Research, reading, referencing & evaluation

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Research, reading, referencing & evaluation

The relevance of the lecture?

And what about the tutorial & laboratory?

How does this all fit into my learning and ability to deal with exams?

Assessment literacy?

Research, reading, referencing & evaluation

What should you be reading?

Where would you find these sources?

How would you evaluate the reliability of these sources?

Research, reading, referencing & evaluation

There are a number of different sources that you can use;

- Text book
- Journal article
- Report
- Web site

Your university library will be the place to find these sources. Sometimes you wont even need to go into the library, it can be done online e.g. finding & printing a journal article.

What ever source you use, it is important that you are able to gauge its reliability.

Research, reading, referencing & evaluation

What’s your analysis of the content?

- Read the preface (book) or abstract (article) to determine the author's intentions.
- Is this source too elementary, too technical, too advanced, or just right for your needs
- Is the information fact, opinion, or propaganda
- Does the information appear to be well-researched & evidenced
- Does the work update other sources, substantiate other materials you have read, or add new information

Research, reading, referencing & evaluation

References have two purposes:

(1) to provide the source of information you use
(2) to enable the reader to *find* it.

There are a number of different styles that can be employed. You need to check that you are using the correct style.

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What does all this tell us?

Campbell, N. A., Reece, J. B., Urry, L. A., Cain, M. L., Wasserman, S.A., Minorsky, P. V. and Jackson, R. B. (2008) Biology (8th edition). Published by Pearson Education. ISBN-13: 978-0321536167.

Chapter 6 (A Tour of the Cell) Hillis, D. M., Sadava, D., Heller, H. C. and Price, M. V. (2012) Principles of Life. Published by Sinauer Associates. ISBN-13:978-1429286572.

Camp, PJ, Jones, AC, Neely, RK & Speirs, NM 2002, 'Aggregation of copper(II) tetrasulfonated phthalocyanine in aqueous salt solutions' *The Journal of Physical Chemistry A*, vol 106, no. 44, pp. 10725-10732

Pauling, L., and Corey, R. B., *J. Am. Chem. Soc.*, **72**, 5349 (1950).

Astbury, W. T., and Bell, F. O., *Nature*, **147**, 696 (1941).

N.M. *Speirs*, W.J. Ebenezer and A.C. *Jones* (2002). Observation of a *fluorescent dimer* of a sulfonated phthalocyanine, Photochem. Photobiol 76,247-251.

Research, reading, referencing & evaluation

Where do the references appear?

The dimerization of phthalocyanines (and the closely related porphyrins) and its effects on the UV–Vis absorption spectrum are well documented in the literature (1–10). Dimerization results in a significant blueshift in the Q band region together with some band broadening. That is, the absorption band of the dimer species lies at higher energy than does that of the monomer. This can be explained in terms of exciton coupling between the two monomer chromophores (4,5,11).

Leznoff, C. C., A. B. P. Lever 1989 Phthalocyanines Properties and Applications VCH Publishers, New York

Gouterman, M. 1978 Optical spectra and electronic structure of porphyrins and related rings In The Porphyrins, Vol. III (Edited by D.Dolphin), pp. 1–156. Academic Press, San Diego

Sheppard, S. E., A. L. Geddes (1944) Effects of solvents on the absorption spectra of dyes. IV. Water as solvent: a common pattern. J. Am. Chem. Soc, 66, 1995–2002.

Research, reading, referencing & evaluation

Where do the references appear?

Research pertaining to the interaction between carbon nanotubes and conjugated organic molecules is attracting growing interest as a new topic of fundamental research with numerous potential applications ranging from sensing[1] to photovoltaics.[2] Combining the remarkable electrical, thermal, and mechanical properties of carbon nanotubes[3] with the optoelectronic properties of conjugated organic compounds is also a promising path to realizing hybrid composite materials for utilization in emerging disruptive technologies such as nanoelectronics.[2,4-6] Increasingly, materials systems exhibiting spontaneous nanostructuring upon processing from solution have also come to the fore as an economical path to realizing optimized device structures.[7,8]

Research, reading, referencing & evaluation

Now you try……..

