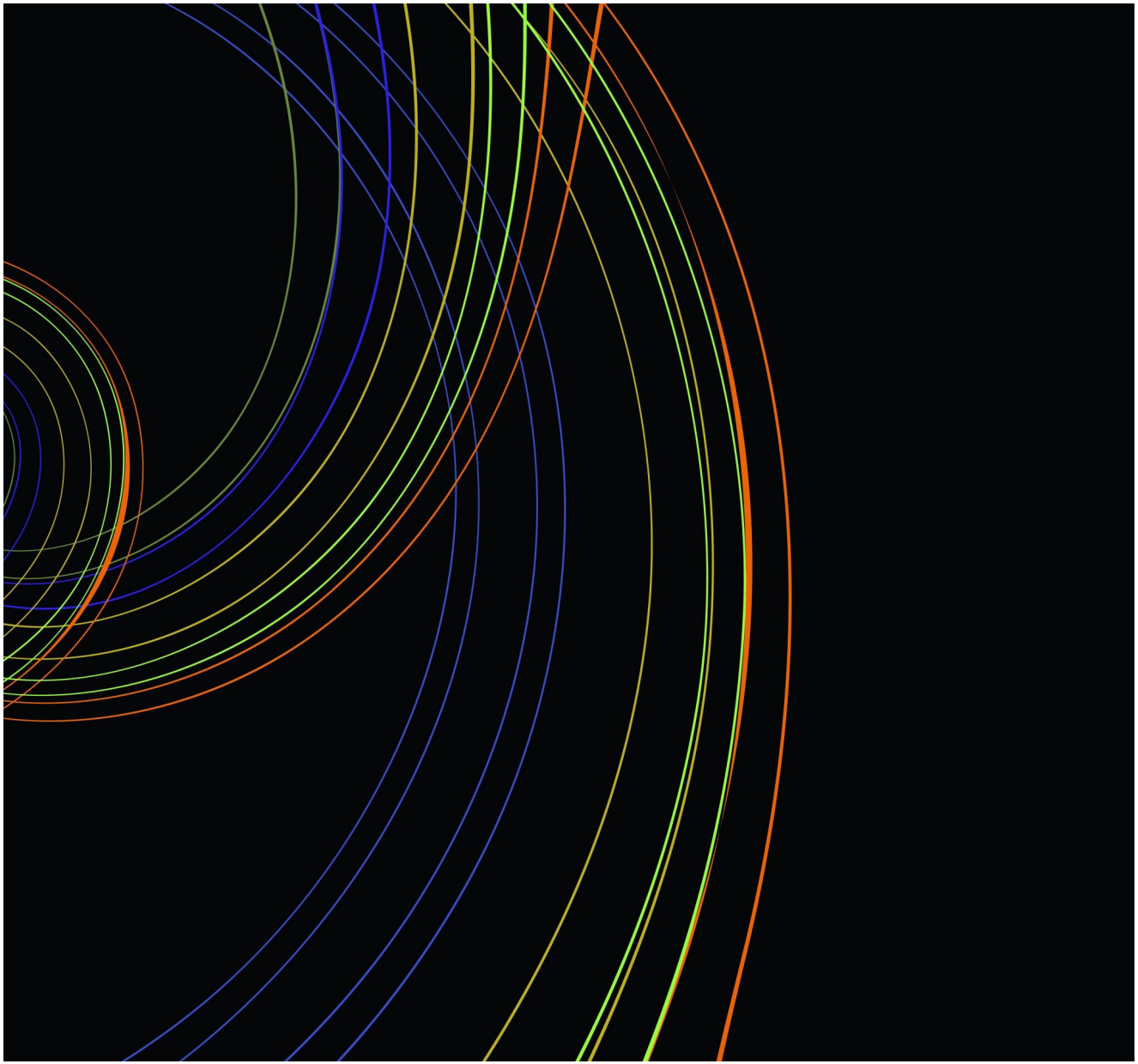


CRACS - 290426

SCIENTIFIC WRITING

STRUCTURAL LEVELS OF LANGUAGE: CURRENT USE IN SCIENTIFIC WRITING

The text and its rhetoric: choice of foundations and argumentative structures, breadth, justification and validity of the text

