Foundations of Science

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① Guneet Lake: Intellectual activity - Akkalkot to Bangalore

1/3 Silicon Valley - ASians

Books:

① Science and Philosophy - past and present. Derek Gjertsen
Pelican ~~Penguin~~ Books

अहिंसा प्रथमं पुष्पं
पुष्पं इन्द्रियनिग्रहः
सर्वभूत दया पुष्पं
क्षमापुष्पं तथैव च ।
ज्ञानिः पुष्पं तपः पुष्पं
ध्यानपुष्पं विशेषधः
सत्यँ अष्टविधः पुष्पं
विष्णोः प्रीतिकरं भवेत् ॥

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- Foundations of Sciences
- Foundations and Methodologies of Sciences
- Foundations and Grand Facets of Sciences

(Why and how foundations change)

* The Changing Picture of the Universe — Could be one chapter
  Star studded sphere – Curvature of Space of GTR – Blackholes, Neutron Stars,

Whitehead
"The Stable Foundations of physics have broken up"
(Pg 41 in Thakur's Book on Gita)

"On the day when quanta / Simultaneity"

De Broglie

The Predictors: Thomas A Bass Henry Holt (1999)
(How a band of Maverik Physicists used Chaos Theory to trade their way to a fortune on Wall Street)

"CHAOS is the Score Upon Which Reality is Written"
Henry Miller

Derek Gjertsen

p239. • Science has a history. It is a history rich with discarded and false theories.

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p2 :• Today the disciplines of Science and Philosophy seem to be so far apart so fundamentally distinct, that it is initially hard to see how they could be related in any significant manner.

• While many philosophers may treat Science with immense respect, many Scientists have only, according to Peter Medawar, an 'exasperated Contempt for Philosophy

Socrates on Science: (p15-16)

① How could any one hope to understand Nature without knowledge of Himself

② Dispute Characteristic of Science — (of his day)
While Some argued 'Reality is One' others insisted that it is Infinitely Many

(3) Science had little practical value.

(4) The Gods would be unlikely to be pleased by attempts to pry into matters they had chosen to conceal.

(p19)

Copernicus 1543 De Revolutionibus –
"One will look in vain through the large work for empirical investigation on which his conclusions were based. Instead a number of philosophical and mathematical arguments are presented to show the superiority of his views."

(p25) Philosophy and Science also differ in the views they take of their own past.

The history of Science is of peripheral interest to the modern Scientist

The History of Philosophy is and always has been part of philosophy

"Grander conclusions from scanties observations" (how the picture of the universe is changing — perihelion of Mercury — too small and scanty a data)

Historians of Science, Richard Rorty, notes 'do not think it anachronistic to say that Aristotle had a false model of the heavens or that Galen did not understand how the circulatory system worked. We take the pardonable ignorance of great dead scientists for granted.'

—

(p29) Campbell's definition of Science (1921, What is Science)

* Science was "the study of those judgements concerning which universal agreement can be obtained"

John Ziman (in Public knowledge)

"The object of science is not just to acquire information nor to utter all non-contradictory notions: its goal is consensus of rational opinion over the widest possible field"

Peter Medawar (Immunologist)

"If politics is the art of the possible, research is surely the art of soluble (The Art of Soluble 1969)

Fragility and Indirect Evidence in Science leads to Profound Conclusions

p37 Fabric of Reality

Thomas Kuhn (p46)

"The ability of men to generate ~~Science~~ theories requires a decision process which permits rational men to disagree"

(?)

Philosophical Speculations on Nature of Matter } → Chemistry

Debates on Nature of Man } → Medicine

Atomism } → Physics.

Pythagorean Mysticism } → Mathematics

Philosophical Issues } Mind-Matter Free Will Reality } Scientific Issues

(p54)

According to Needham

Beginning of algebra:

"If we thus designate the art of solving the equation $ax^2+bx+c=0$ expressed in these symbols, it is a 16th. Century AD development. If we allow other less convenient symbols it goes back to 3rd. Century AD ~~BC~~ at least. If purely geometrical solutions are allowed it begins in the 3rd. Century BC. and if we are to class algebra any problem which could now be solved by algebraic methods, then the second millennium BC has acquainted with it."

