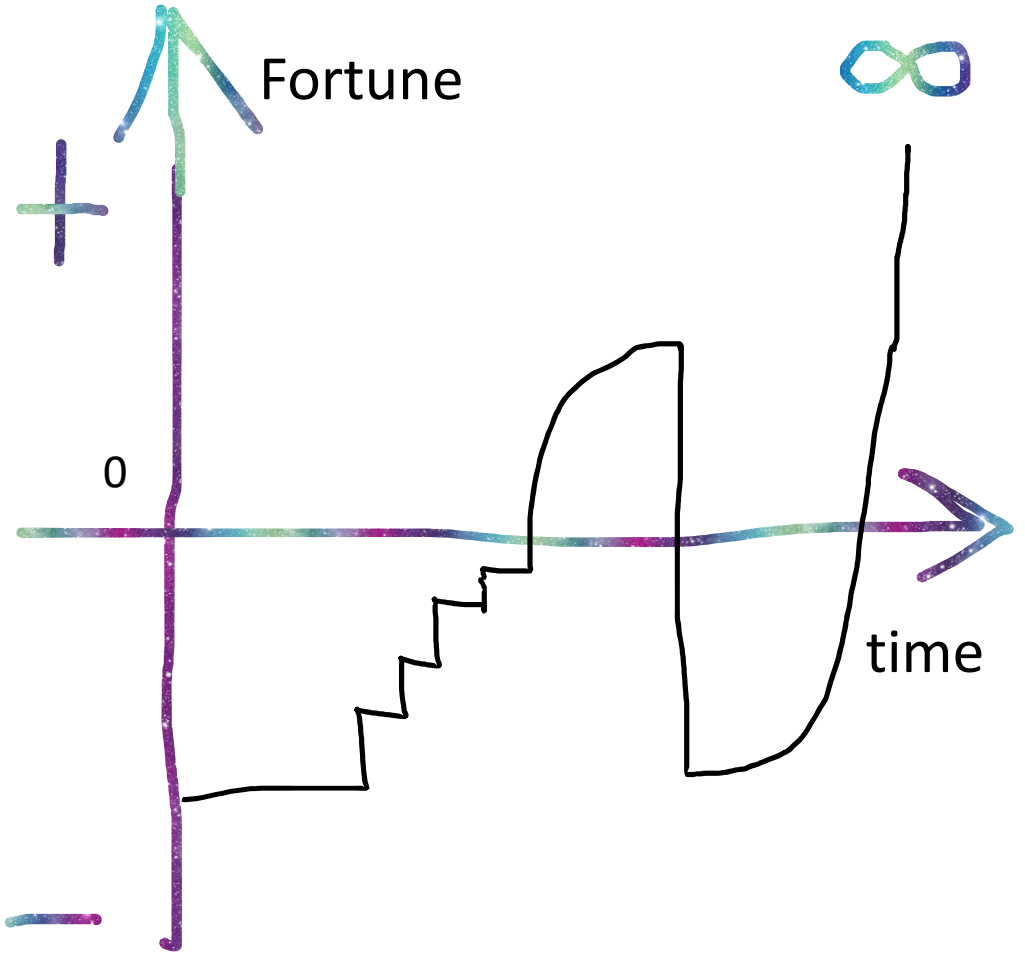


The narrative arc:

- Equilibrium
- Disruption
- New Equilibrium

A well known story| … Cinderella

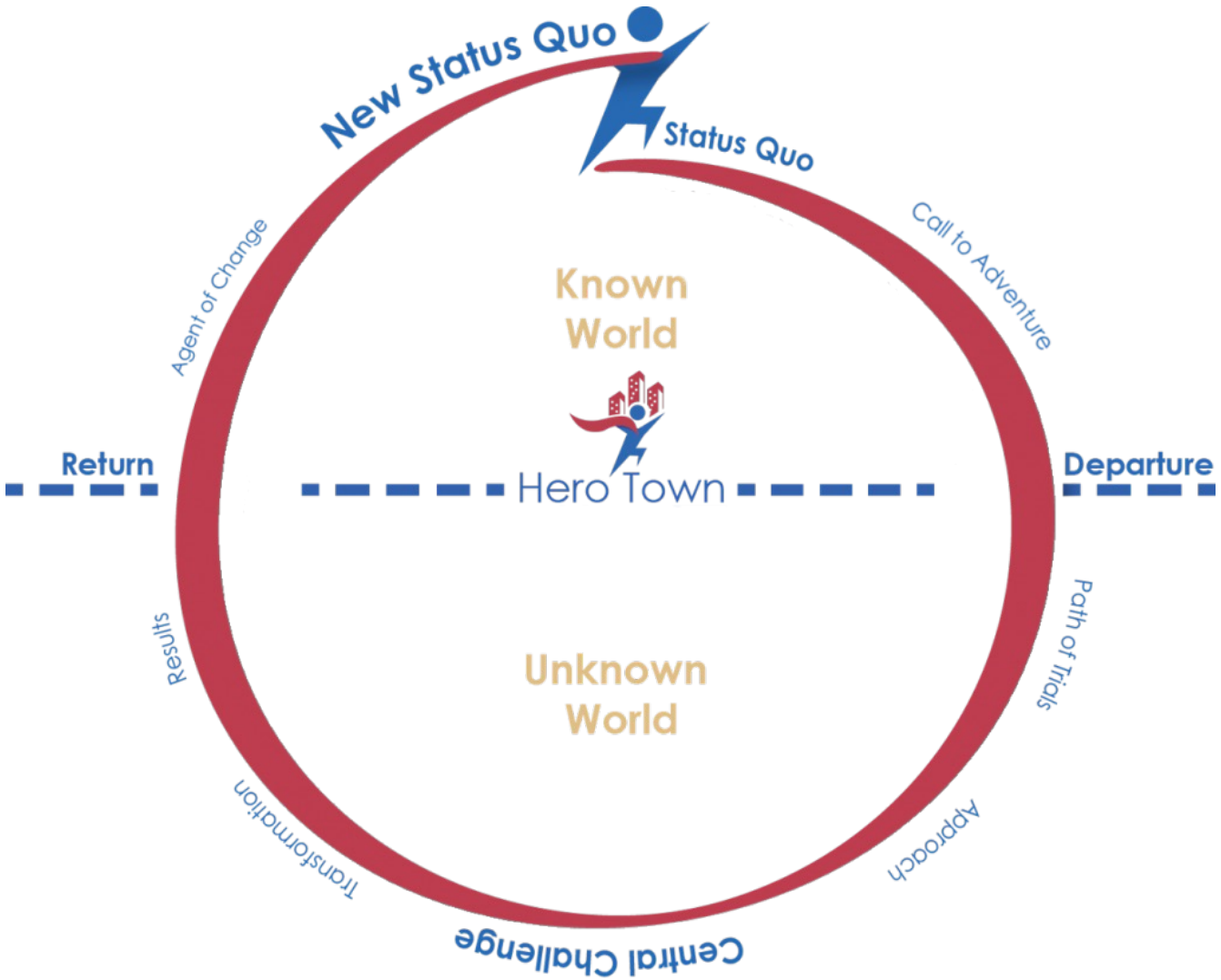




Kurt Vonnegut – The Shapes of Stories

https://www.youtube.com/watch?v=oP3c1h8v2ZQ

Narrative structures | *… the Hero Journey*



It involves:

- *A Hero (a person, a community, a team)*
- An initial scenario and a modified end scenario
- A "heroic" journey with overcoming obstacles
- The acquirement of new knowledge

Useful to:

- Tell about a journey, an adventure, an experiment story
- Highlight the positives of exploring
- Describe a scenario change (new paradigm, someone's theory)