The lexicon and its meaning: search for precision/neutrality

The iconographic set: maximum selection, clarity, information content, argumentative orientation

The data system: numerical, instrumental, observational; selection, clarity, information content, argumentative orientation

The bibliography: sources, comparison, dialogue, contrast, polemic

FOLLOWING **CURRENT USAGE** IS ESSENTIAL FOR EFFECTIVE COMMUNICATION. DEVIATIONS FROM ESTABLISHED NORMS CARRY GREATER SIGNIFICANCE, ESPECIALLY DEPENDING ON THE AUTHOR'S PROMINENCE WITHIN THEIR COMMUNITY.

LANGUAGE ANALYSIS

textual analysis: arrangement, argumentative hierarchies, coherence and cohesion

intertextual analysis: citations, principle of authority, dialogical structure, affiliation with schools

rhetorical analysis: discourses on method, forms of argumentation, use of metaphor

lexical analysis: truth practices, affiliation with schools, idiosyncratic uses

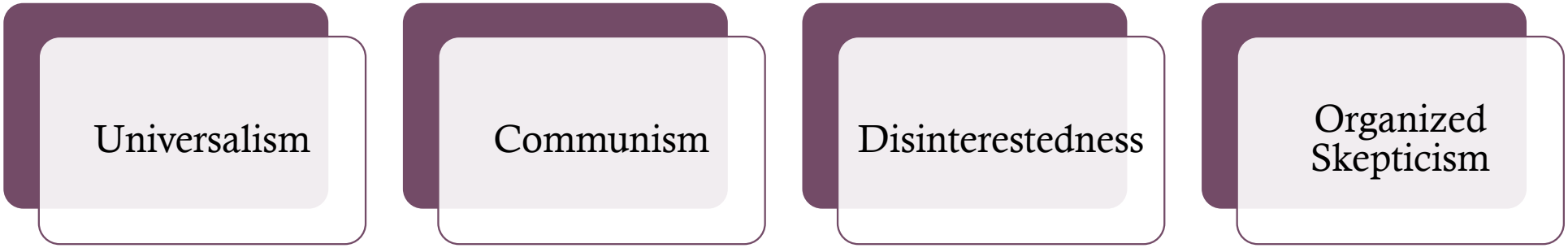
semantic analysis: referential issues, ontological commitment, polysemy, ambiguity

LANGUAGE ANALYSIS: RETHORICAL (METHOD'S DISCOURSE)

- The discussion on the method is the main tool for struggle for dominance and privilege within science, as well as in the broader society.
- **Merton's norms** also have an effect on the lexical, syntactic, and semantic structure of scientific texts.
  - There is a large use of the third person, reflexive, and passive voice.

    The first person is very rarely used (in conflict with communalism and disinterest).
  - At the same time, universalism implies the necessity for anyone to be able to verify or falsify: a complete description, step by step, of both the conceptual steps and the experimental procedures.
  - However, originality requires that abstracts and conclusions highlight contributions.
- The discussion on the method marginalizes researchers who do not have access to the most sophisticated instrumentation, as if the cognitive value of results depended solely on obtaining better or novel instrumental performance.