(p56)

Origin of Thermodynamics

Carnot himself located origin of his work in neither physics nor philosophy but in technology of his day.

Limits to efficiency → Thermodynamics

(p56) Darwin's Theory of Evolution

During his voyage on HMS Beagle, he had been:
"deeply impressed by - - - group"

These three sets of facts →
"Species gradually became modified"

Fusion of disciplines — new disciplines
Astrophysics, Molecular Biology
(Astronomy)

(p62)
Plato: Republic (521c-531c)

Knowledge of heavens could not be gained by staring at the sky for the simple reason that knowledge of sensible objects were impossible
* The true realities were not part of the visible world; they belonged to, rather, to the "world of pure numbers and perfect geometrical figures." And inevitably these were not seen by the eyes, but by reason and thought.

Objects belonging to the kind of appearance were known of and were things we could have no knowledge of; the intelligible kind, in contrast were real and could be the object of our knowledge.

*(Neugebauer "The Exact Sciences in Antiquity" New York 1969)

(p64) Physics

- physics, as we know it to-day, did not originate in any single event or in any simple manner.
  - Motion -
  - Composition of bodies relevant for motion?
  - Weight.
  - Resistance - force.
  - Medium of motion.

Scientific knowledge has to be theoretical and abstract in order to be useful and practical

(p69) Science without philosophy is impossible, while philosophy without science is merely immature.

p72

Descartes:

- Machines get not through understanding but only through the disposition of organs.
- Thoughts are the activities of the conscious mind.

p73

- Mind was an unextended substance distinct from the body The mind was indivisible, without parts and consequently far ever beyond the anatomists scalpel and chemists retorts.

1959 J.C. Smart.

"Sensations are nothing over and above brain processes" – Statement of strict identity.

1963 Nobel Prize Winner Sir John Eccles:
Gifford Lecture

p73

"Recent experimental investigations did in fact ~~support~~ lend support not for materialism, but for dualistic ~~interpretation~~ interaction hypothesis

Eccles "The Human Mystery" London 1984
p214

p24

Eccles talks without any apparent embarassment of the manner in which sensory data becomes perceptual experience as a miraculous transformation

p76-77

Searle:

Computers are machines for manipulation of meaningless symbols that lack any semantic content.

Thoughts may occur to be as symbols. These symbols are, however, about something. They have meaning.

"The reason that no computer programme can ever be a mind is simply that a computer programme is only syntactical and minds are more than syntactical. Minds are semantical - they have a content.

The results of Searle are often relevant to philosophers, but seldom crucial for any particular philosophical position

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Reality

- Scientific views on Reality are likely to change as Science itself changes
- On the nature of Reality Science may not always offer instant enlightenment

Hume and Causality

"Though distant objects may sometimes seem productive of each other, they are commonly found upon examination to be linked by a chain of causes, which are contiguous among themselves and to distant objects; and when in any particular instance we cannot discover this connection, we still presume it to exist."

[Treatise on Human Nature Book 1 part 3, § 2

p80

→ Locality Principle though valid classically is not valid Quantum mechanically

"Whatever Reality is it must be non-local" Bell.

"Money is always there, but the pockets change. It is not in the same pockets after a change and that is all there is to say about money" Gertrude Stein

Do we have to change our notion of Reality?

How to link quantum world of photons and electrons with the familiar world of tables and chairs?

