Academic Profession --- Some Random Thoughts on Teaching and Research

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Three issues, all within the domain of academics.

- Asking questions
  - Science: observation and questioning is intimately related
- Challenges in teaching
- Ethics and Integrity

- Ideally the message is best if subliminal.

Success is what others perceive --- satisfaction is what you feel

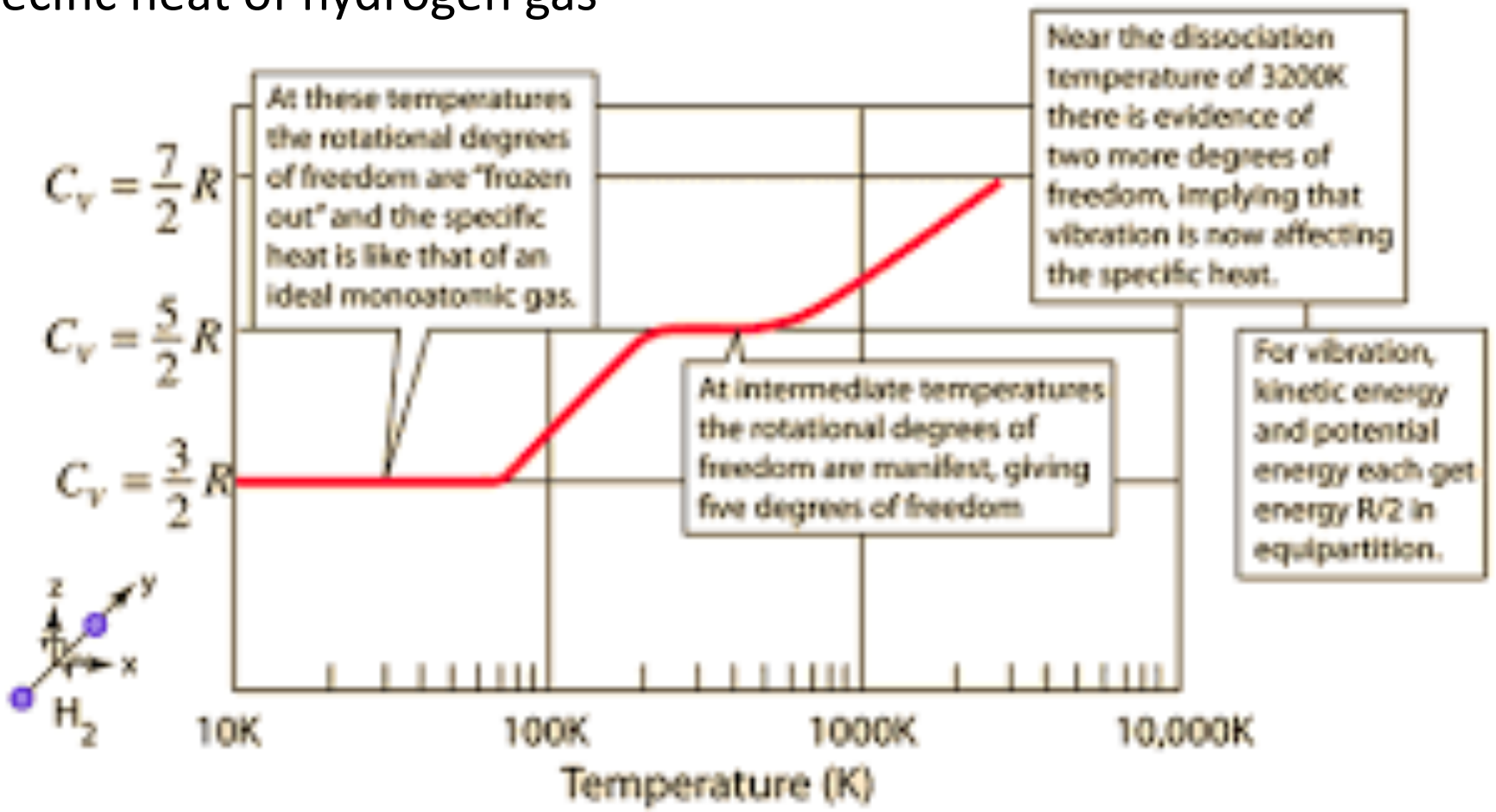
- Academics:
  - Education, learning, studying …..
  - Knowledge:
    - creation through research
    - dissemination through teaching
    - acquiring through reading and listening
  - It is of academic interest --- no practical or useful significance ☺
  - what is of academic interest today, affects the society tomorrow --- technology and everywhere else

