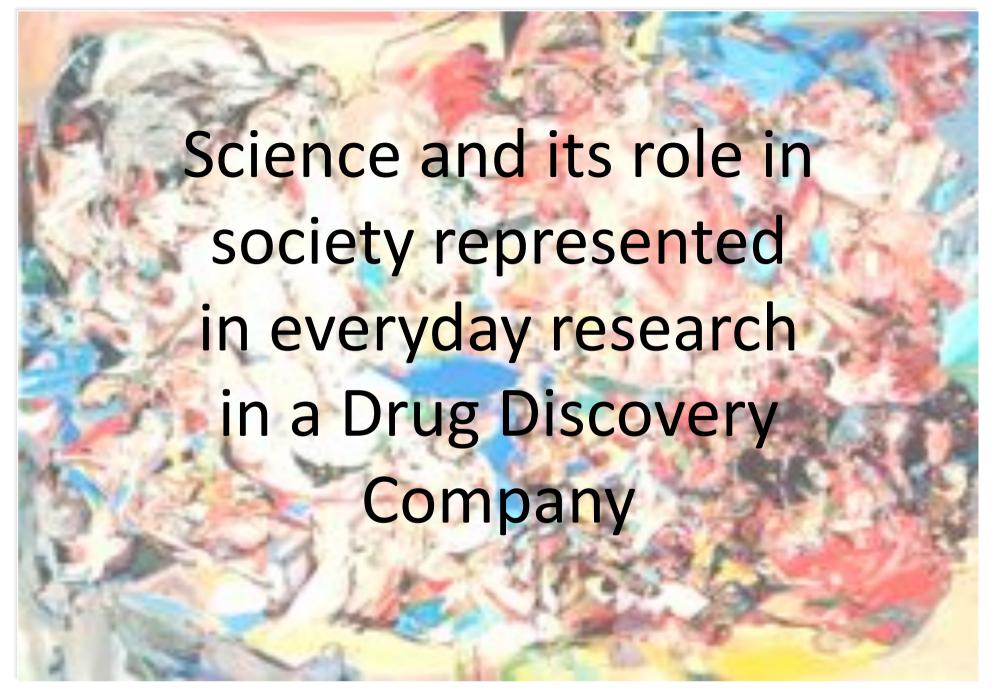16th International Summer School 2010

European Ph.D. on
Social Representations and Communication
At the Multimedia LAB & Research Center, Rome-Italy

"Social Representations and Sciences"

16th - 27th July 2010
http://www.europhd.eu/html/_onda02/07/18.00.00.00.shtml

Key Lecture

European Ph.D

on Social Representations and Communication

www.europhd.eu

Science and its role in society represented in everyday research in a Drug Discovery Company

Eloisa Cianci   University of Bergamo

Rome 2010

EPISTEMOLOGY

Episteme: knowledge, science
Logos: discourse

A branch of philosophy of science that studies *knowledge* in its different forms (science is one of theese) It is concerned with the nature of *knowledge*.

Historically epistemic studies were born from the human need to better understand:

- His own faculty of knowledge;

- His own real possibility of know.

Typical questions:
"what is knowledge?"
"how is knowledge acquired?"
"what people can know?"
"how do people know what he know?"
"what is the relation between knowledge and science, and belief ?"
"How can we justify and discriminate true to false knowledge?"

From the true knowledge …

Demonstrative conception:

Doxa/episteme
Absolute certainly is given from
the logic connection between
assertions

MP: All mortals die.
MP: All men are mortals.
C: All men die

…to a justified true belief

Descriptive conception:

Scientific method has the authority to distinguish the real scientific
knowledge (truth) from other forms of knowledge (common knowledge)
not declarable true becouse they are not supported by a rational method
that make them unquestionable.

Representationist epistemology (Realism)

The mind cannot directly perceive objects in the external world, but perceives them instead as mental images, ideas or faithful "representations."

Scientific knowledge, thanks to its method is the only way to the truth

Scientific laws are objective and ever-fixed

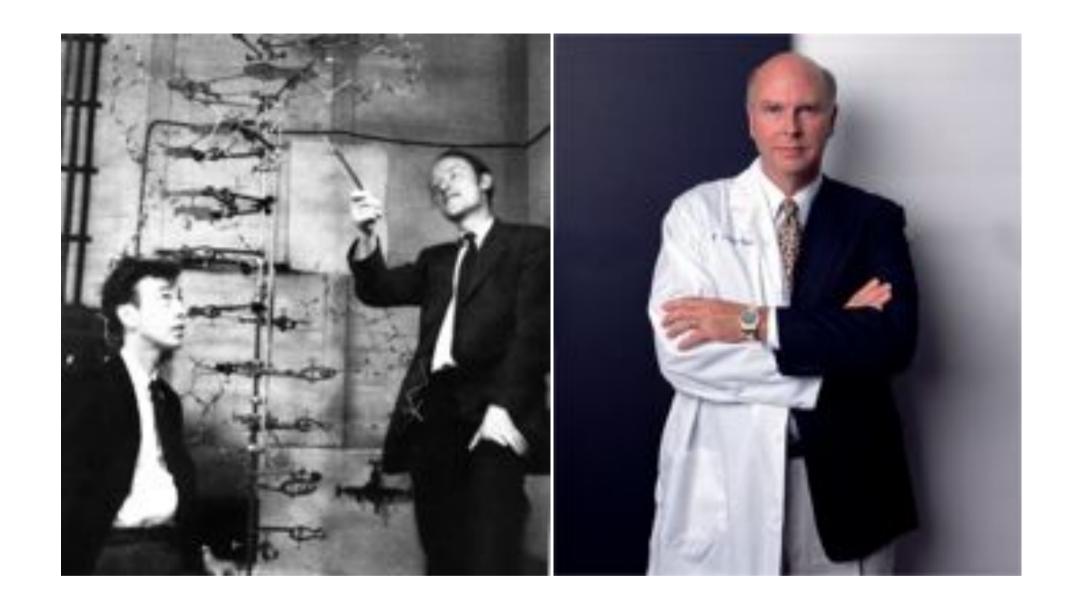## Genetic Epistemology (Constructivism)

Knowledge can be studied as a dynamic process, in evolution (Piaget).

(Scientific) Knowledge emerges from the relation between the observer (scientist) and the object observed (data) in a particular environment (geographical and historical).