Author; N. Tang
Journal; Atmos. Environ.
Year; 1980
Title; On the equilibrium partial pressures of nitric acid and ammonia in the atmosphere.
Volume/page; 14, 819-834

Author; William R. Harvey, Signe Nedergaard
Journal; Proc. Natl. Acad. Sci. U.S.A.
Year; 1964
Title; Sodium-independent active transport of potassium in the isolated midgut of the Cecropia silkworm.
Volume/page; 51, 731-735

Author; Hassan, B.; Li, H.; McKeown, N. B.
Journal; *J. Mater. Chem.*
Year; 2000
Title;
Volume/page; *10*, 39−45.

Research, reading, referencing & evaluation

Now you try……..

N. Tang, On the equilibrium partial pressures of nitric acid and ammonia in the atmosphere. *Atmos. Environ.***14**, 819-834 (1980).

William R. Harvey, Signe Nedergaard, Sodium-independent active transport of potassium in the isolated midgut of the Cecropia silkworm. *Proc. Natl. Acad. Sci. U.S.A.***51**, 731-735 (1964).

Hassan, B.; Li, H.; McKeown, N. B. *J. Mater. Chem.* **2000**, *10*, 39−45.

Research, reading, referencing & evaluation

The Royal Society of Chemistry referencing style;

Journal articles should be cited in the form:

A. Name, B. Name and C. Name, Journal Title, year, **volume**, page.

For example;

T. J. Hebden, R. R. Schrock, M. K. Takase and P. Müller, Chem. Commun., 2012, **48**, 1851–1853.

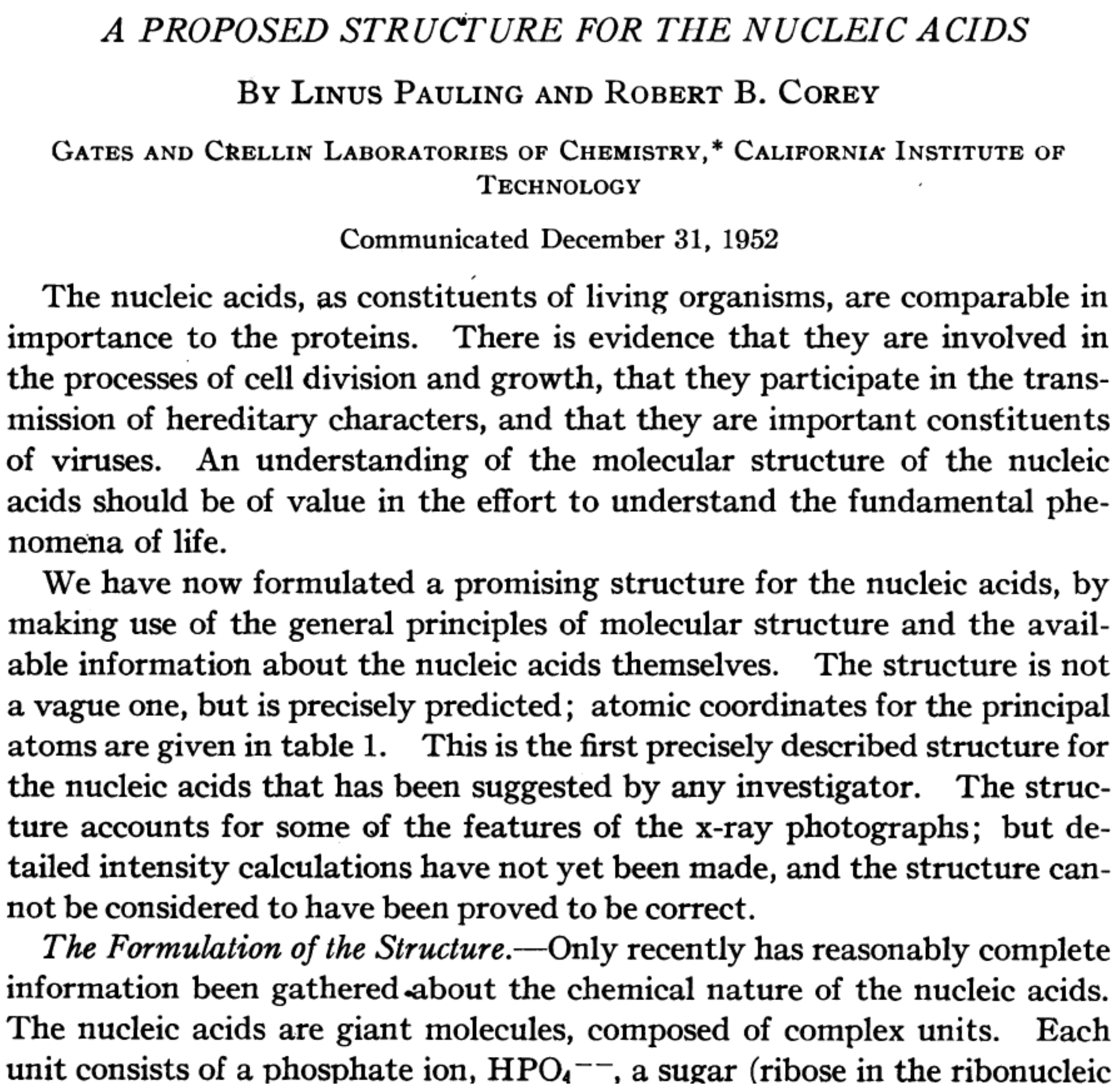
Books should be cited in the form:

A. Name, B. Name and C. Name, Book Title, Publisher, Publisher Location, year.

For example;

S T Beckett, Science of Chocolate, Royal Society of Chemistry, Cambridge, 2000.

Research, reading, referencing & evaluation



A PROPOSED STRUCTURE FOR THE NUCLEIC ACIDS

By Linus Pauling and Robert B. Corey

Gates and Crellin Laboratories of Chemistry,* California Institute of Technology

Communicated December 31, 1952

The nucleic acids, as constituents of living organisms, are comparable in importance to the proteins. There is evidence that they are involved in the processes of cell division and growth, that they participate in the transmission of hereditary characters, and that they are important constituents of viruses. An understanding of the molecular structure of the nucleic acids should be of value in the effort to understand the fundamental phenomena of life.

We have now formulated a promising structure for the nucleic acids, by making use of the general principles of molecular structure and the available information about the nucleic acids themselves. The structure is not a vague one, but is precisely predicted; atomic coordinates for the principal atoms are given in table 1. This is the first precisely described structure for the nucleic acids that has been suggested by any investigator. The structure accounts for some of the features of the x-ray photographs; but detailed intensity calculations have not yet been made, and the structure cannot be considered to have been proved to be correct.

The Formulation of the Structure.—Only recently has reasonably complete information been gathered about the chemical nature of the nucleic acids. The nucleic acids are giant molecules, composed of complex units. Each unit consists of a phosphate ion, HPO_4^{--}, a sugar (ribose in the ribonucleic