Narrative structures | *The LHC Adventure 1*

Higgs Boson discovery announcement

Higgs Boson hints

Data selection and analysis

Competition among experimental collaborations

LHC starts again

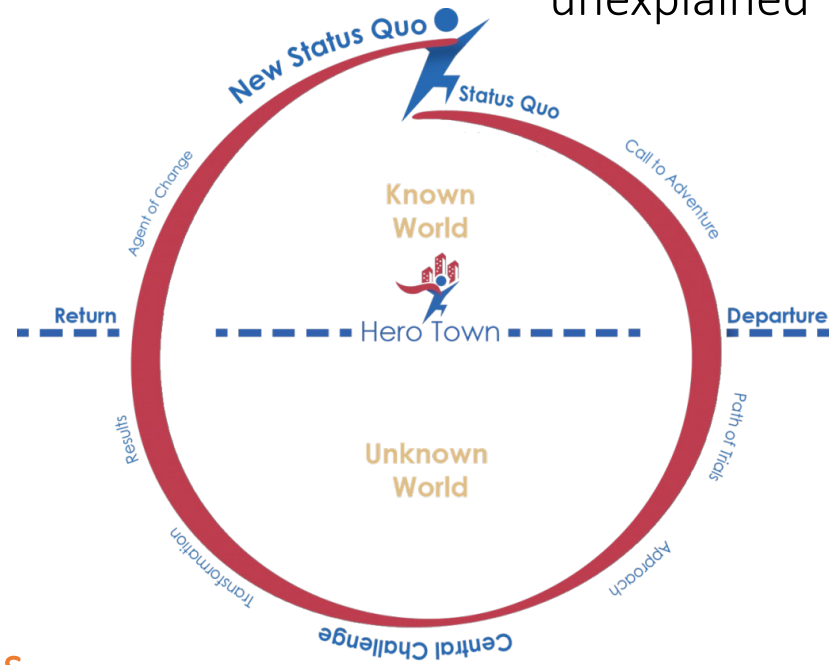
Something gets wrong

LHC starts

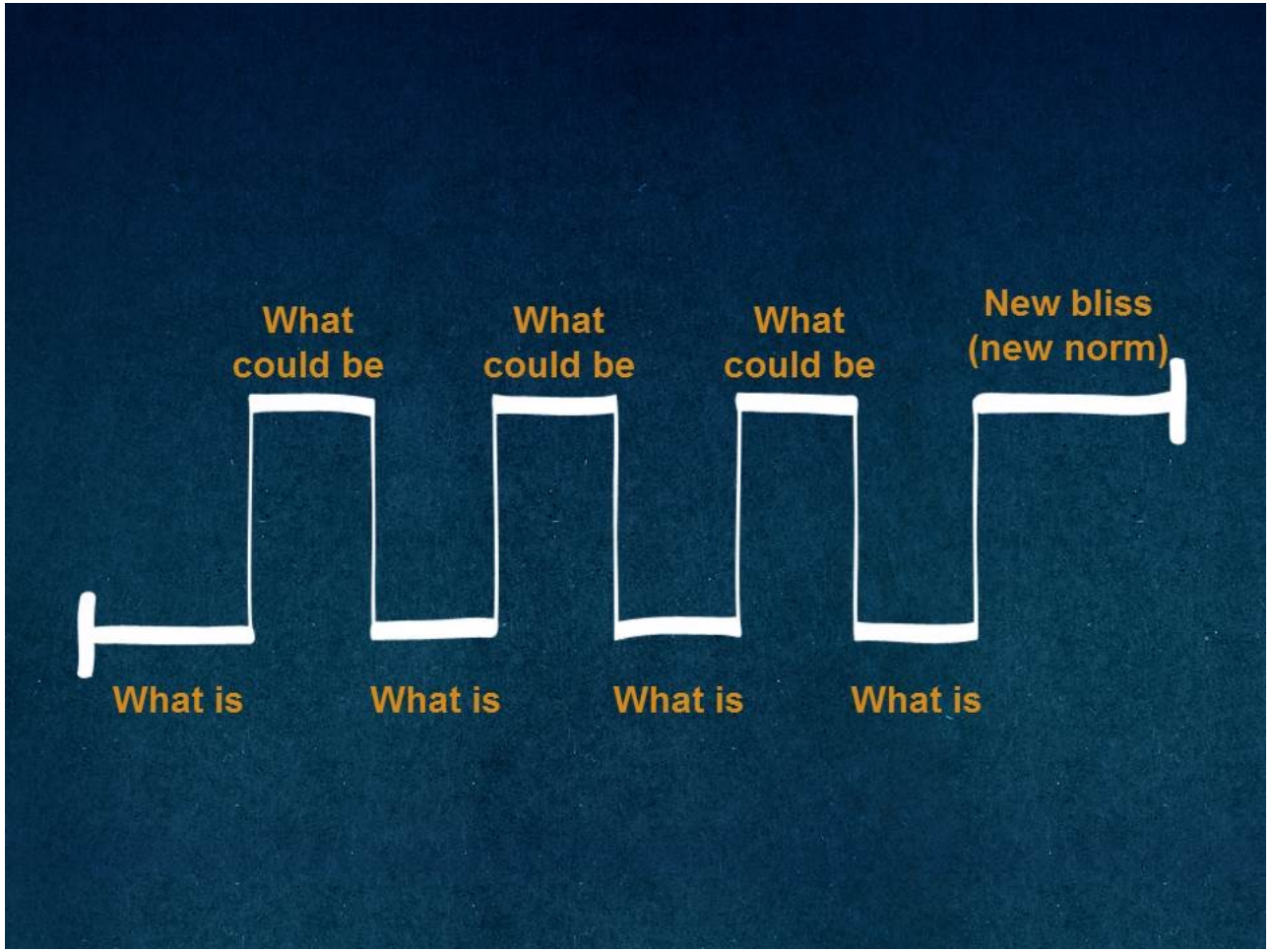
Experiments are designed and constructed

LHC is designed and constructed

Standard Model: mass is unexplained



Narrative structures | *… the sparklines*



Useful to:

- Keeping the public's attention
- Generate wait and suspense
- Give rhythm without losing the thread of a sequence

Examples:

- Time Travels: Possibility vs. Impossibility
- What is dark matter: Hypotheses and evidence vs. experiments/Known vs. unknown
- LHC history: from initial strategies/expectations to path changes (rigid timeline).