- Scientist has a fundamental role in constructing scientific knowledge

- They constrain science development and open new possibilities for science

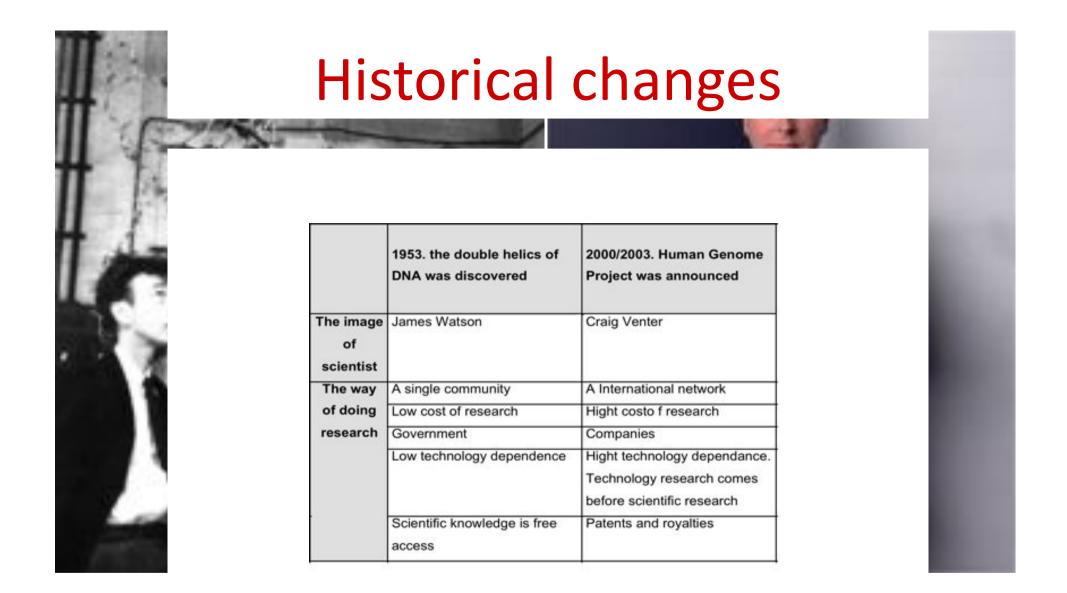- Scientists are responsable for their science

Ethics and epistemology are two faces of the same coin

Society role gains strenght and becomes essential to understand the construction of scientific knowledge

Ceruti, M.

Watson and Crick, 1953   Craig Venter, 2000

Historical changes

	1953. the double helics of DNA was discovered	2000/2003. Human Genome Project was announced
The image of scientist	James Watson	Craig Venter
The way of doing research	A single community	A International network
	Low cost of research	Hight costo f research
	Government	Companies
	Low technology dependence	Hight technology dependance. Technology research comes before scientific research
	Scientific knowledge is free access	Patents and royalties

USA. from 1945: goverment

USA '80: companies

Environmental changes

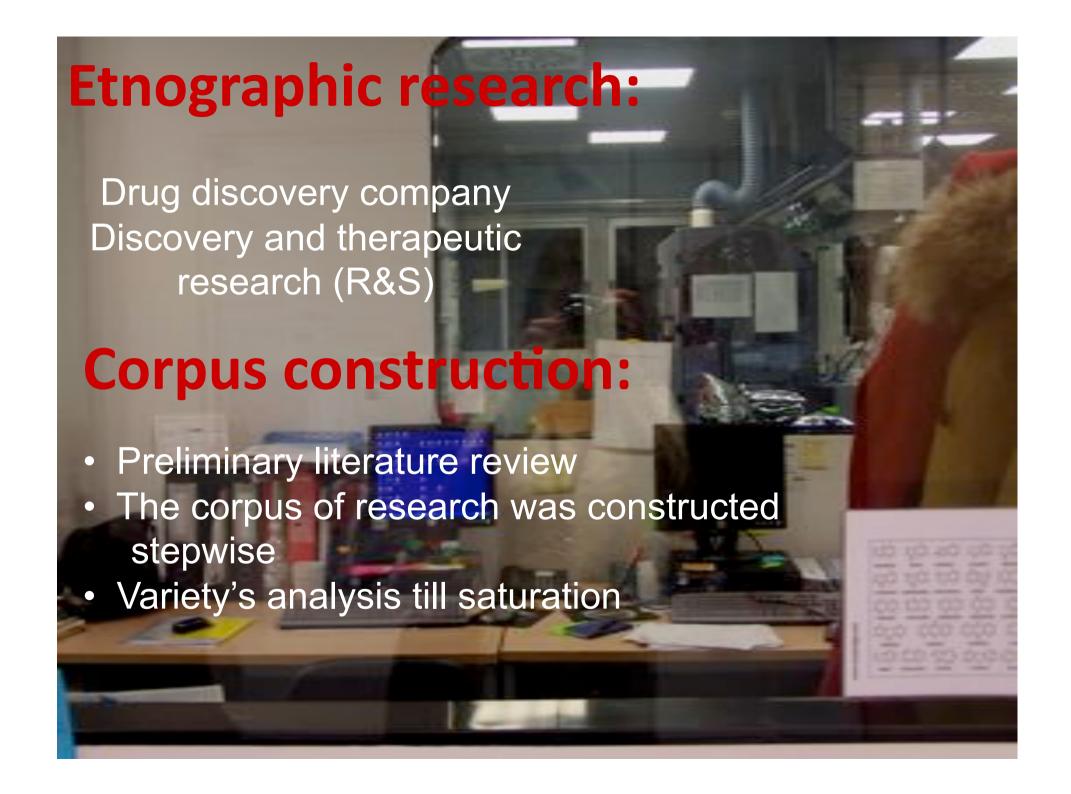The organization of science changes:

- Disclosure and confidentiality

- Intellectual property

- Transformations of the role and functions of pubblications

- Reordered goals of scientific research

- The human subjects

- Science in the public sphere

USA '80: companies

The Construction of Biotechnological Knowledge
is strictly shaped by social and economic needs

PUBLIC FOUNDED RESEARCH	PRIVAT FOUNDED RESEARCH
Free	Oriented
Low press on timing	Hight press on timing
Generally monodisciplinar approach	Multidisciplinar approach
Lower need of communication	Highter need of communication
Peculiar identity	Peculiar Identity

Etnographic research:

Drug discovery company
Discovery and therapeutic
research (R&S)

Corpus construction:

- Preliminary literature review
- The corpus of research was constructed stepwise
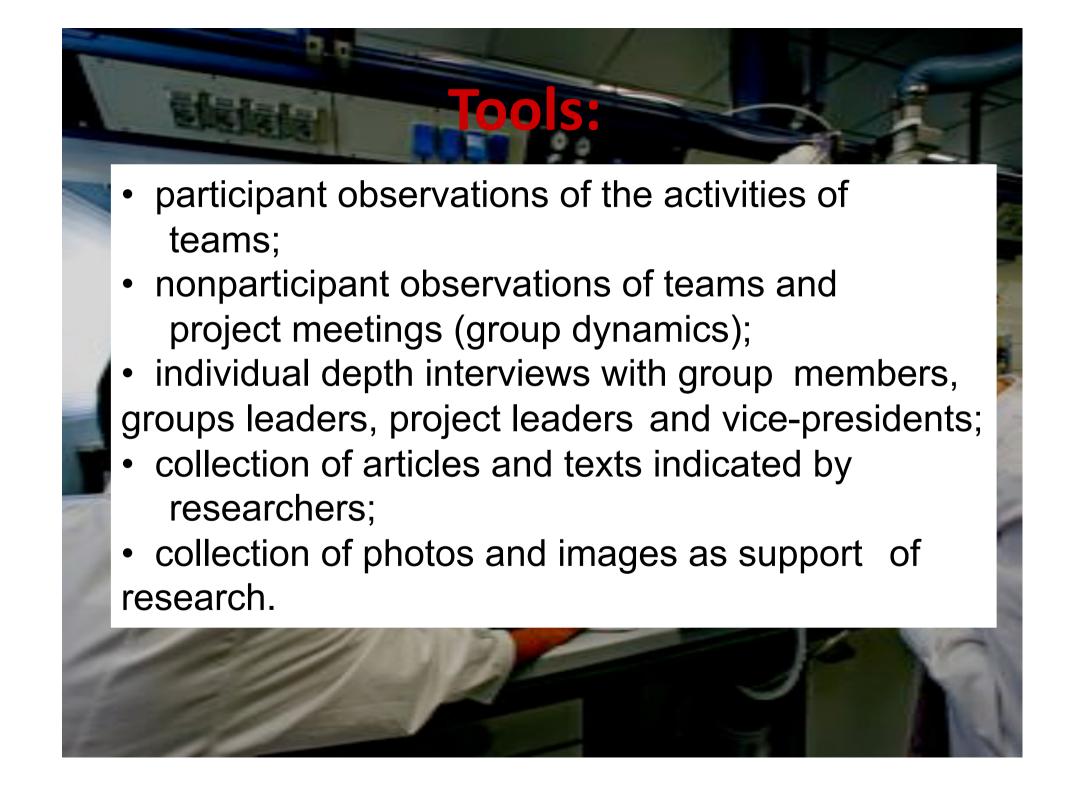- Variety's analysis till saturation