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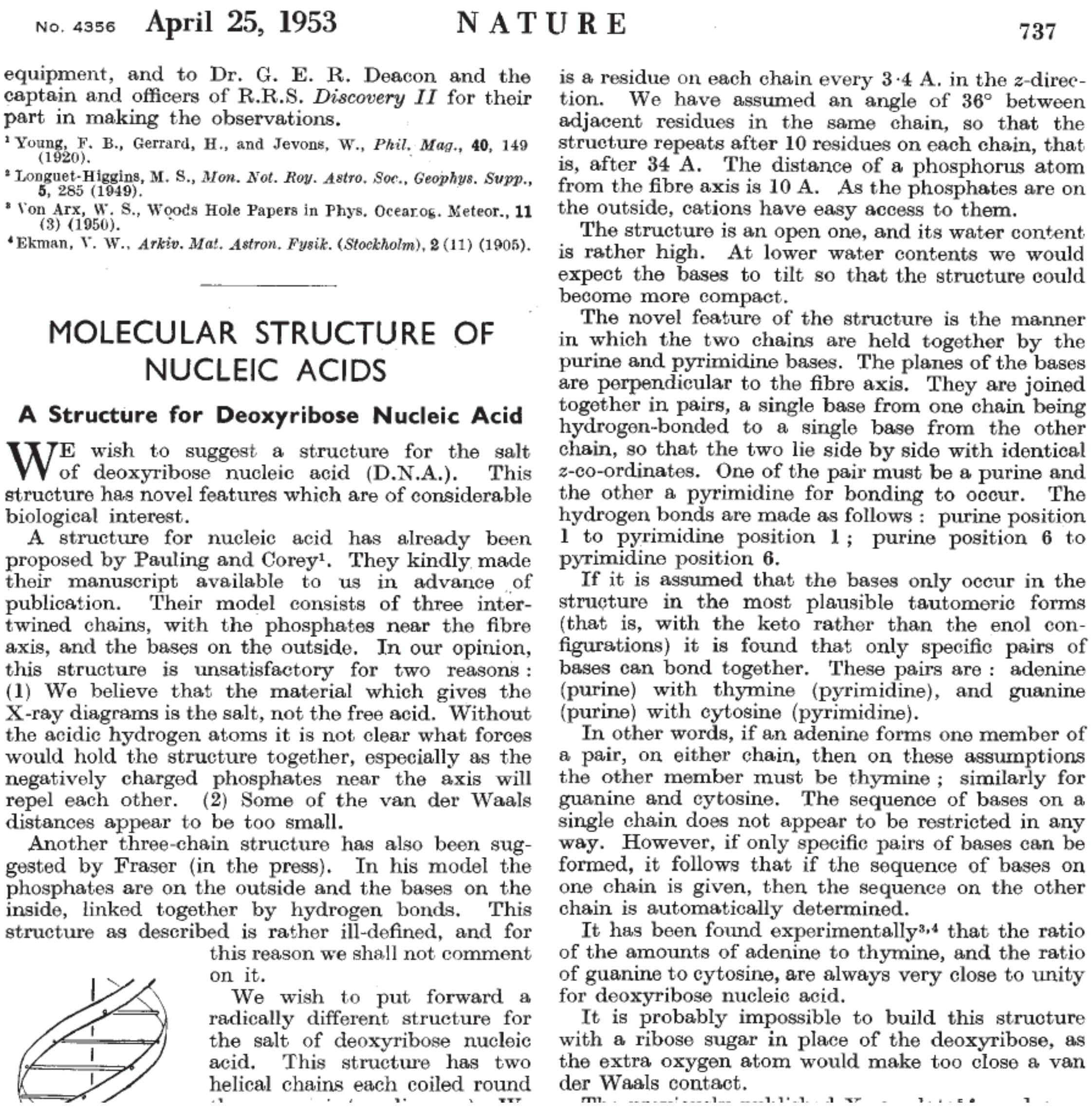

No. 4356 April 25, 1953 NATURE 737

equipment, and to Dr. G. E. R. Deacon and the captain and officers of R.R.S. *Discovery II* for their part in making the observations.

[1] Young, F. B., Gerrard, H., and Jevons, W., *Phil. Mag.*, **40**, 149 (1920).
[2] Longuet-Higgins, M. S., *Mon. Not. Roy. Astro. Soc., Geophys. Supp.*, **5**, 285 (1949).
[3] Von Arx, W. S., Woods Hole Papers in Phys. Oceanog. Meteor., **11** (3) (1950).
[4] Ekman, V. W., *Arkiv. Mat. Astron. Fysik.* (*Stockholm*), **2** (11) (1905).

MOLECULAR STRUCTURE OF NUCLEIC ACIDS

A Structure for Deoxyribose Nucleic Acid

WE wish to suggest a structure for the salt of deoxyribose nucleic acid (D.N.A.). This structure has novel features which are of considerable biological interest.

A structure for nucleic acid has already been proposed by Pauling and Corey[1]. They kindly made their manuscript available to us in advance of publication. Their model consists of three intertwined chains, with the phosphates near the fibre axis, and the bases on the outside. In our opinion, this structure is unsatisfactory for two reasons: (1) We believe that the material which gives the X-ray diagrams is the salt, not the free acid. Without the acidic hydrogen atoms it is not clear what forces would hold the structure together, especially as the negatively charged phosphates near the axis will repel each other. (2) Some of the van der Waals distances appear to be too small.

Another three-chain structure has also been suggested by Fraser (in the press). In his model the phosphates are on the outside and the bases on the inside, linked together by hydrogen bonds. This structure as described is rather ill-defined, and for this reason we shall not comment on it.