(p93) Scientific Methodology

- Complex phenomena should be first resolved into their composite elements from which appropriate cause could be identified

(p105)

- Hypotheses should be consistent with all observed facts. But further they should successfully foretell phenomena which have not been observed

(p106) - (p108)

Darwin's problem was ~~how~~ to explain how the kinds the variable traits that natural selection worked on could be inherited. (Jenkin's objection)

It required the discovery of Mendel to dispose of this objection. (Long wait)

Serendipity

Fleming discoverer of Penicillin (July 1928)

The discovery of Penicillin is surely "the supreme example in all scientific history of the part that Luck may play in the advancement of knowledge"

" R. Hare "The Birth of Penicillin" London. 1970 p57

p111-112

Originality and Novelty

- Alfred Wegner's theory of Continental Drift — great shock to his Contemporaries — (impossible? Out-rageous?)
- No scientific method scientific or otherwise to account for Wegner's insights.

What forces drive the Continental drift?
Is it still an open question

CARNAP - Logician. p112

(Foundations and Methodologies of Science)

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The hypothetico-deductive method favoured by distinguished scientists — BUT does not accurately the methodology of Science.
Can lead to false conclusions
Does not account for creativity, originality, luck.

(Philosophy and Science)

(p114)

Philosophers consistently see the method of Science before their eyes and are irresistably tempted to ask and answer questions the way Science does. This tendency .... leads philosopher into complete darkness

Ludwig ~~Wittgenstein~~
↳ Wittgenstein's
The Blue Book (1933)

How Russel planned Principia Mathematica
↓
"Every morning I would sit down before a blank sheet of paper... I would stare at the blank sheet. - Throughout the Day. Often when evening came it was still empty"

p116

'If the techniques worked out for the study of TB prove initially misleading when applied to malaria and if Leverrier's extension of his work on Uranus to Mercury has proved to be equally misleading it must be very certain that transplantation of scientific techniques to more distant philosophy will fare better'

The three successful methods in Science
(1) Deductivism of Euclid (300 BC)
(2) Attractive Force - Newton
(3) Natural Selection - Darwin

Rudolf CARNAP: (1913)
(PHYSICS, PHILOSOPHY, LOGIC)

Logical Positivism: } Experience is
Logical Empiricist: } fundamental.

- From the simplest elements of experience using only logical machinery, all other aspects of our thoughts and experience could be constructed.

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4th. Century BC. Epicurus:

* "Better to follow the myths of the philosophers than be a slave to the fatalism of physicists"

p145

Feyerabend: Astrology, voodoo, witchcraft, rain-dancing and much more besides, are no less reasonable procedures than astronomy, medicine and meteorology. ?

p 156

SCIENCE IS IN DETAILS

Much of Science, including Science of the highest kind, consists little more than the obsessive working out of the details and implications of an initial hypothesis

* Ideas alone are not enough. You have to show they work. Then only it became Science.

p 15

Mythical Thinking according to 'Feyerabend' →

inventors of
- Fire
- rotation of fields
- Crossing of oceans in vessels

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In a quite abstract manner Parmenides had argued that Being, whatever exists is eternal and unchangeable.
Nothing, therefore, seemed predictable of Being, other that It is.
Even motion was impossible with Being for ever being in the same place.
Zeno with his antimonies reinforced these claims

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[The fullest account of ancient atomism can be found in "De Rerum Natura" of Lucretius 1st. Century BC
↓ "The Nature of the Universe
Hammondsworth 1951

1. Nothing can ever be created by divine power out of nothing
2. Nature never reduces anything to nothing

The atomic hypothesis revived by Thomas Harriot (1560-1621).
Harriot wrote to Kepler in 1606
"If he wished to discover the mysteries lying within Nature's house, he should abstract and contract [illegible] data an[illegible]

Newton in Principia (Book II Prop. XXIII)

Rule 3 of Rules Philosophical Reasonings ⇒

"The extension, hardness, impenetrability, mobility, inertia of the whole result from extension, hardness impenetrability and inertia of the parts; and hence we conclude that the least particles of all bodies to be also extended and hard, and impenetrable and movable and endowed with their proper inertia. And this is the foundation of all Philosophy."