Goal: understanding in depth, using epistemological tools

- The characteristics of the construction processes related to scientific knowledge in a private funded scientific laboratory, in order to understand how society comes into biotechnological knowledge and influences its construction;

- The increasingly important role of communication, visualisation and technology in the construction of biotechnological knowledge.
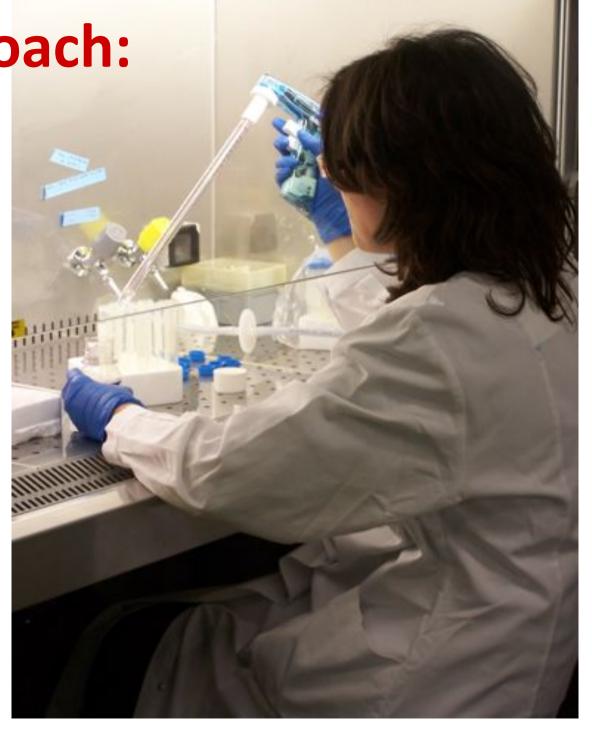
Tools:

- participant observations of the activities of teams;
- nonparticipant observations of teams and project meetings (group dynamics);
- individual depth interviews with group members, groups leaders, project leaders and vice-presidents;
- collection of articles and texts indicated by researchers;
- collection of photos and images as support of research.

Analytic Approach:

Classical Content Analysis

Bauer, M., Gaskell, G.

It reduces the complexity of a collection of texts crossing them with a declared theoretical frame. It permits to make valid inferences from data to their context.

Collected data:

- More then 20 hours of interviews
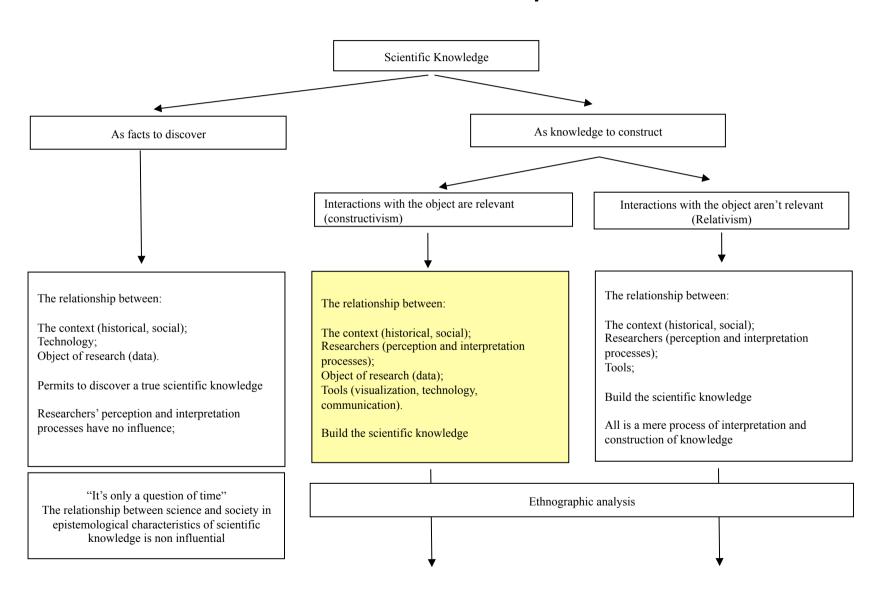- 390 images and photos
- 75 articles and texts

A total of 724 primary documents
(Atlas-TI)

Coding frame construction

Step 1. To derive main categories from data.
The preliminar analysis of the material showed the importance of some cognitive processes involved in the practices of research, an important role played by tools like visualization, the processes of communication between scientists, influences of society and so on…

Step 2. Declare the theoretical/epistemological context used for data analysis

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┌─────────────────────────┐
│   Scientific Knowledge  │
└─────────────────────────┘
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Scientific Knowledge

As facts to discover

As knowledge to construct

Interactions with the object are relevant (constructivism)

Interactions with the object aren't relevant (Relativism)

The relationship between:

The context (historical, social);
Technology;
Object of research (data).

Permits to discover a true scientific knowledge

Researchers' perception and interpretation processes have no influence;

The relationship between:

The context (historical, social);
Researchers (perception and interpretation processes);
Object of research (data);
Tools (visualization, technology, communication).

Build the scientific knowledge

The relationship between:

The context (historical, social);
Researchers (perception and interpretation processes);
Tools;

Build the scientific knowledge

All is a mere process of interpretation and construction of knowledge

"It's only a question of time"
The relationship between science and society in epistemological characteristics of scientific knowledge is non influential

Ethnographic analysis

Ininfluential	**Influential**
in epistemological characteristics	in epistemological characteristics
of scientific knowledge	of scientific knowledge

■

Historical analysis of:
Social context's develop
Subject's development (biology)

Different kinds of science and type of research

Type of Research
Processes involved
Economics factors
Social factors
Political factors

Ethnographic analysis

Step 3. To create a coding frame uniting steps 1 and 2 and identifying codes needed to analyse the corpus.