We wish to put forward a radically different structure for the salt of deoxyribose nucleic acid. This structure has two helical chains each coiled round

is a residue on each chain every 3·4 A. in the *z*-direction. We have assumed an angle of 36° between adjacent residues in the same chain, so that the structure repeats after 10 residues on each chain, that is, after 34 A. The distance of a phosphorus atom from the fibre axis is 10 A. As the phosphates are on the outside, cations have easy access to them.

The structure is an open one, and its water content is rather high. At lower water contents we would expect the bases to tilt so that the structure could become more compact.

The novel feature of the structure is the manner in which the two chains are held together by the purine and pyrimidine bases. The planes of the bases are perpendicular to the fibre axis. They are joined together in pairs, a single base from one chain being hydrogen-bonded to a single base from the other chain, so that the two lie side by side with identical *z*-co-ordinates. One of the pair must be a purine and the other a pyrimidine for bonding to occur. The hydrogen bonds are made as follows: purine position 1 to pyrimidine position 1; purine position 6 to pyrimidine position 6.

If it is assumed that the bases only occur in the structure in the most plausible tautomeric forms (that is, with the keto rather than the enol configurations) it is found that only specific pairs of bases can bond together. These pairs are: adenine (purine) with thymine (pyrimidine), and guanine (purine) with cytosine (pyrimidine).

In other words, if an adenine forms one member of a pair, on either chain, then on these assumptions the other member must be thymine; similarly for guanine and cytosine. The sequence of bases on a single chain does not appear to be restricted in any way. However, if only specific pairs of bases can be formed, it follows that if the sequence of bases on one chain is given, then the sequence on the other chain is automatically determined.

It has been found experimentally[3,4] that the ratio of the amounts of adenine to thymine, and the ratio of guanine to cytosine, are always very close to unity for deoxyribose nucleic acid.

It is probably impossible to build this structure with a ribose sugar in place of the deoxyribose, as the extra oxygen atom would make too close a van der Waals contact.

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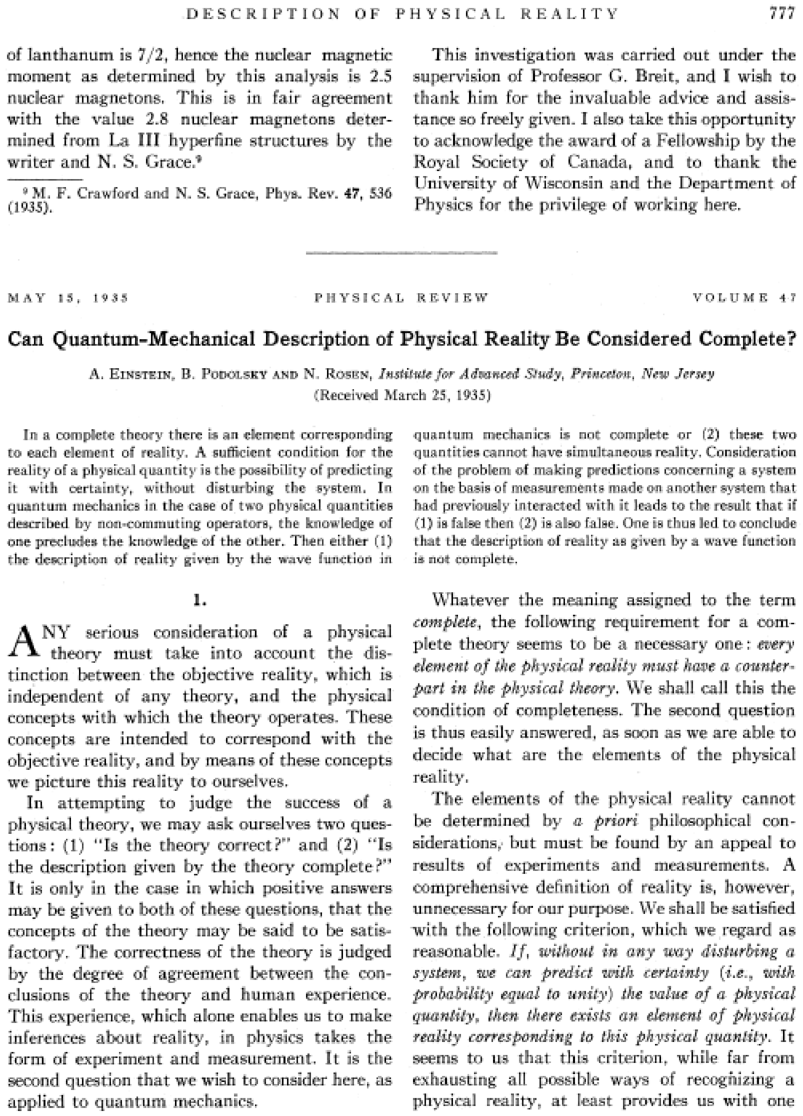