- Knowledge

  - Is different from wisdom
  - Is much more than information
  - Is often created using information
  - Information is gathered using our senses
  - Information is raw data
  - In modern times, our senses are replaced by ‘detectors’

  - We observe, and we look for patterns in data
    - Tycho Brahe, Kepler
  - And then create knowledge
    - Newton

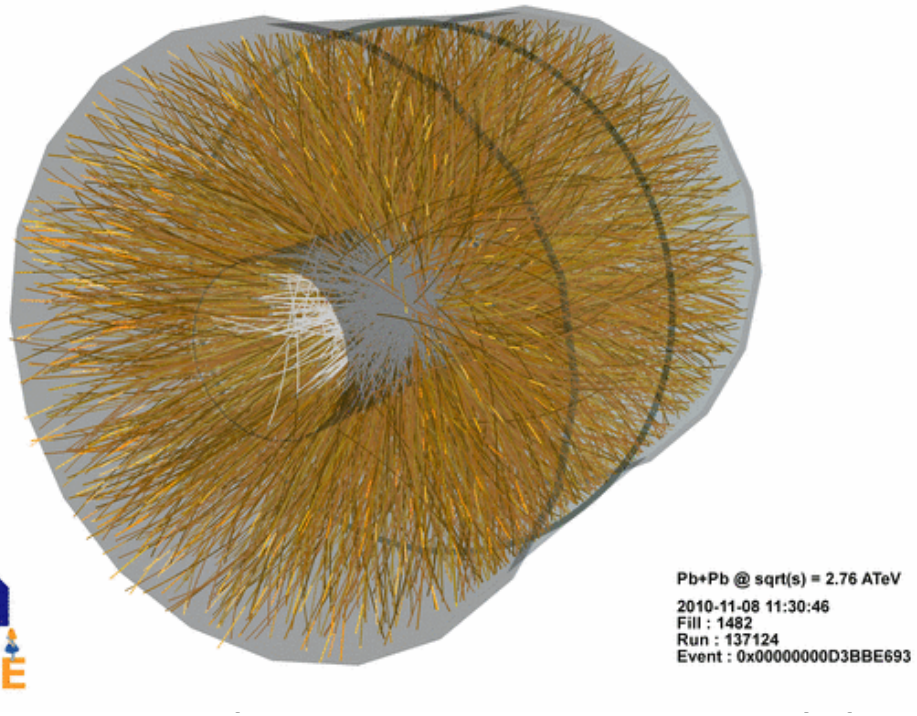
Specific heat of hydrogen gas



Why at 100 K? What / who decides?

Picture taken from: http://hyperphysics.phy-astr.gsu.edu/

- A heavy ion collision event



- Is this [illegible]erns !
- Close your eyes and imagine two heavy ions collide. Ask: what happens, sequentially.
  - If you find answers, you learn more
  - If no answers, you know more problems to solve :-)