Formal categories

Patterns of the Construction Process	V1 Perception	V2 Idea	V3 Sensing	V4 Experience
V5 Interpretation	V6 Sharing	V7 Scientific Knowledge		
Visualization	V8 data	V9 Representation	V10 Selection	V11 handling
V12 Communication				
Technology	V13 Perception	V14 Interpretation	V15 knowledge	V16 Communication
Communication	V17 Networking	V18 Language	V19 Knowledge sharing	V20 Controll
Society's direct influence on knowledge	V21 oriented	V22 speed	V23 selection	V24 Scientific community
V25 Knowledge construction				
Society's indirect influence	V26 economic	V27 context	V28 scientist's identity	

Cognitive patterns

Tools

Social factors

Tabella 2 Coding sheet elaborato per la content analysis dei dati raccolti.

Computer assisted analysis (CAA)

CAA permits the analysis of lots of data, textual and visual data together.
It makes the research process more systematic and explicit, more trasparent and rigorous.

Every method used, also CAA, influences research results.
The researcher must be aware of that when he/she chooses the method to use. It must be the most as adaptable as possible to the aim of the research.

Atlas-TI software was choosen because it is the best one to analyze visual and textual data together

Computer assisted analysis (CAA)
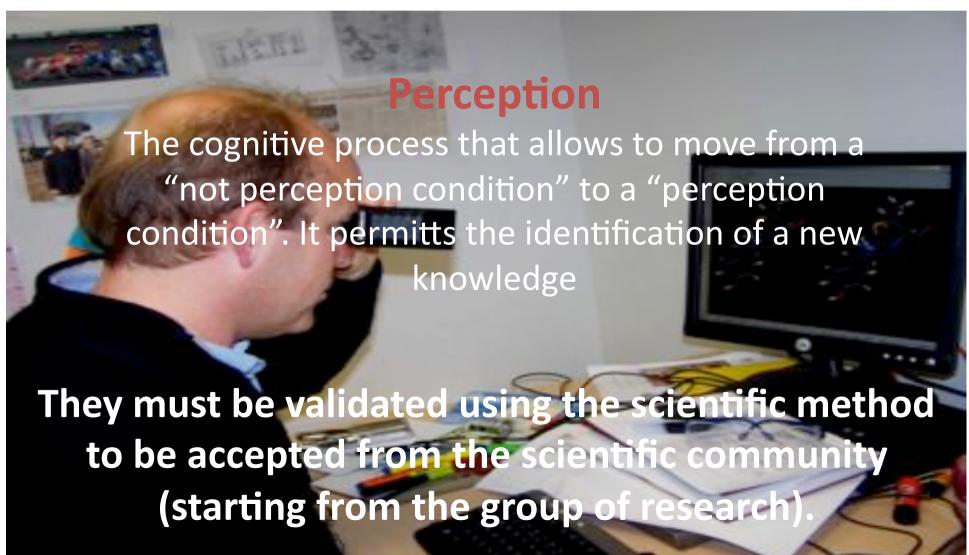
the ethnograph
nud*ist
atlas-ti
n-vivo
Paject
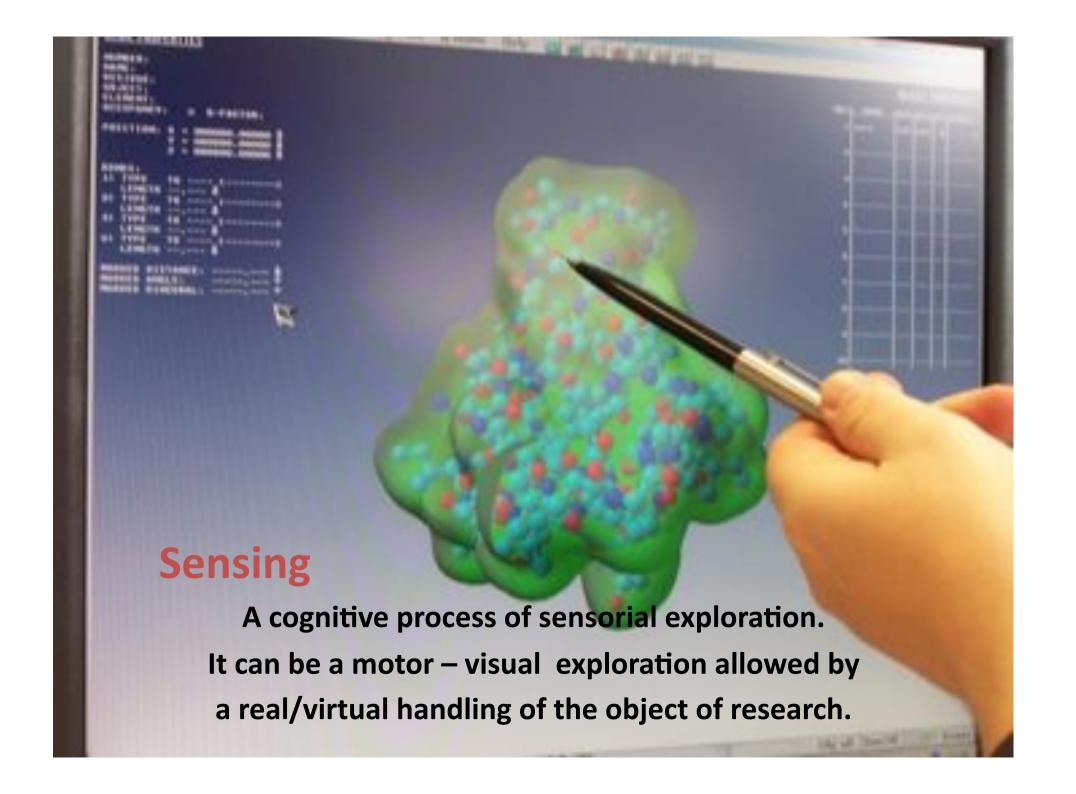
It permits:

- To discover differences, commonalities and relations between text segments

- To develop typologies and theories

- To examine hypotesis

- To identify patterns and develop categories
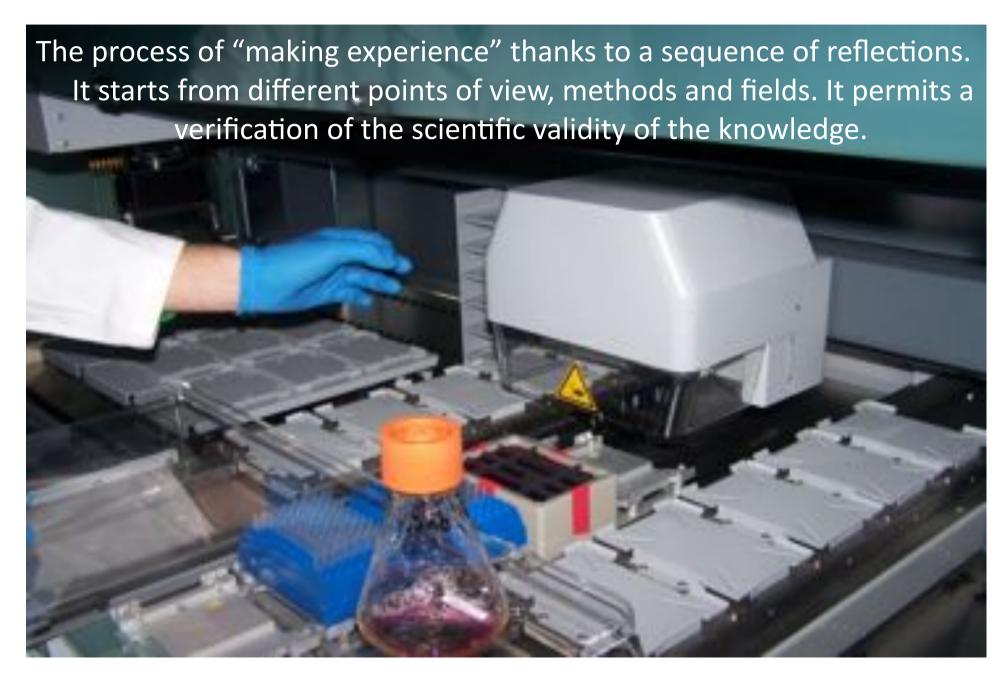
Idea