of lanthanum is 7/2, hence the nuclear magnetic moment as determined by this analysis is 2.5 nuclear magnetons. This is in fair agreement with the value 2.8 nuclear magnetons determined from La III hyperfine structures by the writer and N. S. Grace.[9]

This investigation was carried out under the supervision of Professor G. Breit, and I wish to thank him for the invaluable advice and assistance so freely given. I also take this opportunity to acknowledge the award of a Fellowship by the Royal Society of Canada, and to thank the University of Wisconsin and the Department of Physics for the privilege of working here.

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[9] M. F. Crawford and N. S. Grace, Phys. Rev. **47**, 536 (1935).

MAY 15, 1935 PHYSICAL REVIEW VOLUME 47

Can Quantum-Mechanical Description of Physical Reality Be Considered Complete?

A. Einstein, B. Podolsky and N. Rosen, *Institute for Advanced Study, Princeton, New Jersey*

(Received March 25, 1935)

In a complete theory there is an element corresponding to each element of reality. A sufficient condition for the reality of a physical quantity is the possibility of predicting it with certainty, without disturbing the system. In quantum mechanics in the case of two physical quantities described by non-commuting operators, the knowledge of one precludes the knowledge of the other. Then either (1) the description of reality given by the wave function in quantum mechanics is not complete or (2) these two quantities cannot have simultaneous reality. Consideration of the problem of making predictions concerning a system on the basis of measurements made on another system that had previously interacted with it leads to the result that if (1) is false then (2) is also false. One is thus led to conclude that the description of reality as given by a wave function is not complete.

1.

ANY serious consideration of a physical theory must take into account the distinction between the objective reality, which is independent of any theory, and the physical concepts with which the theory operates. These concepts are intended to correspond with the objective reality, and by means of these concepts we picture this reality to ourselves.

In attempting to judge the success of a physical theory, we may ask ourselves two questions: (1) "Is the theory correct?" and (2) "Is the description given by the theory complete?" It is only in the case in which positive answers may be given to both of these questions, that the concepts of the theory may be said to be satisfactory. The correctness of the theory is judged by the degree of agreement between the conclusions of the theory and human experience. This experience, which alone enables us to make inferences about reality, in physics takes the form of experiment and measurement. It is the second question that we wish to consider here, as applied to quantum mechanics.

Whatever the meaning assigned to the term *complete*, the following requirement for a complete theory seems to be a necessary one: *every element of the physical reality must have a counterpart in the physical theory*. We shall call this the condition of completeness. The second question is thus easily answered, as soon as we are able to decide what are the elements of the physical reality.

The elements of the physical reality cannot be determined by *a priori* philosophical considerations, but must be found by an appeal to results of experiments and measurements. A comprehensive definition of reality is, however, unnecessary for our purpose. We shall be satisfied with the following criterion, which we regard as reasonable. *If, without in any way disturbing a system, we can predict with certainty (i.e., with probability equal to unity) the value of a physical quantity, then there exists an element of physical reality corresponding to this physical quantity*. It seems to us that this criterion, while far from exhausting all possible ways of recognizing a physical reality, at least provides us with one

Research, reading, referencing & evaluation

So, what research & enquiry related skills have I developed?

- identify (e.g. counter examples)
- define
- analyse problems
- identify or create solutions
- synthesise
- evaluate
- critique / critical judgment / critically assess
- interpret
- creating new understanding
- thinking creatively or imaginatively
- formulate key questions
- rational enquiry
- search for, evaluate and use information