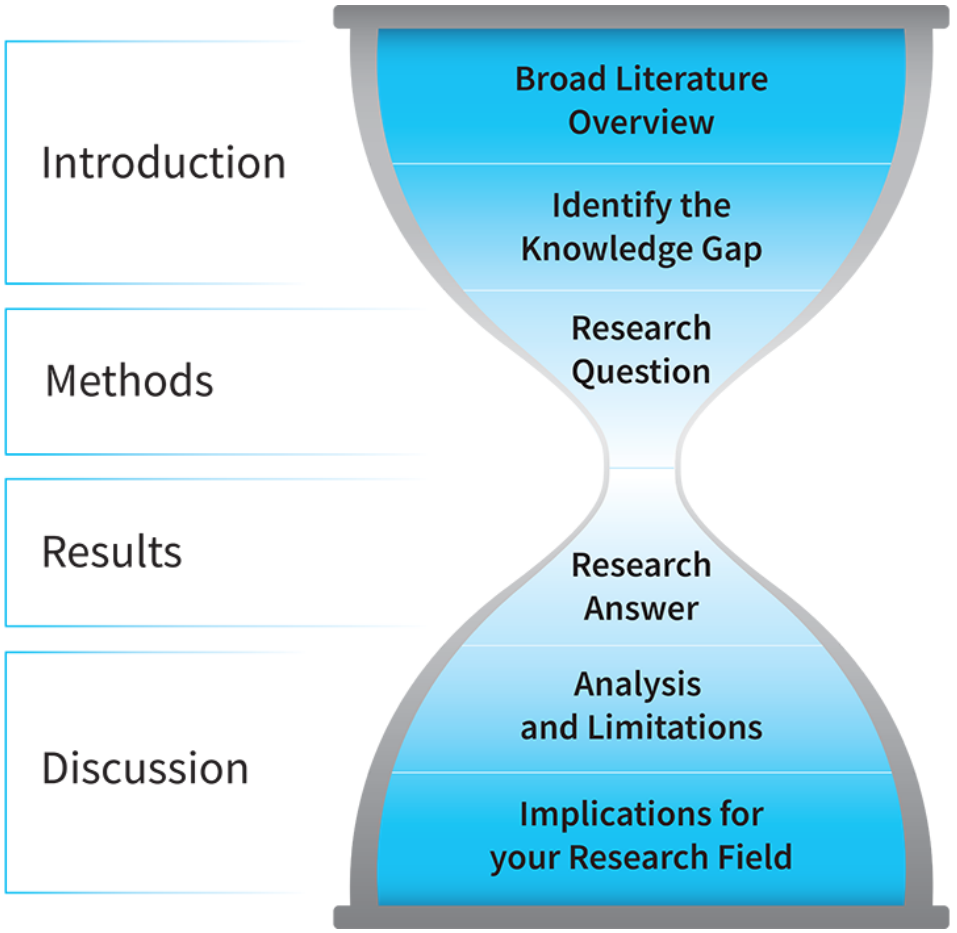
MERTON'S NORMS



LANGUAGE ANALYSIS: TEXTUAL

"The preparation of a scientific paper has almost nothing to do with literary skill. **It is a question of *organization.*"**

(Robert A. Day, *How to Write and Publish a Scientific Paper*)


Introduction
Methods
Results
Discussion
Broad Literature Overview
Identify the Knowledge Gap
Research Question
Research Answer
Analysis and Limitations
Implications for your Research Field

LANGUAGE ANALYSIS: TEXTUAL

Title: direct, short, informative

CONTENT

- The title should clearly and accurately describe the content.
- The reader should be able to decide whether or not to read the report.
- Provide keywords for indexing.

SUGGESTIONS

- Avoid inflated terms ("study of," "an investigation on," etc.
- Avoid jargon and acronyms
- Avoid sensational or evocative titles

OUT OF 1000 READERS

Out of 1000 readers:
1000 read the title
100 read the abstract
100 read the introduction
10 read the body of the paper
.5 read references to related work
.5 read conclusions and further work

MAKE EXAMPLES

DIFFERENT KINDS OF RESEARCH WRITING

Look and compare the examples

DOES A PUBLIC LANGUAGE OF SCIENCE EXIST?