The cognitive process that makes possible to emerge a theoretical hypothesis not directly related to a perceived data.
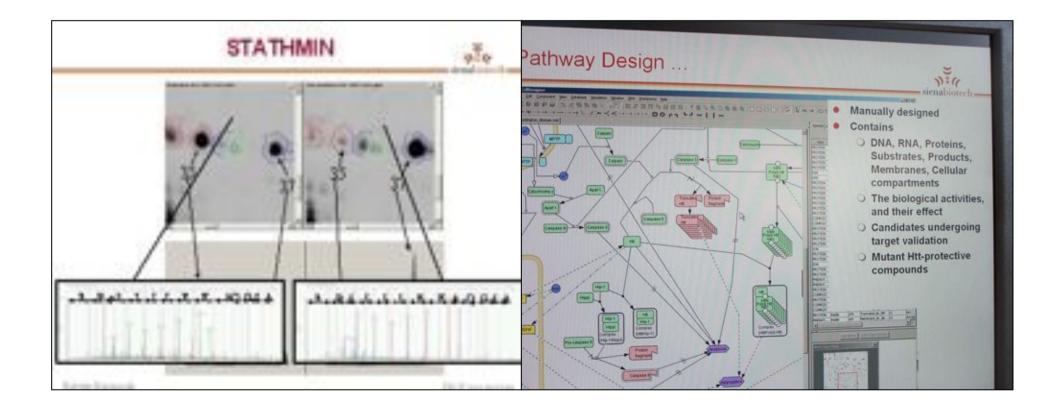

Perception

The cognitive process that allows to move from a "not perception condition" to a "perception condition". It permitts the identification of a new knowledge

They must be validated using the scientific method to be accepted from the scientific community (starting from the group of research).

Sensing

A cognitive process of sensorial exploration.

It can be a motor – visual exploration allowed by

a real/virtual handling of the object of research.

Experience

The process of "making experience" thanks to a sequence of reflections. It starts from different points of view, methods and fields. It permits a verification of the scientific validity of the knowledge.

Interpretation

The cognitive process that enables the creation of knowledge by connecting datas. It allows the construction of representations of data and processes on the bases of their interpretative frames.
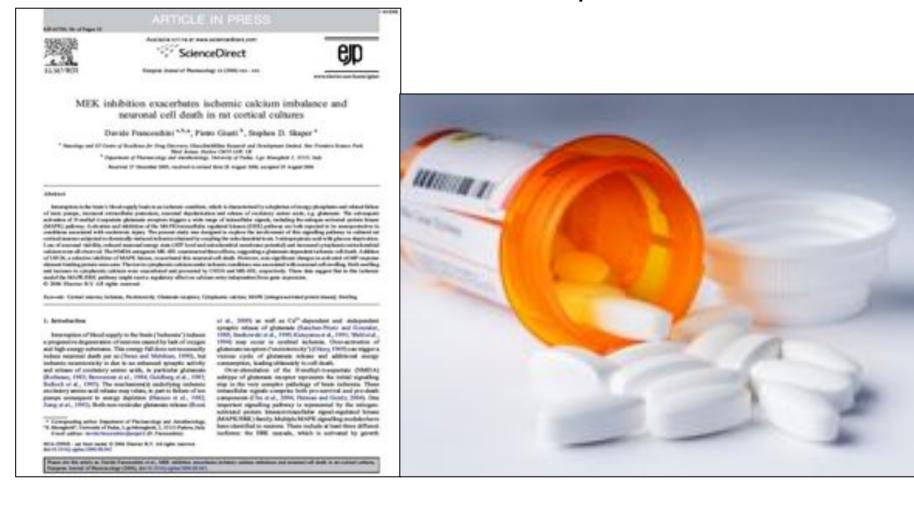
Sharing
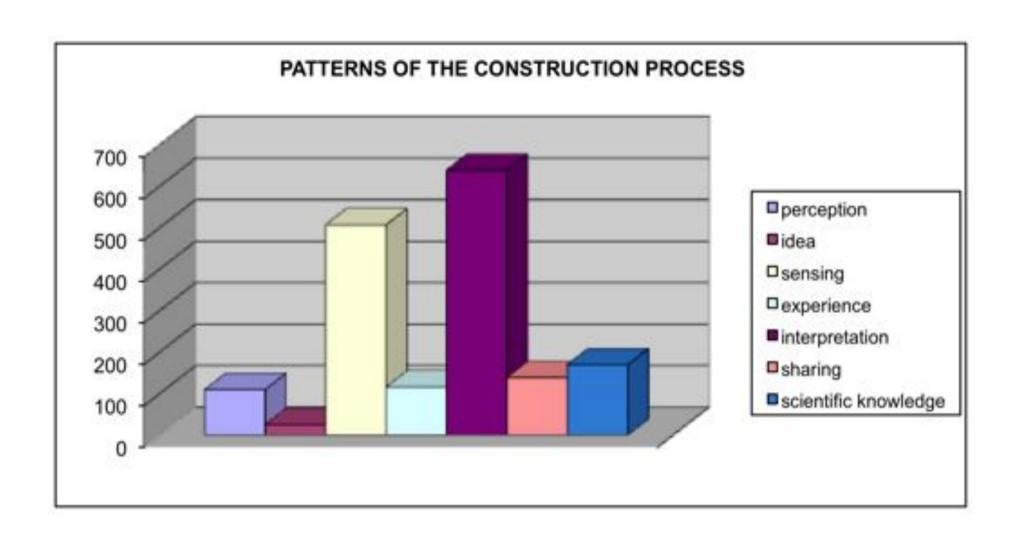
The process of sharing and communicating data and knowledge. It can involve only the company scientists or a larger scientific community (other research centers)