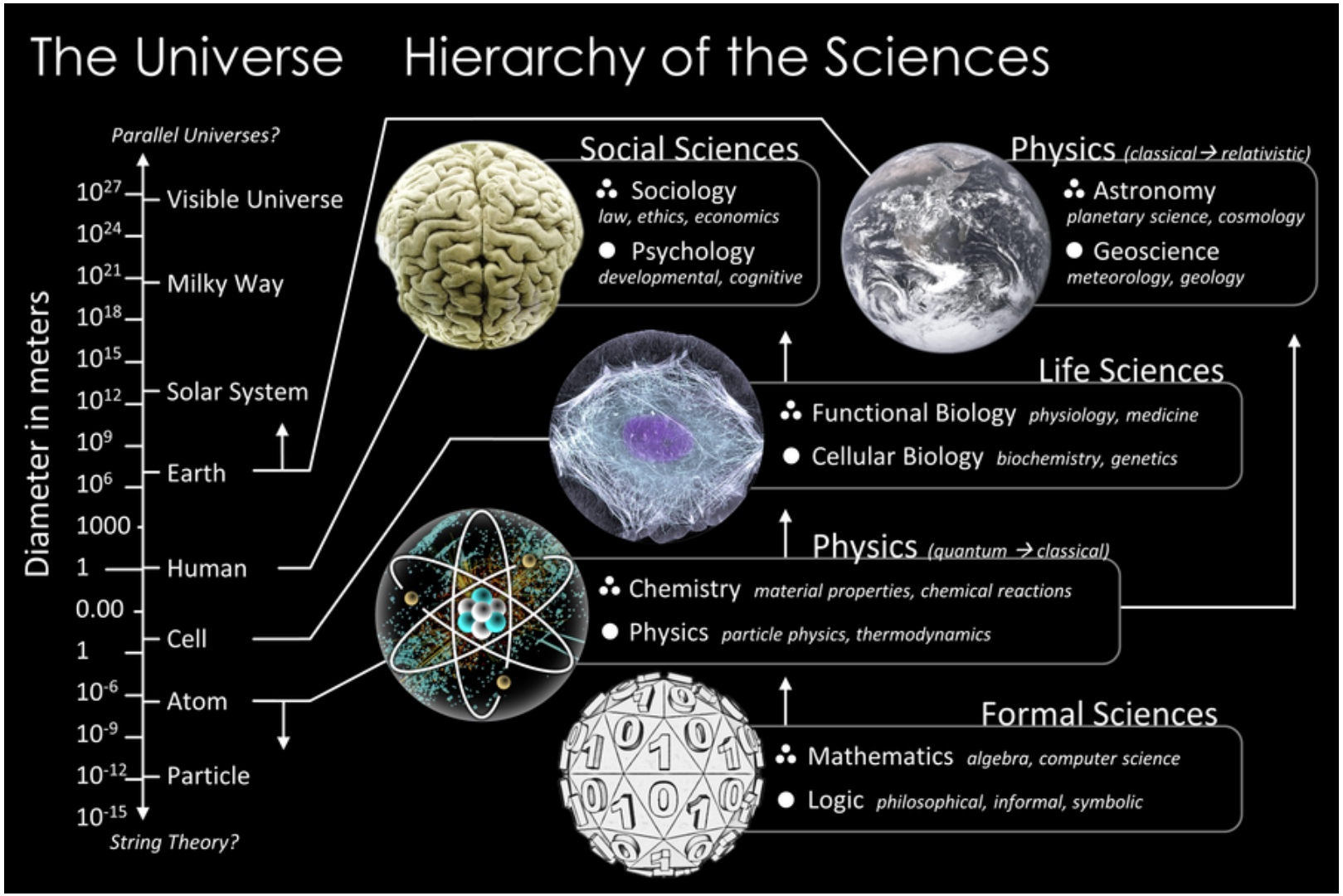
- Another example on pattern recognition:
  - Data on Miss World/Miss Universe
  - 1994 – 2000:
    - 4 Miss world pageants and 2 Miss Universe pageants won by Indian contestants.
    - Why not before or after that (I think one each 1960s and 2017)
  - Is this a chance? Is there a pattern?
  - We learnt something. Predict. Test. Rest.

- Creating knowledge is research
- We never ask “Why create more knowledge?”
  - We want to know
  - We ask questions. What questions?

- Digression:

- Creation of knowledge and information is ‘field’ dependent

- In sciences, length scales as classifiers



Tools and methods change

https://commons.wikimedia.org/wiki/File:The_Scientific_Universe.png

- What questions to ask?
  - While every question is meaningful, not all have answers.
  - Not all have unique answers.
  - Requires wisdom to choose the question

  - Earthshaking….well, nearly:
  - Can we derive the complete internucleon potential starting from QCD? (or the Van der Waals force from electromagnetic interactions)

- Questions:
  - Why 12 months in a year?
    - Sept-ember should be 7th
    - Oct-ober should be 8th
  - Number of days in a week?
  - Why 360 degrees in a circle?

- Some have roots in natural phenomena: number of days in a year.
- Others have roots in history and conventions.

- Our domain knowledge should be multidimensional --- deBroglie's idea of standing waves in an atom to produce quanitisation was 'inspired' by the standing waves in musical instruments.

π --- Amazing

- We know its value up to a billion decimal places

(We know it is irrational, then why?)