PUBLIC LANGUAGE OF SCIENCE

- The choice of target:
  - Cultured audience -> cultured language
  - General audience -> general profile language
- Cultured language:
  - Use of scientific terms (sometimes even without explaining them – it is assumed that the reader/listener is capable of understanding or implicitly understands the meaning)
  - Use of complex examples and logical abstractions that may be far from common sense
- General profile language:
  - Uses language levels appropriate for the audience it addresses (familiar, educational depending on age, colloquial)
  - Uses few scientific terms, and if it does use them, always explains their meaning
  - Uses many examples close to common sense (but perhaps very distant from scientific sense)

EXAMINE THE FOLLOWING EXAMPLES CLOSELY AND UNCOVER THE DISTINCT WAYS IN WHICH THEY EMPLOY SCIENTIFIC LANGUAGE, AND FIND THE DIFFERENCES HOW THEY USE THE SCIENTIFIC LANGUAGE

Stephen Hawking, *L'universo in un guscio di noce*, Mondadori (2002)

Tutte le particelle hanno una proprieta' chiamata spin, che si potrebbe definire il modo in cui la particella ci appare da direzioni diverse. Possiamo illustrare il concetto con un mazzo di carte da gioco. Prendiamo l'asso di picche: ci appare identico solo se lo giriamo di 360 gradi. Diciamo allora che ha spin 1. La regina di cuori, invece, ha due teste e ci appare quindi identica anche se la giriamo di soli 180 gradi. Diciamo allora che ha spin 2(...) Ma il fatto sorprendente e' che alcune particelle appaiono identiche solo se compiono due rivoluzioni complete. Sono particelle con spin ½. (pag. 52)

Robert Gilmore, *Alice nel paese dei quanti*, Raffaello Cortina Editore (1996)

"Io sono un elettrone", disse la piccola figura. "un elettrone spin-up. Mi puoi distinguere facilmente da quella mia amica li': lei e' un elettrone spin-down e quindi, ovviamente, e' molto diversa." (pag. 7)

Gerhard Staguhun, *Breve storia* dell'atomo, Salani Editore (2002)

Gli elettroni non solo si muovono a velocita' fulminea sulle loro orbite, ma allo stesso tempo ruotano su se stessi, sempre ad altissima velocita' . Gli elettroni hanno un momento di rotazione (in inglese spin), detto anche momento angolare intrinseco. Anche in questo somigliano ai pianeti che orbitano intorno al Sole e ruotano su se stessi. (pag. 55)

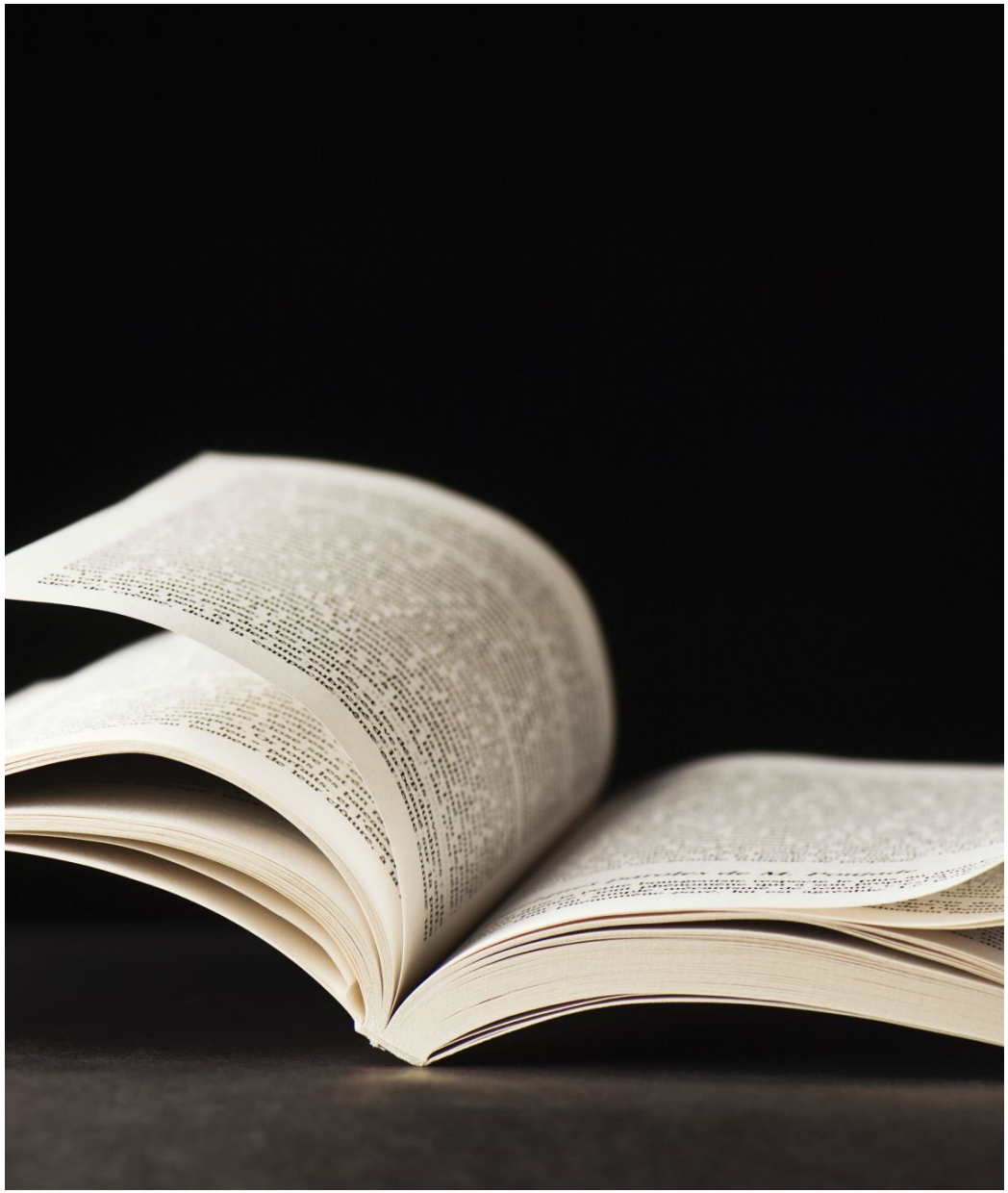
Fabio Pagan, *Dentro l'atomo – parte I*, Frontiere della Scienza a cura di Piero Angela (1983)