Biotechnological knowledge

Enacted product that emerges from the interaction between scientist and the object of research, shared by the community of researcher that work on the project and approved by the scientific community
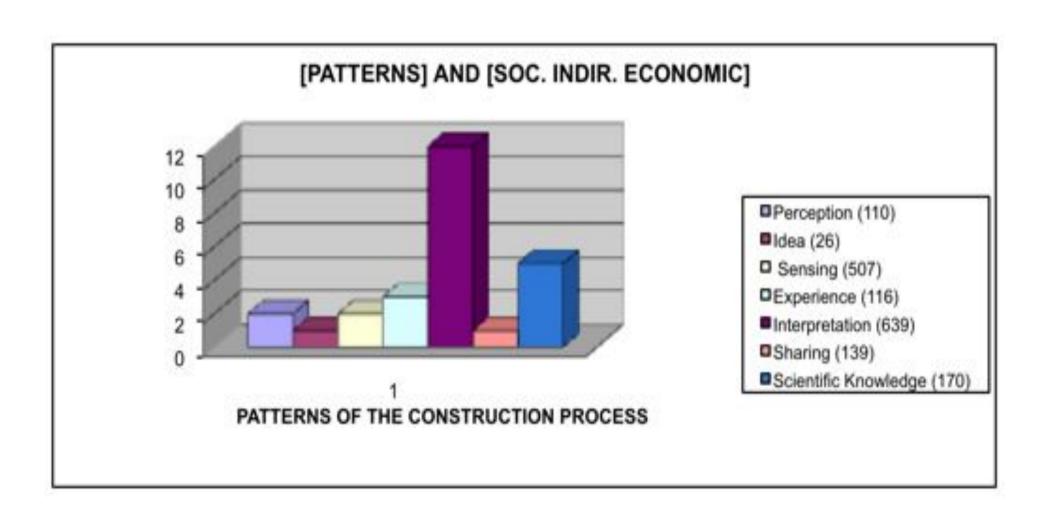
PATTERNS OF THE CONSTRUCTION PROCESS

Legend:
- perception
- idea
- sensing
- experience
- interpretation
- sharing
- scientific knowledge

Formal categories
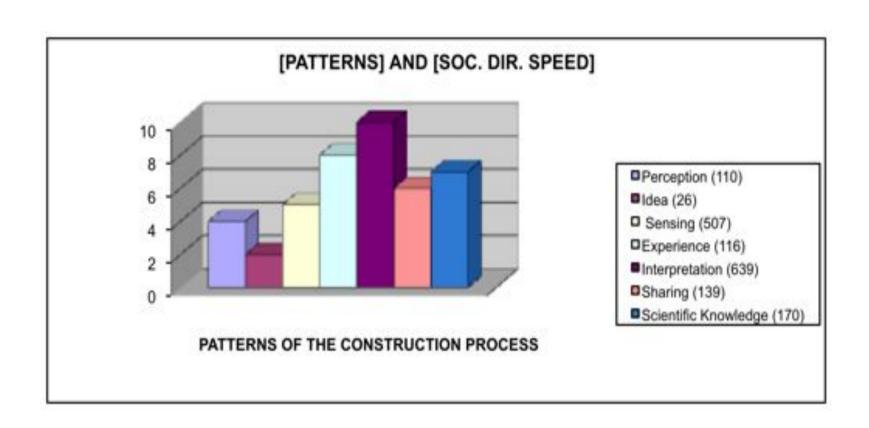
Patterns of the Construction Process	V1 Perception	V2 Idea	V3 Sensing	V4 Experience
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V25 Knowledge construction				
Society's indirect influence	V26 economic	V27 context	V28 scientist's identity	

Tabella 2 Coding sheet elaborato per la content analysis dei dati raccolti.

Cognitive patterns

Tools

Social factors

Influence of Economics factors
on SK construction
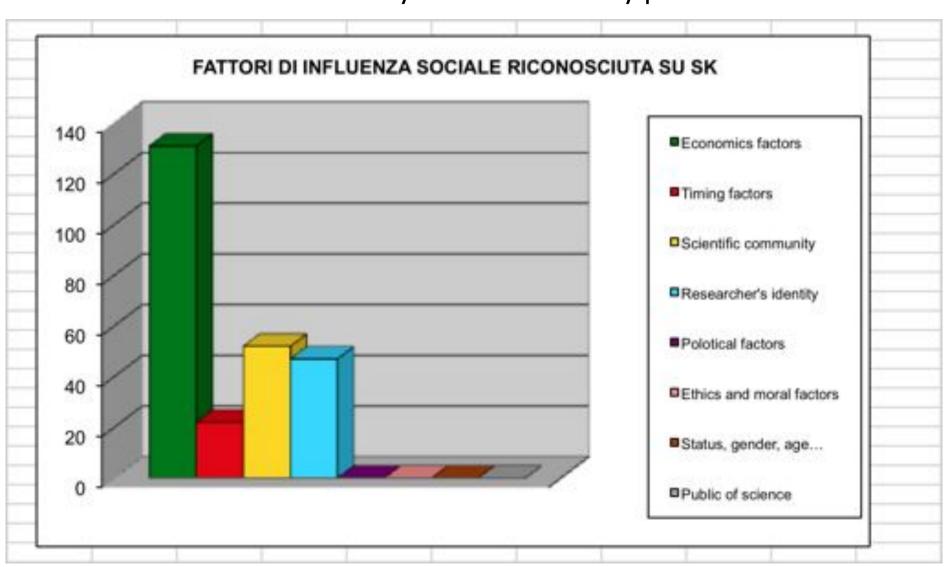
Influence of "Speed" (required by company to ultimate a project of research) on SK construction
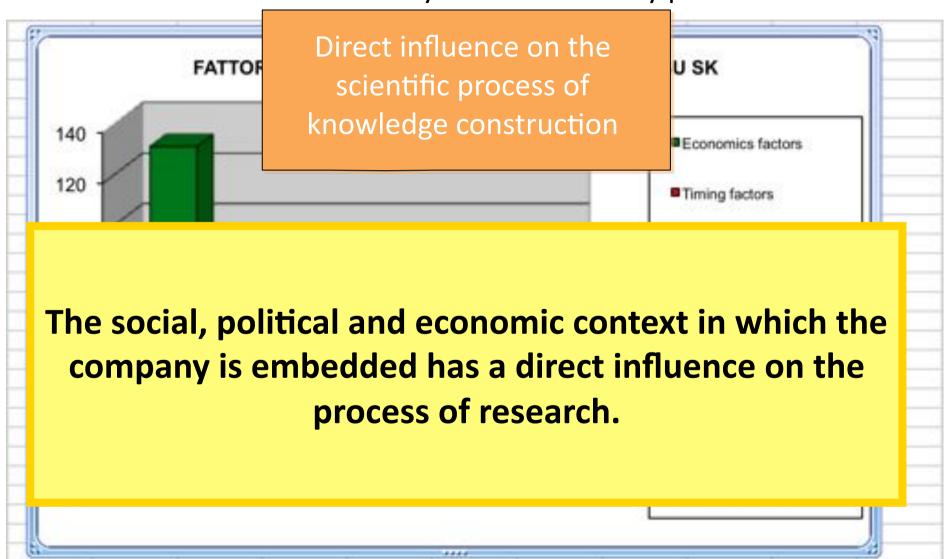
Social aspects that influence the process of research
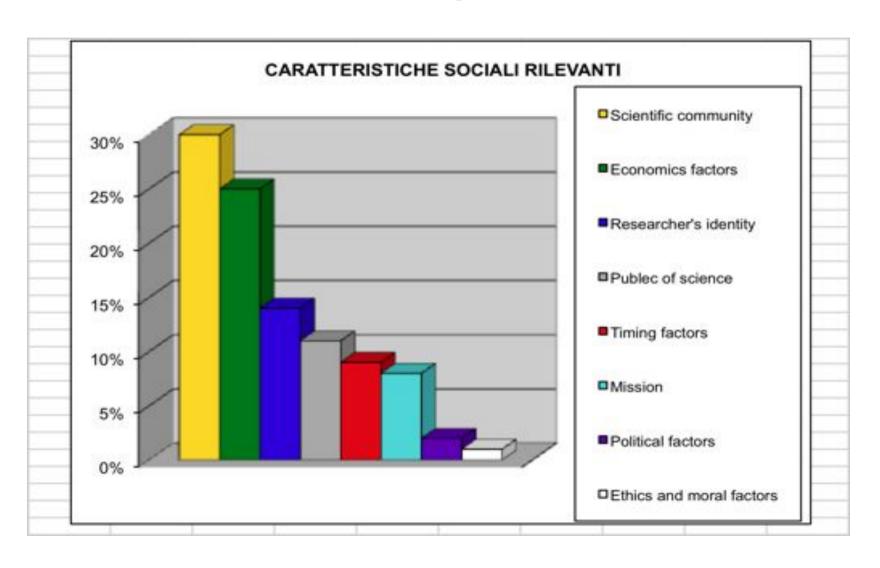
The role of society in the laboratory practices