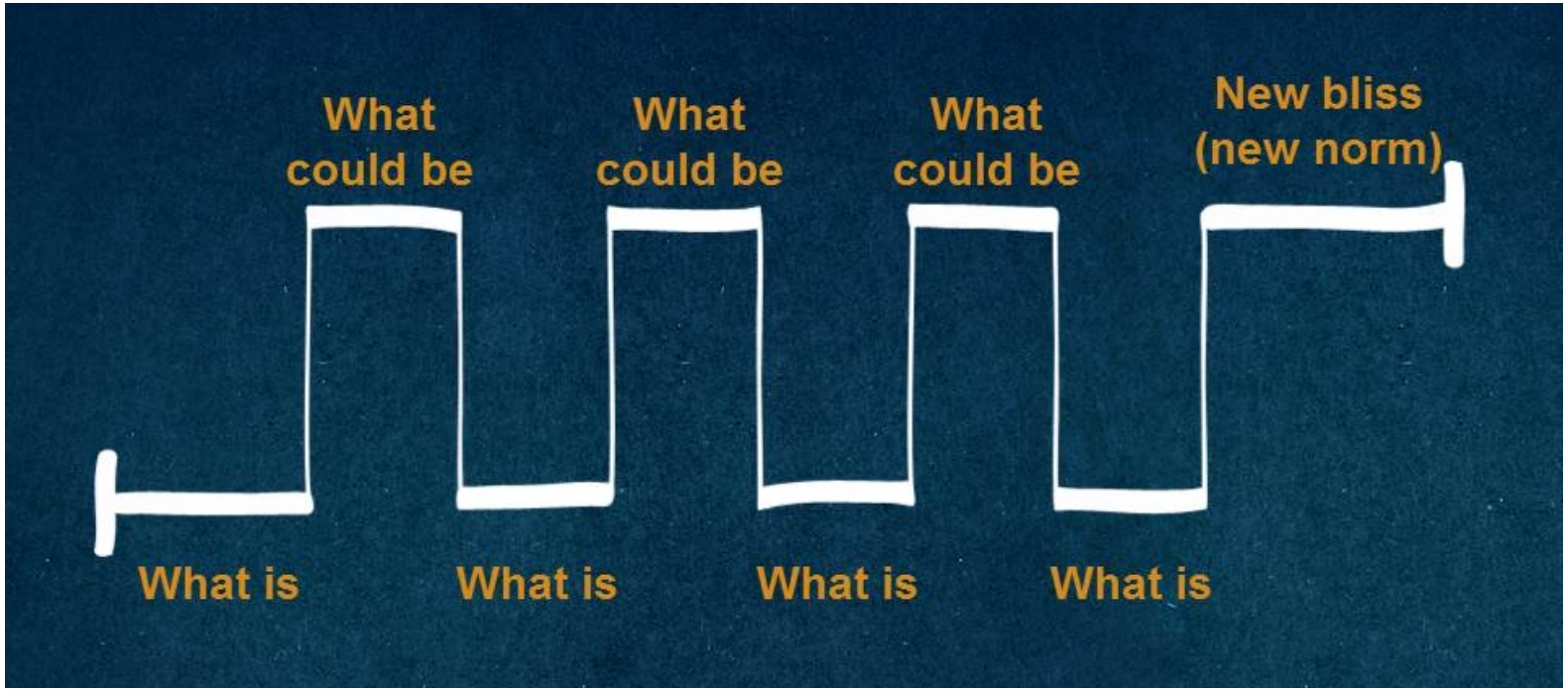
Narrative structures | *The LHC Adventure 2*

Standard Model: mass is unexplained

Theoretical model Higgs Mechanism

Theoretical previsions which energy to produce Higgs Bosons

Simulations to design LHC and its experiments



Theory

Research Strategy

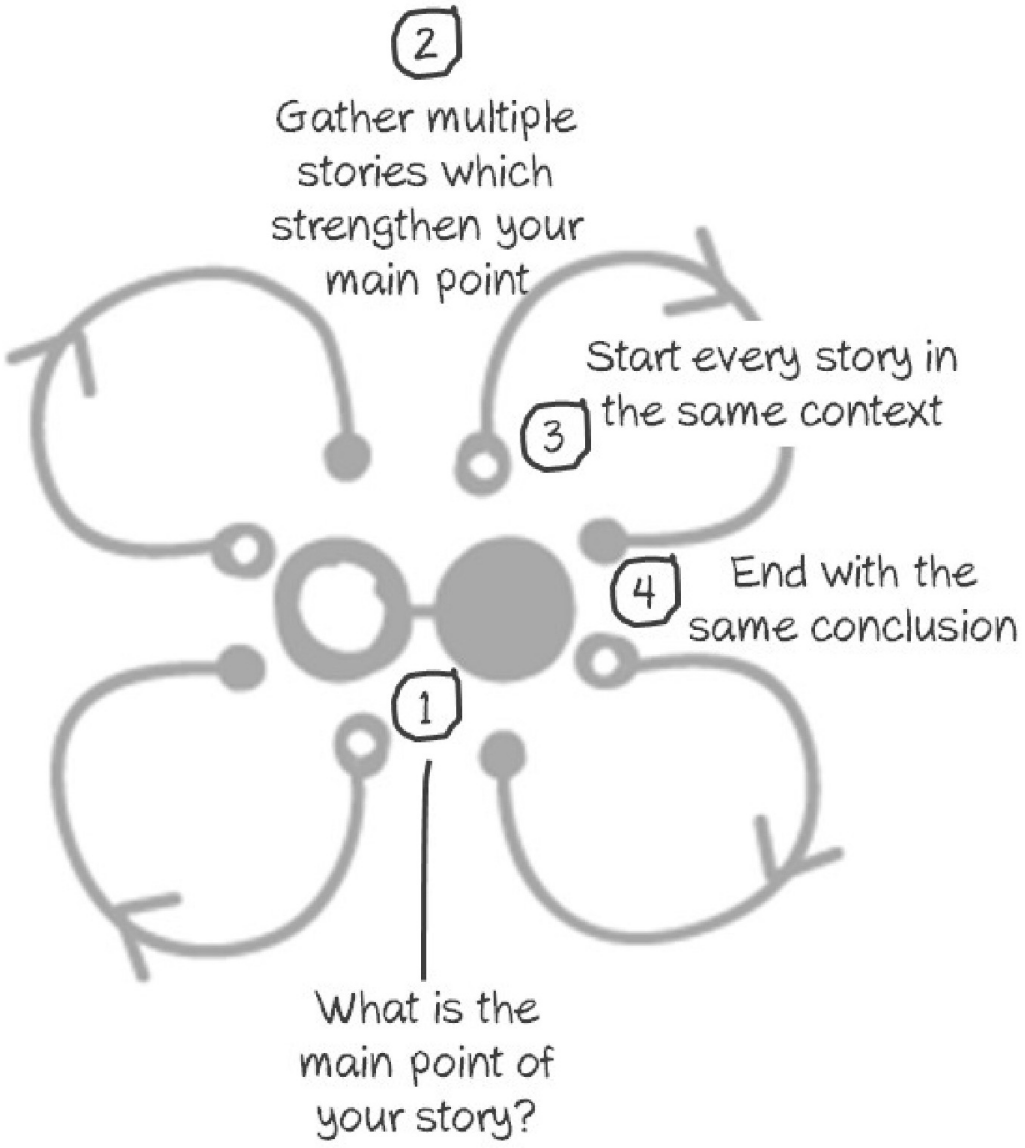
LEP energy limits

LHC proposal

Discussion about LHC promises/ costs ands benefits

Decision about LHC construction

Narrative structures | *… the Petal structure*



Useful to:

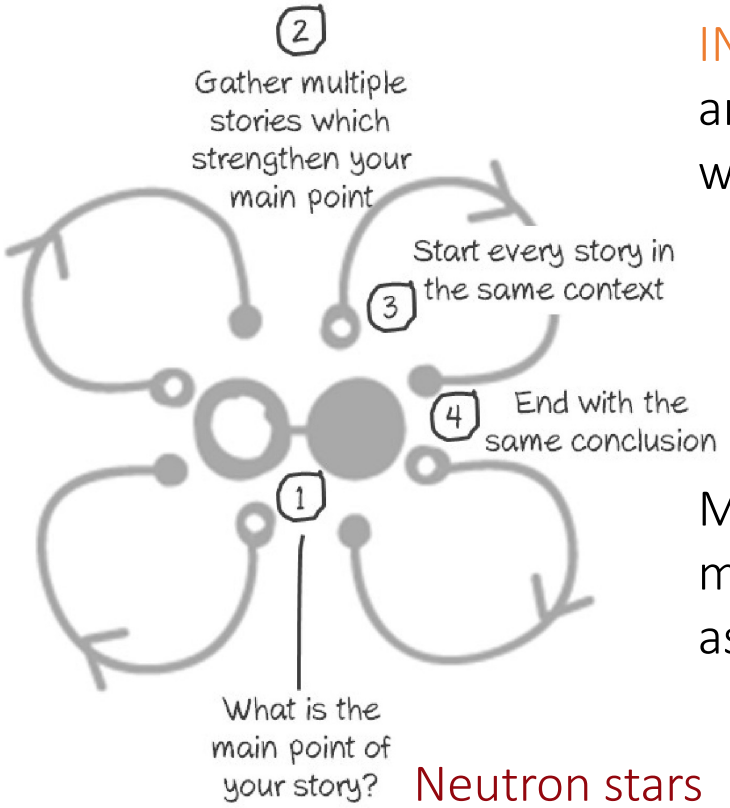
- Describe connections between threads in a story or process
- Show how different scenarios relate to a single idea
- Allow multiple speakers to talk around a guiding theme