L'ipotesi che l'elettrone – fino a quel momento considerato una carica puntiforme – potesse venire equiparato a una particella che ruota su se stessa come una trottola porto' Uhlenbeck e Goudsmith a determinarne il momento angolare di spin, cioe' la velocita' di rotazione attorno al suo asse. Per una serie di considerazioni matemache che qui tralasciamo, lo spin dell'elettrone vale ½. (Naturalmente l'elettrone-trottola non va preso alla lettera, e' soprattutto un'immagine concettuale). (pag. 40)

A JUMBLE OF PUBLIC SCIENCE LANGUAGES THAT EMPLOYS LINGUISTIC TOOLS AND STRATEGIES CHARACTERISTIC OF THE AUTHOR'S STYLE, THE HISTORICAL CONTEXT, AND THE TARGET AUDIENCE IT ADDRESSES (AND IN SOME CASES, THIS IS NOT AT ALL SHARED BY THE SCIENTISTS THEMSELVES WHO DO NOT ACCEPT THE DEPARTURE FROM THE SCIENTIFIC MEANING AND THE UNRESTRAINED PURSUIT OF ALIGNMENT WITH COMMON SENSE).

STRUCTURAL LEVELS OF PUBLIC LANGUAGE OF SCIENCE

- **The text and its rhetoric**: personal choice of argumentative structures, breadth, searching for parameters that justify the content and its importance/relevance, personalization of content (models and narrative techniques borrowed from literature and fiction)
- **The lexicon and its meaning**: use of appropriate terminology only if properly contextualized and explained; use of vocabulary without clarity, simplicity vs. rigor and exhaustiveness
- **The iconographic apparatus**: little selection, rare relevance, seeking special effects and immediately impactful images
- **The data system**: absolutely insignificant because it is incomprehensible
- **The bibliography**: minimal source research, references primarily to already popularized texts