Social aspects that influence the process of research

The role of society in the laboratory practices

Direct influence on the scientific process of knowledge construction

The social, political and economic context in which the company is embedded has a direct influence on the process of research.

Which social representation of society has a company resercher?

Relevant social factors starting from their narrations…

Content areas:

1. Researcher's Identity;

2. The company;

Mission, economics and timing factors;

3. The government

4. Publics of science

Scientific community and public of science

These factors are tightly interconnected each other

Researcher's identity: psychological traits

"doing research is a costant test of your <u>stubborness</u> in achieving your goal"

"Surely there are failures in your ideas, in your experiments<u>, that can depend on your character,</u> for example if you are inclined to belive in what you do or not.. "

" <u>enthusiasm</u> is a considerable part of what you want to do, if you do not arouse enthusiasm in what you do it will be very difficult to arrive somewhere"

"working with enthusiasm means to focus on your particular object of research and go on until you "break the wall and move forward" or you are really sure that you can't do anything else more"

Researcher's identity: motivations

"we need that <u>inventivenes</u> that maybe happens only one time in a life. […] I think that many inventions and discoveries are <u>guided by a sacred inner fire</u> that bring you to studying problems you plan for yourself"

"discovery is copletly linked to <u>a very important investment</u> made by people that belong the project team, if they aren't <u>super-involved,</u> it doesn't work, because it is very complex, you can't face complexity distantly, you can't, <u>you must invest yourself,</u> you must do it"

"it continues to remain in your head, in some way or other , <u>in your subconscious</u> you continue to put on trial the work you did during the day… Otherwise not all the things you see make sense immediatly and… <u>your brain make it autonomously.</u>. In some way or other there's something that however work… It is like <u>an obsession,</u> eh! That was, it was a completely obsession for me.."

Professional identity

"There are different kinds of reserchers, like different kind of people: some of them love a focused research, here we work with time lines, mile stones, we can't lose too much time in explorations. Sure, some exploration is necessary during all kind of the research, but borders are different.
How scientists live it? Someone want to go from A to B as soon as possible, it is the nature of people, others love a more exploratory approach"

"When an accademic researcher comes and start working in a company laboratory often lives a couple of years of crisis, becouse he want to make science, he wishes to explore all scientific space, but all that our kind of research need is only a small part of it and everything else must be leaved."

Marked identity:
Strong professional peculiarity, total involvement

Paul Serusier 1888

Society

Company 42%

mission 8%

Economic factors 25%

Public of science 13%

Ethic-moral factors 2%

Goverment 2%
Political factors

Scientific community 30%

Patients 11%

Time factors 9%

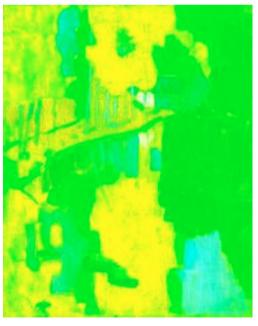# Company:

Mission and identity

"Now <u>we have a very important role</u> because on the one hand there are the accademic researcher that have discovered the active molecule for cancer, on the other hand there are clinical and neuroncological scientists that want to fine a treatment for cancer. There's an enormous gap between them. Both don't know how to translate this knowledge in a treatment.This is the reason <u>why we are of utmost importance: to do this translation.</u>"

"When researchers understand that research in company <u>works in a different way</u> there are two possibilities [...] If I was a researcher and I understand what kind of research I want to do, I took a decision and I went where research is like this. To continue is a nonsense becouse, at the end of all, <u>system is bigger then a single researcher.</u>"

New processes of SK construction

"We must do a lot of training because there isn't a degree in metabolism. <u>There isn't a university in the world</u> that offers curricula in toxicology or metabolism... You can attend a degree in industrial chemistry, <u>but it's not enough.</u> You have to learn these subject here, in the company. There isn't another way"

<u>"Till you haven't proved that the new compound makes something in the patient, you don't know anything.</u> You can make fantastic theories, but you don't know anything, because this isn't a research institute."

From the knowledge to the product

"But what do companies have to do? They must sell something. And to sell something is needed to think to <u>the compound not as a reseanch instrument but as a potential product to sell.</u>"

Economic factors:

Survival career…

"Our survival depends from the possibility to sell the compound as soon as possible"

Research without business can't exist

"Then the XXX foundation wants that we do research on rare diseases, and it is strange, because this means to do research without business…"

Economic factors:

Bearer of economic responsabilities

"Make a mistake here, means lose a mount, two mounts. Make a mistake there means lose years and dozen of thousands euros. <u>Our unique responsability is towards shareholders"</u>

Without the "luxury" of scientific responsability

"We can't discover all that there is to discover, but university can do all that it wants. Not only 'can do' but 'must do it' and <u>it has the responsability to discover and understand all. We haven't any responsability."</u>

The government

The big absent

"There wouldn't be companies [...] if there wasn't profit. The only alternative would be that young people of the whole world do it, but it is a model that doesn't work.

Governments haven't duties and don't feel like doing it, the global system isn't based on industrial production on public bases. The only exception has been the Soviet Union, but it didn't work."

Scientific communities

Segmentation of public of experts:

- Specialists in the same field

- Specialists in different fields

- academic researchers,
- company researcher,
- clinical reserchers,
- regolatory agency(FDA),
- commercial agency...

Competitive scenary to controll

"you must be sure to have a clear wiew on the <u>competitive scenary</u> before starting a project: who work in this sphere, in which phase are they, how promising their compounds are, how much they are similar to ours, how much they are different. Otherwise you reinvent the cold water!