Examples:

- Innovation and research: physics and medicine/cultural heritage/computing/new materials
- Contemporary astronomy: different approaches. GW/neutrinos/gamma/optical
- Dark Universe: Dialogue between researcher from different fields

Narrative structures | … *Neutron stars merger*

ASI Voice: Fermi space telescope. Gamma rays



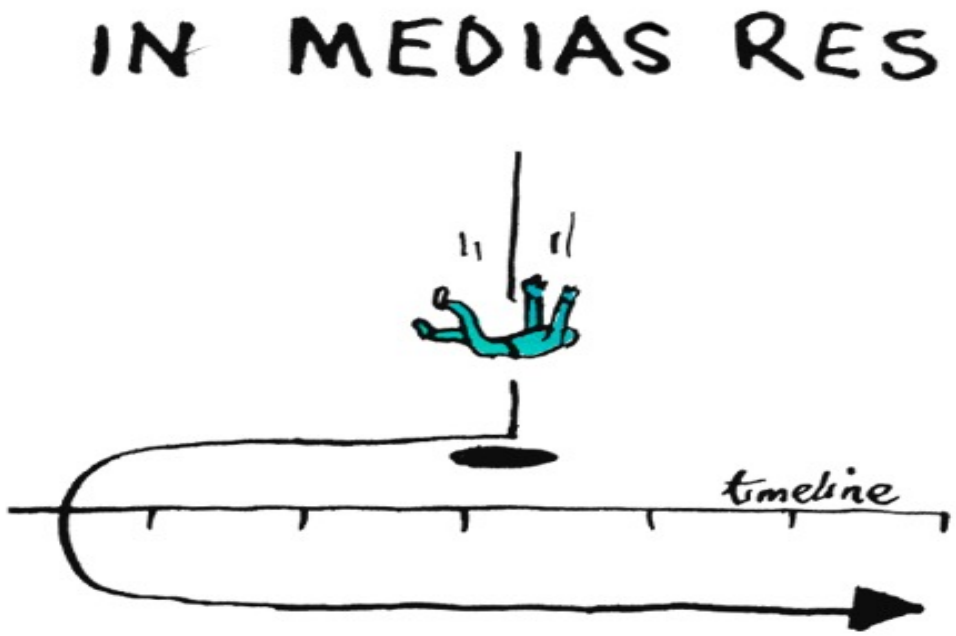
INFN Voice: Virgo and gravitational waves

INAF Voice: Terrestrial optical telescopes

Multi-messenger astronomy

Neutron stars merger
August 2017

Narrative structures | … in *Media Res*



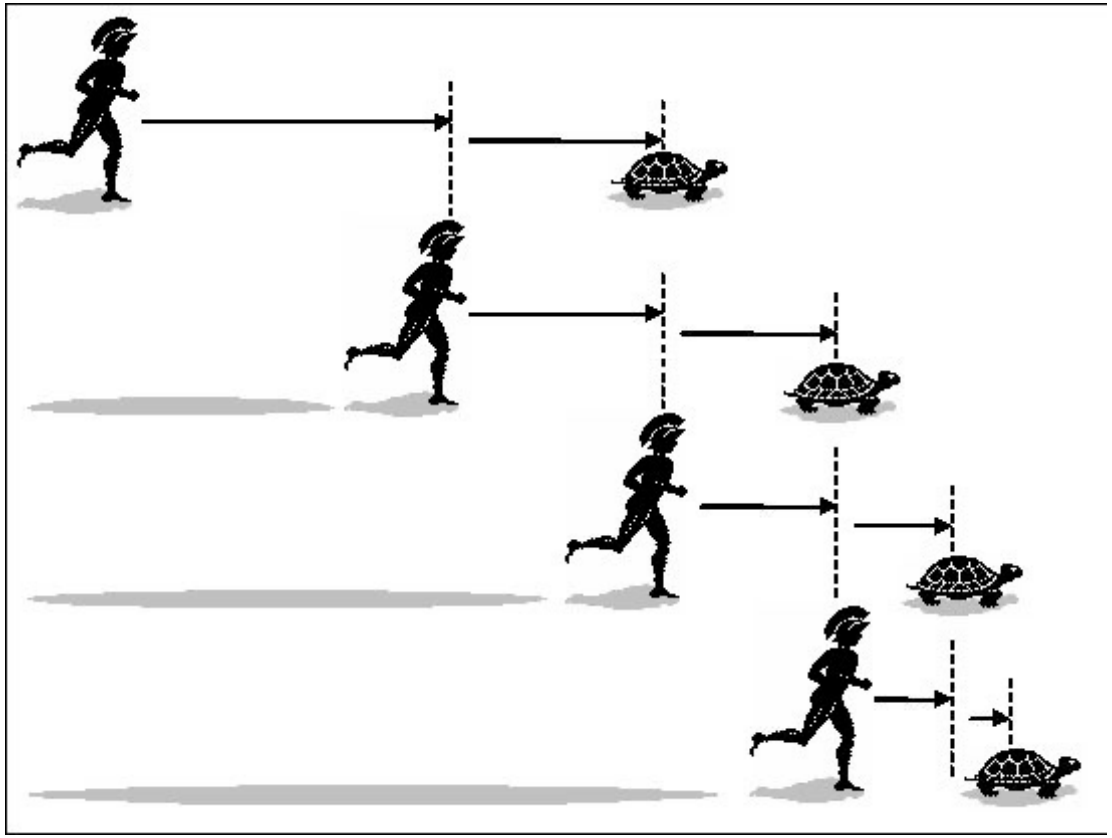
Useful when the story has a well-defined development to:

- Capturing attention from the first moment
- Keep the audience suspended while waiting for an explanation
- Focus on a crucial moment in your story

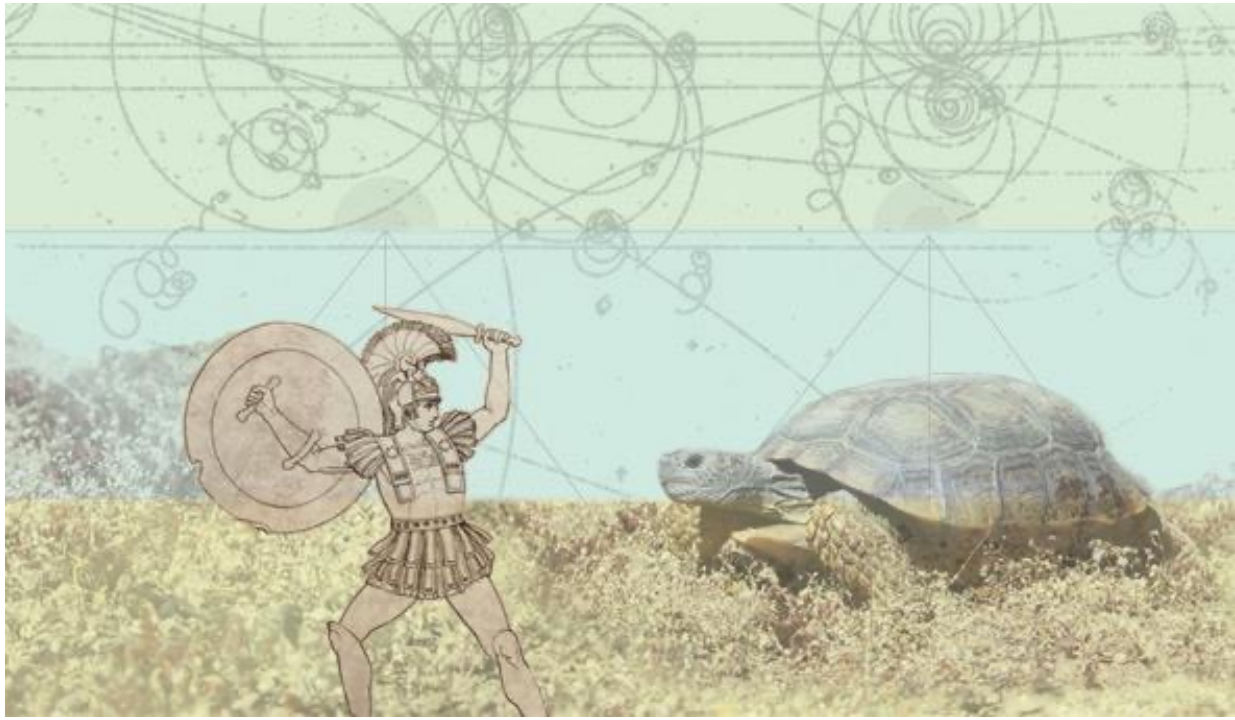
Examples:

- LHC is the coldest place in the universe
- Einstein is the unwitting inventor of the GPS
- The 2015 gravitational wave was emitted at a distance of more than a billion light years

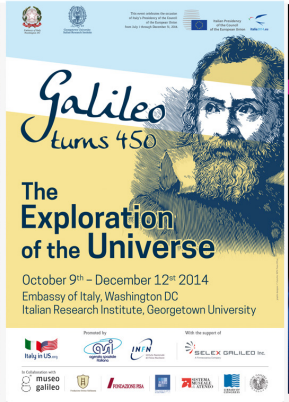
Narrative structures | … *The paradox*



Zeno’s paradox: Achilles and the tortoise



Narrative structures | … while *making institutional communication*



Exhibitions and Conference Shows

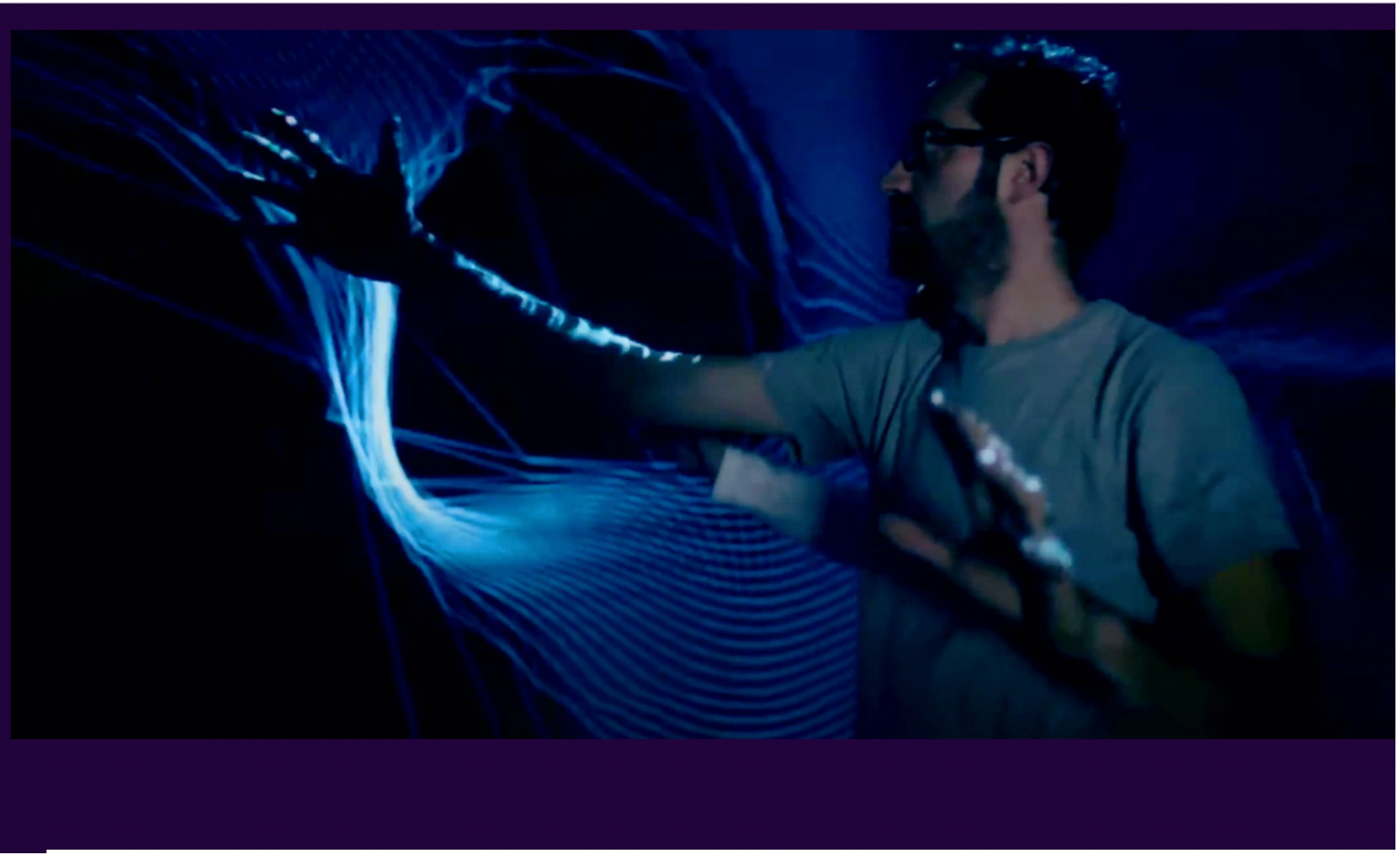
Based on the **intertwining of science and arts**

Having **researchers** as main voice and **discoveries**, **infrastructures and research projects** as a narrative line

Designed to be host at **Festivals, in Theatres and Museums**

KNOWING BY DOING | *making of science an experience*

COLLISIONI!INFN
Spazi culturali
all'Istituto Nazionale di Fisica Nucleare



Not everyone is willing to play
Not only children love to play

Not only adults want to understand
Not everyone wants to really understand

LISTENING
OBSERVATION
PARTECIPATION

Exhibitions

Immersive, interactive, multimedia

SCIENCE BLUNDERS, Pisa Palazzo Blu and Catania: 56.000 Visitors

EXTREME Permanent museum space, Museo L. Da Vinci Milan, 2016.

GRAVITY. *Imagining the Universe after Einstein*. MAXXI Museum, Rome. 150.000 visitors.

UNCERTAINTY. *Interpreting the present, foreseeing the future*. Palaexpo Rome, October 2021-March 2022. Just opened

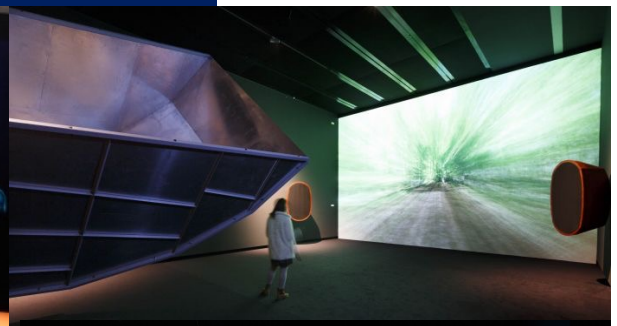
2014&2016 | 2014 | 2016 | 2017&2018 | 2019 | 2020 | 2021