—

p170 - p171

Disappearance of Atomism

philosophical objection of Descartes, Leibniz
Life - Non-Life partners - Harvey

- In Chemistry Affinity turn out than atomism

Boscovich Atom. → mathematical points bounded by attractive repulsive fields
Kant's proposition

p172 → Universe as a plenum filled with forces rather than things

↓

Faraday

p 174

Second Revival of "atomism"

The Second Revival of atomism in the 19th. Century was by Chemists - John Dalton

The greatest achievement of the 18th. Century - atmosphere Composed of oxygen, nitrogen and water vapor - Not One homogeneous gas. Then they they do not separate and form layers?

F. Von Kekulé opposed atomic hypothesis

"The question whether atoms exist or not has but little significance from the chemical point of view; its discussion belongs rather to metaphysics"

[D. Knight Atoms and Elements London 1967 p114]

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Beginning of 20th. Century : Atomic hypothesis

Neither physicists nor Chemists - Solidly behind Atomic hypothesis!

Friedrich Ostwald: 1909 Nobel Prize winner for Chemistry

(1904) – Ostwald said:
"Atomic hypothesis unnecessary.

Mach: Atoms have only a mathematical
1897 model facilitating mental
reproduction of facts.
(The Science of Mechanics
La Salle, Ill, 1962 p 492-4, 505.

What restored Atomic hypothesis was
Brownian motion

p176

"For Positivisk: all expressions, other than logical constants, must either refer directly to specific sense-data, ~~Otherwise~~ or be explicitly definable in terms of expressions which do refer directly to specific sense-data Otherwise the expressions are meaningless

p177 Paul Davies

- Science is a surer path to God than religion.

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Failure of Phrenology

Astrophysics ← Physics — 19th. Century. Internal Constitute of Stars

Biochemistry ←
Neurophysiology ←
Molecular Biology ←

Psychology ←

Location of Soul — Pineal gland / all parts of the body

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Parascience.

p 186

ESP. — 21 British Scientists, 10 Fellows of Royal Society, 2 Nobel Laureates — Among 47 presidents of Society of Psychical Research

Sir William Crookes
President of Royal Society

ON Levitation

"The most striking case of levitation I have witnessed ..."

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R G Medhurst
"Crookes and the Spiritual World"
London 1972 p119

p189. (Regarding Crookes's evidence for levitation)

- The point can be accepted without difficulty that no unsupported testimony is beyond ~~doubt~~ challenge
- Eminence is no defence.
- Critical observations of Newton's own observations show conclusively that at certain (cited) points, he fudged the data

(p198)

Do in fact the strange theories of quantum physics make parascience any more plausible?

(p200)

Can Science demonstrate the existence of God?

Lucretius, Cicero — History has shown the ruin of many a good man and the success of more than a few villains.

Newton stressed repeatedly that it was the inability of his Science to throw light on a number of issues that most clearly revealed the hands of God

* (See page 201 for his reasons)

p202 physico-theology, astro-theology } topics of Boyle Lectures

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Leibniz: Any gaps in the system of Principia were the result of Newton's inadequate physics rather than God's oversight.

p204-205

Hume: The danger of analogies.

- Experience alone ~~cannot~~ can point out .... the true cause."

= Chance can account ~~for~~ neither for the assembly of bricks and mortar into a house, nor for the manner in which planets move in the same plane and in the same direction.
In the first case we seek a builder
In the second case, in Newton's phrase "the Counsel and Contrivance of a Voluntary Agent." // Derek Gjertsen - author

Hume conceded the legitimacy of analogical reasoning, but insisted that "while the similarity of events gives a perfect assurance of a similar event, departure from

Similarity was liable to error and uncertainty.

Example: Blood Circulation in humans →
in mankind → frogs and fleas(?) →
Sap circulation in plants.

How close is the analogy between humans and animals?

Kant: Echoed Hume's views.

In Critique of pure Reason. (1781) Kant argued Physico-Theological Proof for the existence of God.
(Limits God to materials disclosed by Sketches!)

(p210)

Although Hume was right to criticize the manner in which scholars had taken 'apparent design in nature as positive evidence for the existence of God' he had failed to offer an 'alternative explanation' for this design. This gap has been filled by Darwin with Natural

Selection serving as the 'blind watch maker.