You can't make research closed off in your laboratory while in another part of the world there is someone else that make researches in the same field and maybe he is three months ahead of you! You must know it, so you can understand, from scientific papers and congresses, who investigates on what"

Public of science

Ethic and moral factors: man as an aim or as a means?

"Obviously we can't use man as a laboratory animal, mainly for ethical justification, it's clear. An interesting alternative could be the use of apes…"

" and here we are in front of a series of interesting questions. For example: is it true that we are making money on people pains, or it isn't? "

Public of science

Patients: victims or power holders?

"The alzheimer's patient that reads the news calls and asks: 'can I come there for the treatment?' And the source of that news is an accademic researcher who pubblished on Science or Nature... But starting from the discover till a clinical application it passes over 15 years with a 1% of success percentage... So, <u>What can I say him?</u>

"The 12% of compounds fail becouse <u>people decide it isn't interesting</u> The market is not interested. The first compound that arrive to the market doesn't necessarily win the battle".

Conflicts and embarassing answers... The researcher takes a reserved attitude

Public of science

Safety mission or make money with people pains?

"People must understand that our focal point is the patient: <u>he can't wait</u> and this is the reason why our research must be focused"

"Yes, <u>we are making money with people pains,</u> it is true. To work in a pharmaceutical company you have accept that you are paid becouse of other people's pains"

Conflict between declared aims

Public of science
How to comunicate?

"I tought, but I think it is not an original idea, to try to use some of these images to make some <u>picture...</u>"

"Science must be communicate <u>using simple and objectice concepts</u> and trying to <u>spread a true message</u>"

"It should be done a study about journalists and their relationship with scientific news.The news are distorted to cause sensation or becouse it is perceived in that way. Therefore there is <u>intention with design</u> to cause sensation by the journalist or he <u>is not able</u> to understand what the scientist has explained".

Discrepancy between scientific realism and the actual immersion of scientists in society

Summarizing...

There is an ambivalent representation of the role that society has in relation to scientists' identity:

- On the one hand society is represented as bearer of questions and researchers try to answer making a scientific prodoct;
- On the other hand researchers represent public using a "deficit model" and they think it is incompetent and passive in their relation with scientific knowledge.
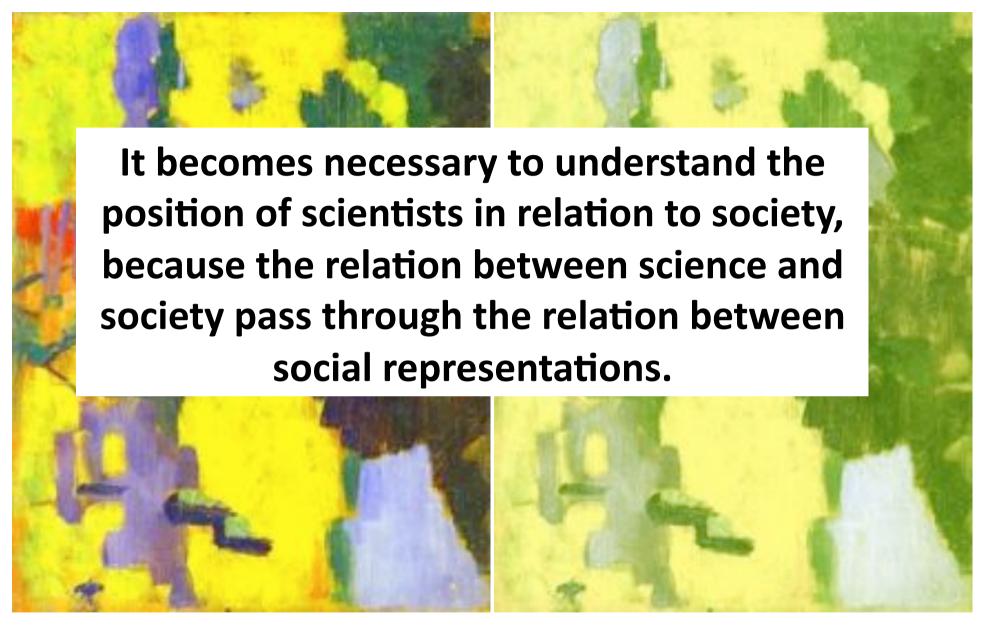
The problem of scientific journalists:
Their representation swings between misunderstanding and aware distortion to cause sensation
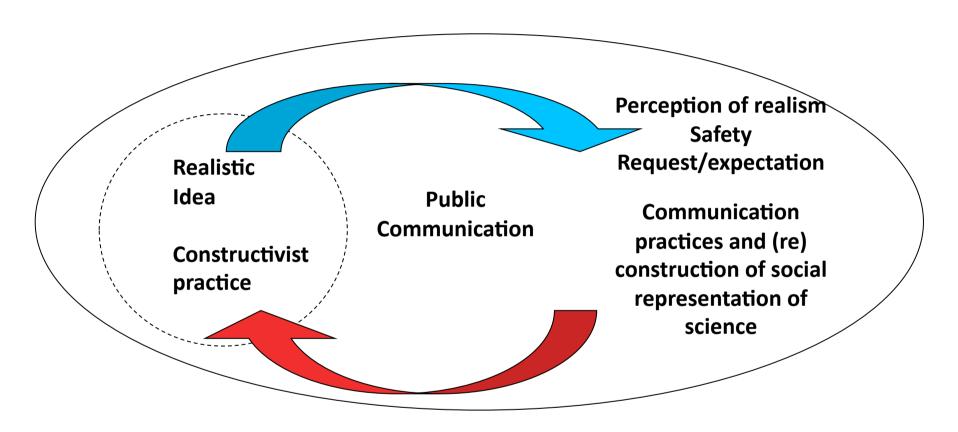
The original paint

What scientists perceive
of society

It becomes necessary to understand the position of scientists in relation to society, because the relation between science and society pass through the relation between social representations.

The original paint

What scientists perceive of society

Where is the dialog?

Realistic Idea

Constructivist practice

Public Communication

Perception of realism
Safety
Request/expectation

Communication practices and (re)construction of social representation of science

An epistemological problem:

Pluralism and conflict of implicit paradigms
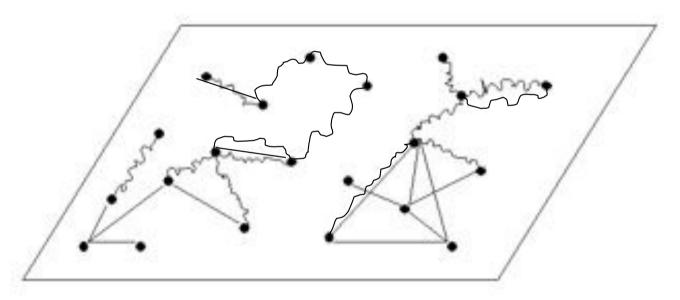
Thank you for your attention!

Dott.ssa Eloisa Cianci
University of Bergamo

eloisa.cianci@unibg.it

The network of knowledge

Every knot is linked to others by different kinds of logical connections. So there are different kind of knowledge, depending on the qualitative differences of connections (links between knots).

This process permitts the parallel co – existence of different kinds of knowledge.