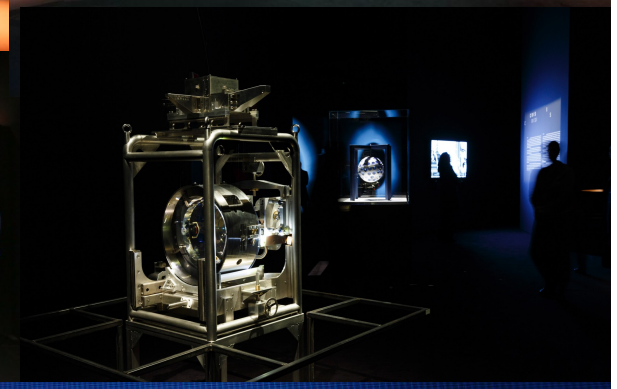
BEYOND THE LIMIT, MUSE Trento, 2014-15: 110.000 visitors

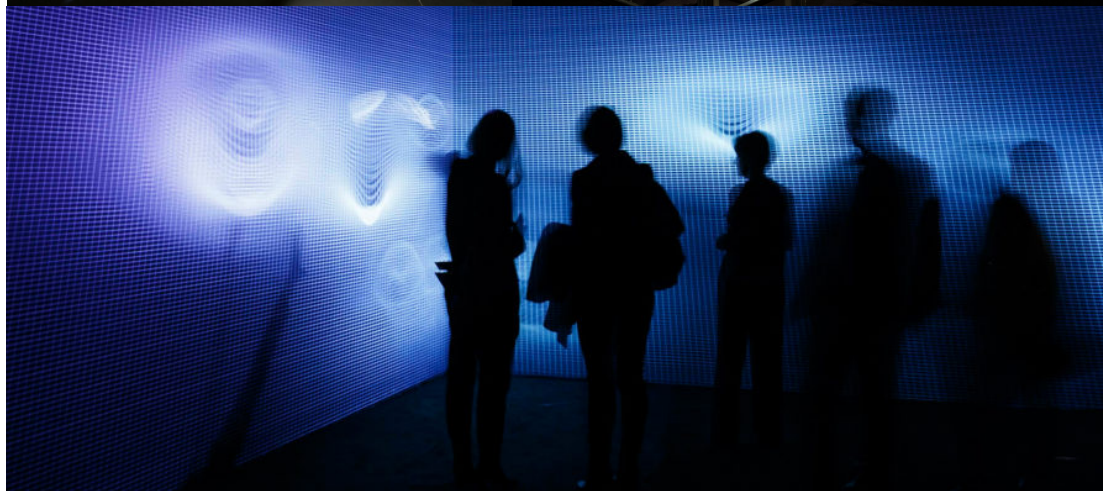
VIRTUAL MAN. *The physics that explores the body*. Pisa Palazzo Blu, Torino Mastio della Cittadella: 25.000 Visitors

CYBORN. *The dawn of an artificial world*. Trieste, Palazzo degli Incanti, ESOF 2020. 3000 visitors

Pandemic context







Conference Shows

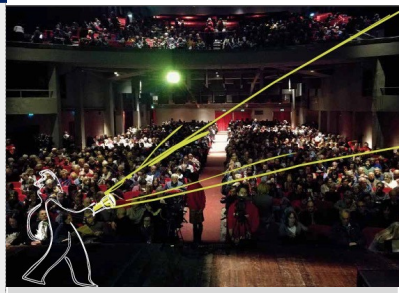
Istituto Nazionale di Fisica Nucleare

POST-LHC STRATEGIES: FCC 2016

- FCC Week Public Event
- 1000 paying spectators
- Sponsorship by ASG Superconductors

ART, SCIENCE AND CREATIVITY 2018

- Art&Science Across Italy
- 2 replicas (NA/MI)
- 1400 spectators
- Synergical with CC3M



A COSMIC TALE 2016-2019

- 7 replicas (Rome, Genoa, Turin, Bergamo, Correggio, Boretto, Baveno)
- 7500 spectators
- 4 stages produced by privates: theatres and foundations
- 4 broadcasts on Rai Scuola

FROM PHYSICS TO MEDICINE 2017

- 600 paying spectators
- Sponsorship by Assobiomedica

TALENTED WOMEN SCIENTISTS 2019

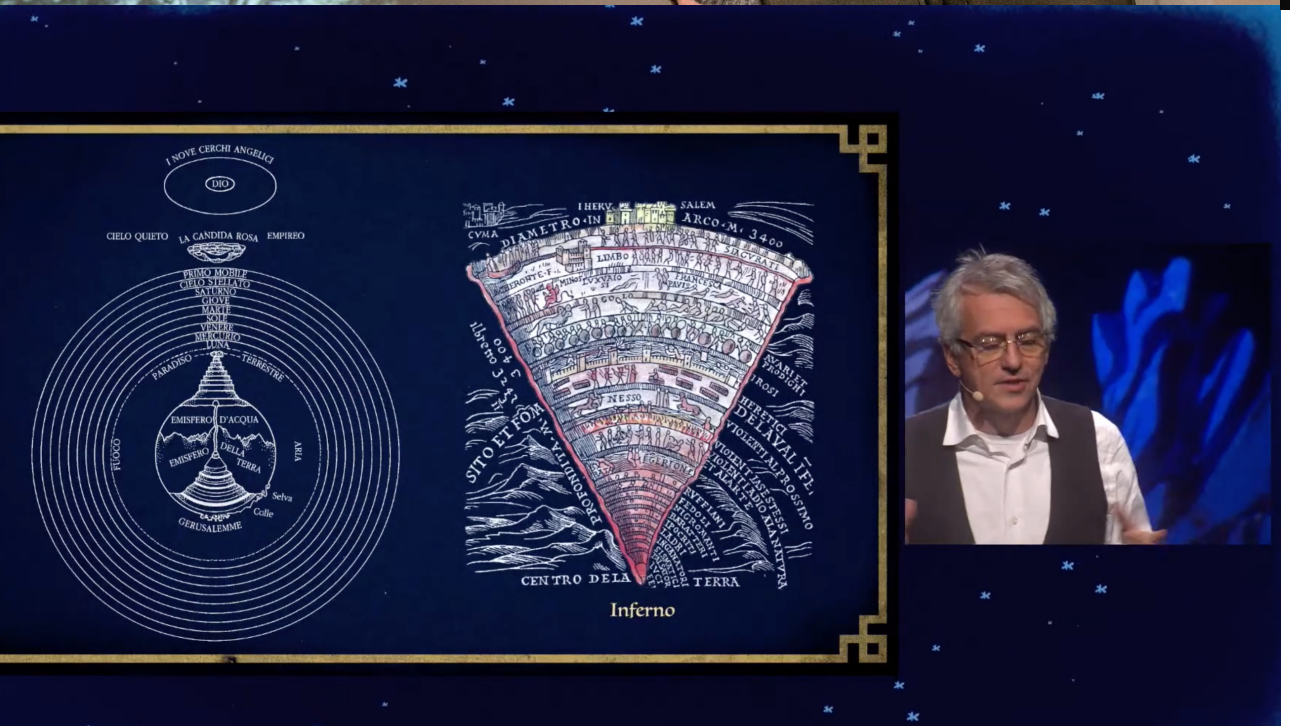
- 700 paying spectators
- Television conduction

THE NEW MULTI-MESSENGER ASTRONOMY, IN MUSIC 2018

- Co-produced by INFN/ASI/INAF
- 3 replicas (RM/NA/GE)
- 3000 paying spectators

RARE EVENTS ("UNDERGROUND UNIVERSE") 2020

- Streaming from LNGS
- 1200 live streamers
- Pandemic context



Science, Art and Literature: the scientist on stage

Why using narratives to talk about science - bibliography

1. Jones M.D., Crow D.A. (2017), *How can we use the 'science of stories' to produce persuasive scientific stories*?, Palmgrave Commuications, 3:53, Nature
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3. Herman D. (2003) *Narrative theory and the cognitive sciences*: Stanford Univ Center for the Study.
4. Dahlstrom, Michael F. *Using narratives and storytelling to communicate science with non expert audiences*, *PNAS* vol 111 suppl. 4 September 16, 2014 [www.pnas.org/cgi/doi/10.1073/pnas. 1320645111]
5. Irwin, A. *The Politics of Talk: Coming to Terms with the 'New' Scientific Governance*, Social Studies of Science 36(2): 299–320
6. Bruner, J. S. *Actual minds. Possible words*, Harvard University Press, Cambridge, 1986.
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8. Bruner, J. (2004). *Narratives of science. In Reconsidering science learning*, (pp. 90-98). Routledge Farme