Blind – because it does not see ahead, does not plan consequences and has no purpose in view.

[R. Dawkins 'The Blind Watchmaker' London 1986] p21.

p210

• Modern Physics and Design

While biologists no longer feel the need to introduce divine providence into discussions on the evolution of mammalian 'eye', physicists have begun to see in the detailed fine-tuning of nuclear and electro-magnetic interactions clear evidence of design.

p211 Feynman's autobiography –

"Evolution of life required a star like the sun ..! then the strength of nuclear had to lie within narrow limits to make life possible."

The Weak Anthropic Principle (Robert Dicke 1957)

(The Anthropic Cosmological Principle
J. Barrow and F. Tipler. Oxford, 1988 p16)

"The observed values of all physical and cosmological quantities are not equally probable, but take on values restricted by the requirement that there exist sites where carbon-based life can evolve and by the requirement that the Universe be old enough for it to have already done so".

The Strong Anthropic Principle
(Brandon Carter 1974 in
J. Barrow and F Tipler p 21

"The Universe must have those properties which allow life to develop within it at some stage in its history".

(Not of much use!)

p217

- Science, one of the several possible ways of looking at nature.
- Before the Science of Newton and Boyle
  - Aristoteans
  - Magi : Priests of ancient Persia
  - Skeptics :

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= Cornelius Agrippa (1486-1535) worked on magic.
dismissed Science as pointless.
"De Vanitate Scientarum" (1530)

Astronomy was concerned with vain disputes about Eccentricks, Concentricks, Epicycles, Retrogradations, Trepidations, accessus, recessus .... all works neither of God or Nature but the Fiddle-Faddle and Trifles of Mathematicans

in J.L. Heilbron, Elements of Early Modern Physics
Berkeley, Cal 1982 p 21-2

p227

* Forms, Substantial Forms, Four elements
Four Causes

Descartes: "It is not the final, but the efficient causes of created things that we must enquire into. To do otherwise would be to assume that we can share in God's plans"
(~~Boyle: "Selected Philosophical Papers"~~ p7
Descartes' Philosophical Writings p202)

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* Sceptical Traditions in Antiquity: (> 200 AD)

Modern Philosophy shaped by the publication "Sextus Empiricus" – Outlines of Pyrrohonism (1562) Henri Estienne.

"We must suspend judgement on all issues"

Demophon, Alexander's waiter, unlike others, shivered when he was in the Sun and felt warm in shade!

(p231)

Science and Philosophy in Non-Western Traditions:

China: "Science and Civilization in China" Needham

Connections between Chinese Science and Chinese Philosophies:

- Non-human phenomena ignored.

Confucius: "you do not know about the living. How can you know about the dead?"

↓ J. Needham Science and Civilization in China vol 2. Cambridge 1956 p13

Not tolerant of theoretical thought.

- Things which have nothing to do with right or wrong -
- Things knowledge of which does not benefit men
- ignorance concerning which does no harm
- Belong to unruly persons of a degenerate age.

Does not make us lesser gentlemen

Needham: With such a philosophy there is no room for Science. ... only traditional technology.

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But Taoism was different

Despite beneficial influences and despite number of early successes, Science failed to develop in China.

China no doubt produced any number of astronomers, chemists, mathematicians and physicians — but no Scientists.

The Confucians dismissed out-right any kind of theoretical knowledge
While Taoists reduced much of its power by forming into a form of esoteric knowledge.

* (crops and early technologies did develop in China) —

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Tradition Vs Science

Pierre Bayle:
" It is the purest delusion to suppose that because an idea has been handed down from time immemorial ... it may not be entirely false

(Paul Hazard
The European Mind
1680-1715, Harmondsworth
1964 p188)

Stages

- Supernatural
- Metaphysical
- Correlations (Science)

- Magic
- Religion
- Science

Kuhn (p245)

Theory preferred to experimental data?

Reappraisal of the experiments of Galileo (inclined plane), Dalton (nitric oxide and water), Mendel (experiments with peas)

In all these experimental data adjusted to fit the theory.