- Circle with centre at north pole: will the ratio of circumference to diameter change?
- OK: Euclidean space :-)
- Real space time is curved too !

- What about our number system? Does that need Euclidean space?
- How about $\sum_{k=1}^{\infty} \frac{1}{k^2} = \frac{\pi^2}{6}$

- Other kinds of Importance of π (pi)
  - And an 'e' to make a pie ☺
- Add pi to onion, and make oPInion ☺

- The Teacher:
  - Acquires and creates knowledge
  - Disseminates knowledge
  - Evaluates

- No structured training for teaching (or research) profession.

  We learn ‘on the go’

  by experience,

  by watching others

  by using our intuition

- Challenges ?

- Many Challenges
- Learning to communicate in abstraction
  - 2 pencils + 3 pencils = 5 pencils
  - 2 + 3 = 5

  - Relate abstraction to reality, it becomes beautiful. Many of other lectures have done exactly this.

- Other challenge:
  - The students should learn the process of learning
  - Appreciate the pride in learning
  - And also discover and acquire new knowledge

  All narrows down to ’how much to tell’
- Making question paper --- evaluation is ours

- In reality
  - Every class is a performance
  - It needs a rehearsal
  - It is ego satisfying --- students are watching you, and will take away from what you make available
  - Talks in conferences need rehearsals
  - In the end, looking for patterns, asking questions, communicating in abstraction, and giving a talk becomes an integrated attitude --- a culture.

- Our value system:

  - We yearn for knowledge.
  - We acquire knowledge….we read, we discuss, we talk --- all because we love it, and we get paid for it !
  - A rare profession where people get paid to pursue their hobby.
  - So you close your eyes and let your figment of imagination go wild as you think about evolution of heavy ions…..and you are being paid to do this !

  - “We should count our blessings and live up to them”

    --- source unknown.

- Unlike in other professions, our sense of authority is in the power of reason.
- We are awed (and inspired) by people with knowledge, (not as much by people with wealth).
- What are the indicators for growth?

  - Businessman: his balance sheet
  - Politician and bureaucrats: greater control
  - Film actors: more followers

  - More knowledge, more talks.
  - (Evening talks means past the peak)

- All need to add value !
  - Iron ore, china
  - What is our resource ?

- Add value: increase our knowledge base --- few things give more pleasure than this.
- Understanding happens at different levels --- enjoy it at whatever level. It is OK if you don’t want to go deeper.
- Write !
  - Everyday. It improves the coherence in your thoughts.

- Think !
  - Nothing is as satisfying as understanding the phenomenon underlying the seemingly uncorrelated events.

  - In the famous story of blind men and an elephant --- it is a great challenge to the wise man to make the blind men comprehend what an elephant looks like

- Ethics and Integrity:

Teaching: cite the source

Research:

Data: cite the source and the method

Analysis: cite similar or original analysis

Interpretation: cite similar or original interpretations

Original: outline the method, should be reproducible

Where can we go wrong? Everywhere !

Blatant: Data fabrication, using others' ideas, published or discussed in forum. Read at the MIT website.

Latent: Is data sample biased? Examples in heavy-ion collisions

!

Plagiarism: once inconceivable sin

"The practice of taking someone else's work or ideas and passing them as one's own."--(https://en.oxforddictionaries.com/definition/plagiarism)

Cheating	Student wants credit for academics through better grades	Plagiarist wants credit for academics
Stealing	Thief takes what others have without working for it	Plagiarist takes what others have without working for it
Fraud	Fraudster masquerades to inspire others to trust in his abilities	Plagiarist masquerades to inspire others to trust in his abilities
Corruption	Personal gain at the cost of public property	Personal gain at the cost of academic excellence in institute
Hara-Kiri	Is a ritual where people commit suicide	Thriving (unchecked) plagiarism is also an example how universities commit 'suicide'

Examples:

- https://integrity.mit.edu/handbook/what-plagiarism
- https://integrity.mit.edu/handbook/academic-integrity-mit/what-academic-integrity
- https://integrity.mit.edu/handbook/citing-your-sources/avoiding-plagiarism-cite-your-source

The real test of character happens when I am not being watched.

Competitive spirit is good; no compromise with integrity and ethics. Remember, honesty is a precious virtue.

Compete with the best. Remember, you are the best !

Enjoy !