LANGUAGE ANALYSIS

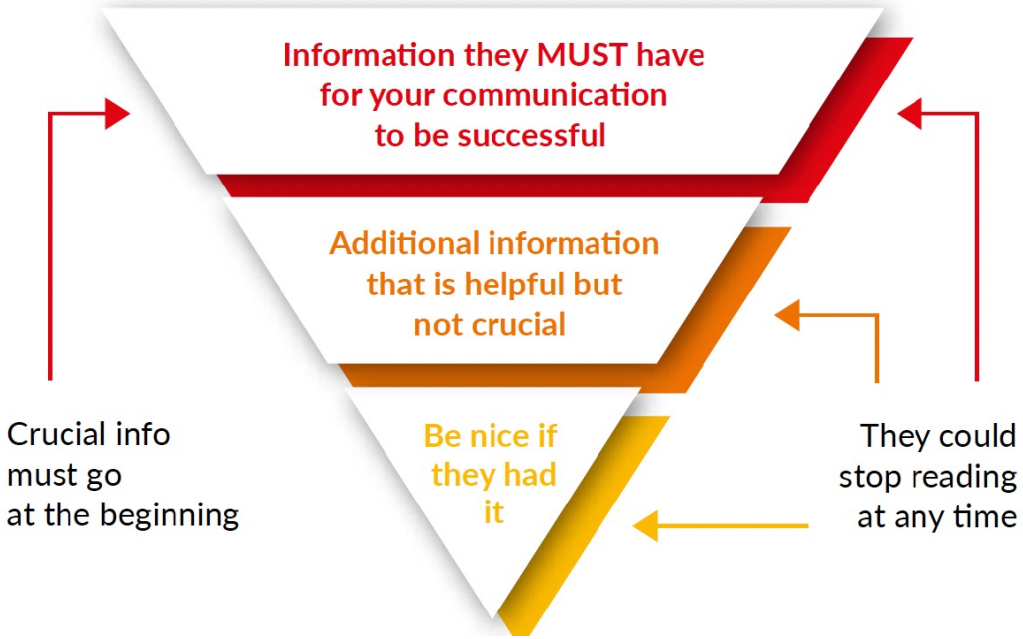
textual analysis: arrangement, argumentative hierarchies

rhetorical analysis: strategies of approach
- Use of the first-person plural
- Use of many interjections, as in spoken discourse
- Use of clear examples, references that belong to the collective imagination

lexical analysis: choices dictated by the type of product (books, magazines, newspapers…)

semantic analysis: ontological commitment, application/technological impact

The inverted pyramid



ATTACK AND HEART

CRUCIAL DETAILS

IMPORTANT DETAILS

LESS IMPORTANT

CAN BE CUT...

IS BEING CUT...

KISS: KEEP IT SHORT AND SIMPLE

MAKE EXAMPLES OF TITLES

EXAMPLES

NO	**Si**
- Cibo per pensare (*bisogna leggere l'occhiello per capire l'argomento)* - Oltre I confini della materia - Nbc: I custodi invisibili della sicurezza - Canguri equilibristi	- L'incubo della bomba sporca - La luce che fa risplendere il passato - Poco mare, molta vita - Diabolik? Lavora al Cnr - Sia fatta la luce

ATTACK: JAW-DROPPING INFORMATION

What
Who
When
Where
Why
How

Osservare ininterrottamente 100.000 stelle per quattro anni. Per scoprire, forse, la presenza di qualche centinaio di pianeti simili la Terra al di fuori del nostro sistema solare. La Nasa pensa che ne valga la pena, e nel dicembre 2001 ha deciso di realizzare il progetto Kepler, nell'ambito del suo programma di piccole missioni scientifiche, il Discovery Program, lo stesso che ha portato la sonda NEAR sull'asteroide Eros e il rover Pathfinder su Marte.

(*Le Scienze* **413**, 50 (2003))

TEXTUAL ANALYSIS

Content: an in-depth look at the five Ws and H

Quotes and citations: interviews with the key players

Boxes and insights: to clarify the terminology and/or to provide more complete and exhaustive information

Conclusion: revisits the introduction, preferably with an impactful statement, usually expressing wishes and hopes

LET'S TRY STARTING FROM:

"CAULIFLOWER FRACTAL FORMS ARISE FROM PERTURBATIONS OF FLORAL GENE NETWORKS"