Around your PE activity

Communication, Budget, evaluation

THE TIME OF THE STORY|

- The time of the **premise** "Once upon a time"
- The duration of the **suspense** «Snow White ate the apple and ...»
- The **development of the story** "the prince departed, met the dragon, got lost in the forest, kissed Snow White..."
- The **moral of the story** "they lived happily ever after”

→ The attention time

THE TIME OF THE STORY| … *The measure of time*

- Duration of speeches/answers
- Number of speakers

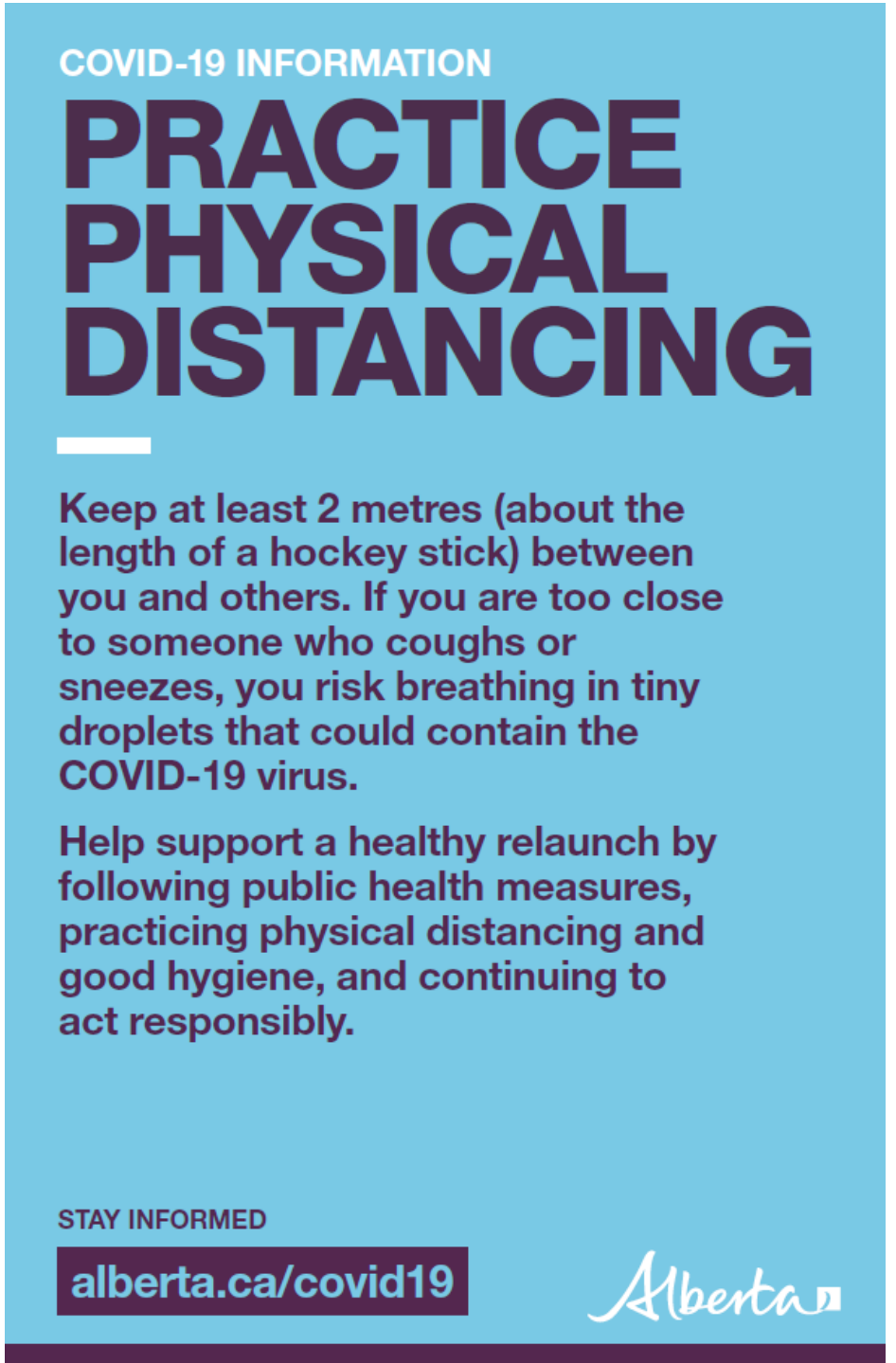
- Equilibrium among speakers
- Duration of videos or other narrative elements

A **text/time unit**: 800 types/minute for someone speaking at the radio

> Improvisation > Dt

VISUAL COMMUNICATION |

the importance of a clear and direct communication



VISUAL COMMUNICATION | *A good example*

In ascolto delle onde gravitazionali

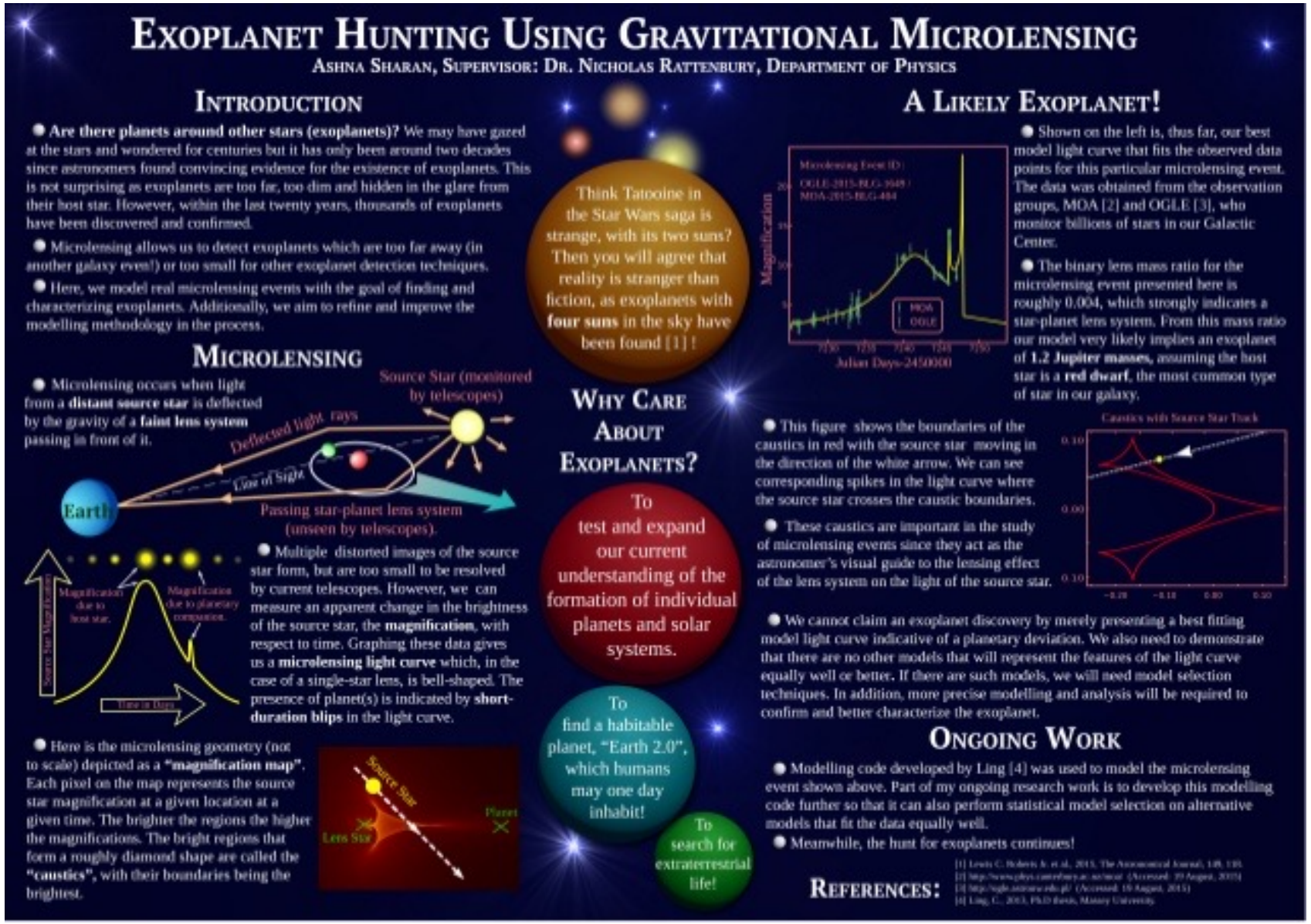
L'esistenza di onde, che, generate da grandi cataclismi cosmici, si propagano nel cosmo, e deformano la trama dello spazio-tempo, era stata prevista da Einstein già nel 1916. Ci è voluto però un secolo di innovazioni scientifiche e tecnologiche per arrivare alla loro scoperta, annunciata nel 2016 dai fisici della collaborazione scientifica degli interferometri statunitensi LIGO e dell'europeo VIRGO, installato in Italia, nei pressi di Pisa. Queste antenne gravitazionali sono oggi gli unici strumenti al mondo in grado di rivelare le onde gravitazionali. Sono costituiti da due bracci lunghi diversi chilometri, nei quali due fasci laser vengono riflessi migliaia di volte fino a che si sovrappongono a formare un'immagine di interferenza. Il passaggio di un'onda gravitazionale, allungando il percorso dei laser lungo un braccio e accorciandolo nell'altro senso modifica questa figura di interferenza.
Nonostante siano prodotte da eventi cosmici violentissimi come le fusioni di buchi neri o di stelle, sulla Terra le onde gravitazionali producono variazioni di lunghezza impercettibili, più piccole delle dimensioni di un atomo. Grazie a tecnologie d'avanguardia per la fabbricazione degli specchi che riflettono i laser, la produzione dell'ultra vuoto e l'isolamento dalle vibrazioni dell'ambiente gli interferometri sono in grado di rilevare anche queste variazioni infinitesime.

Listening to the gravitational waves

The existence of waves generated by major cosmic cataclysms and propagating through the cosmos, warping the fabric of space-time, was predicted by Einstein as early as in 1916. However, it took a century of scientific and technological innovations to achieve their discovery, announced in 2016 by physicists using scientific collaboration of the United States interferometers, LIGO, with the European VIRGO detector, based in Italy, near Pisa. These gravitational antennae are the only instruments in the world today that can detect gravitational waves. They consist of two arms, several kilometres long, in which two laser beams are reflected thousands of times, until they overlap to form an interference image. The passage of a gravitational wave lengthens the path of the lasers along one arm and shortens the one along the other direction, altering the interference figure.
Even though they are the products of extremely violent cosmic events, such as fusions of black holes or of stars, gravitational waves produce imperceptible variations of length on Earth, less than the dimensions of an atom. With leading edge technology for manufacturing the mirrors that reflect the lasers, production of ultra high vacuum and isolation of environmental vibrations, interferometers are now also capable of detecting these infinitesimal variations.

Photo credit: EGO

VISUAL COMMUNICATION | *A bad example*



COMMUNICATION| *The value of the title*

- EVOQUES through images, irony, ideas, literary quotes, puns
- TELLS what the event is about
- INVITE the public
- DEFINE the style

THE SUBTITLE (always useful whenever possible)

it reveals the content and the style

COMMUNICATION| *The event in a few lines*

CONFERENCE-SHOW

LIGHTS AND WAVES RHAPSODY. *A THREE-VOICE MUSIC STORY*

AN EVENT BY THE NATIONAL INSTITUTE OF NUCLEAR PHYSICS, THE ITALIAN SPACE AGENCY, WITH THE CONTRIBUTION OF THE NATIONAL INSTITUTE OF ASTROPHYSICS

(SUBJECT→) The story is that of the most extraordinary discovery in physics of the last 100 years: the first detection of gravitational waves emitted by the fusion of neutron stars, which took place in perfect synergy between very different instruments. A discovery that changed the image of our universe. (STYLE →) In a non-random alternation of words and music, the two-act narrative is entrusted to the protagonists of discovery: (PROTAGONISTS →) exceptional physicists who, thanks to different tools, technologies and knowledge, have rassembled the image (CONTENUTS →) of an extraordinary cosmic event, describing in detail its characteristics and opening the new era of multi-messaging astronomy. (ARTISTS →) The musical contribution to the narrative participates in the choral message. Alternating with the voice of scientists, the music of the jazz trio and the Open Orchestra, returns the image of the specific and at the same time synergistic contribution of three ways of investigating the universe: (CONTENTS →) that of fundamental physics, with gravitational wave detectors, astrophysics, electromagnetic signal detectors from cosmic sources, and instruments orbiting space. **(1100 types)**

HOW MUCH| *Budget*

- To buy objects for demonstrations
- To buy materials to build an exhibit
- To pay the SIAE for copyright on videos, readings, music
- To pay travel and stay for your invited speakers/contributors
- To pay a professional moderator/an artist/a performer
- To rent technical material for your public event: screen, projector, lights, microphones, streaming system, simultaneous translation …
- To rent the place where staging your activity (theatre, auditorium…)
- To pay professionals to create multimedia installations or a videos
- To pay professionals to design an exhibition (architect, stand builder …)

50 euro

5000 keuro

EVALUATION| *impact and appreciation of a single event*

	General Appreciation	Knowledge	Interest	Image&brand
Narration	Entertainment	Language	Research	INFN
Contents	Story	Contents (before and after)	Physics/Science	Fundamental research
People	Main Actors	Research policy	Career	Profession

Towards a quantitative and goals-based evaluation of PE projects →

	Objective	Metric	How measured	When
Goal 1.	**Inform and motivate people on fundamental (or a specific field) research benefits**			
	Reach a number of people with specific contents including research benefits; get % of them to follow up within Y weeks of outreach	• N. of people reached • Increase in the newsletter or the mailing list subscriptions, socials or website hits as a result of the outreach activity.	• Track people attending the event/events and those linking to that remotely. • Ask socials and websites visitors how they get there.	• Start tracking within X weeks of outreach • Tally ongoing results periodically
Goal 2.	**Build credibility for the research program and its benefits through partners the community trusts**			
	Recruit partner organizations (local or national) to actively promote the research program - or support specific outreach events (festivals or campaigns)	• N. of partners committed to join • Response rate on materials distributed by partners • Leads generated by partner events	• Sum of organizations that have agreed to partner • Sum of organizations that fulfilled agreement • Rate of return on partner materials or follow-up from partner outreach efforts	• Assess periodically • After any partner outreach effort or event
Goal 3.	**Demonstrate the benefits of research to generate interest and self motivated political decisions.**			
	Hold a N. of events with a call to action to sign up for a second step of deeper information/or subscribe for a newsletter/magazine/website.	• N. of satisfied individuals in your public • N. of event attendee • N. of participants signing up for an assessment after events • Conversation rate of assessment	• Sum of attendees per event • Dimension of the satisfied public resulting from event referrals (questionnaire). • Sum of requested assessments resulting from event referrals (questionnaire)	• Assess after each event • Monitor periodically