Even the most eminent Scientists have been prepared to modify observational data to satisfy the needs of theory

(R.S. Westfall "Newton and the Fudge Factor" Science Vol 179, 1973 p 751-58.
R.R. Newton "The Crime of Ptolemy" Baltimore 1977
G. Holton "Subelectrons - Pre-suppositions and the Millikan-Ehrenfest-Dispute" "Historical Studies in Physical Sciences" Vol. 9 (1978) p 166-224

Theory Requires Magnetic Monopoles, gravitational Waves, Higgs Boson, Unstable Proton. —

No experimental evidence yet. The Search goes on.

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- Ephemeral Nature of Scientific Theories — Poincare.

"Science and Hypothesis"
New York 1952 p160

* Much of the Science of the past is undoubtedly false. Of course much is also true.

- Some theories change. But much remains unaffected.

- Errors of the past are early approximations of the truths of to-day and atleast to the truths of tomorrow.
- In Science, what is important is not whether we have got the truth but are we advancing towards truth.

p249

• Scientific Revolutions and Advancement

Whewell: "... The earlier truths are not expelled, but absorbed, not contradicted but extended and the history of each Science may thus appear like a succession of revolutions is, in reality a series of developments"

W. Whewell "History of Inductive Sciences", London 1857 Vol I, p8.

(The Velocity of light Story - p250)

p251

Ian Hacking:
There are two kinds of Scientific Realism, one for theories and one for entities

The Scientific Revolutions and the Origins of Modern Science.

John Henry.
(MACMILLAN PRESS Ltd. 1997)

p1 Knowledge of the natural world can easily be seen to have been different in 1700 from the way it was in 1500.
fundamental change.

p(2)
- Continuist vs revolutionary changes.
- Origin vs beginnings
- To judge the past in terms of the present is to Whiggish. - to look back with hindsight about what ~~is important to~~ is known to be important later.

Continuism - antidote to Whiggish tendencies - backward looking than forward looking

Our present use of the word "science" was first coined in the 19th. Century.

There was "natural philosophy" - to describe and explain the entire System of the world.

Disciplines:
- Natural philosophy:
  - Mathematically based - astronomy, optics, mechanics, kinematics
  - Medically based: - anatomy, physiology, pharmacology
- Technical disciplines:
  - Arts: Navigation, cartography fortification, mining, metallurgy and surgery

Galileo: (Kinematics + Natural philosophy) → Science of Motion

Newton: Natural philosophy + Mathematics
Aristotle's Natural philosophy + Chemical knowledge → Atomic theory

∴ Natural Philosophy and Science are not equivalent.

- Scientific Revolution Changed Natural philosophy beyond all recognition

"Natural philosophy" was the one that was most used to refer to the understanding of the physical world.

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p(8) The Scientific Method

One major element of Scientific methodology - Experimentalism can be traced back to 13th. Century —

A.C. Crombe, "Robert Grosseteste and Origin of Modern Science" Oxford: Clarendon Press (1953)

Before Scientific Revolution in Europe

- Mathematical Analysis of Nature

Instrumentalist attitude gave force to mathematical analysis during the Scientific Revolution

- Mathematical analysis reveals how things must be - Astronomy of Copernicus

Fabric of Reality : p 58.

- Since Solipsism, and an infinity of Related theories are logically consistent with your perceiving any observational evidence, it follows that you can logically deduce nothing about reality from observational evidence.

- If Scientific Reasoning does not amount to sequence of logical deductions from evidence what does it amount to? Why should we accept its conclusions. This is the "Problem of Induction"

Inductive Concept of Science — Profoundly false?

(p80) Can you draw a boundary beyond which the claim that human reason has no access or at least, beyond which problem-solving is no path to understanding?

Positivism: the theory that all statements other than those describing or predicting observations, are meaningless.

p80/ Not only explanations change, but our criteria and ideas about what should count as explanation are gradually changing - list of acceptable modes of explanation will be open-ended.

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Popperian view on what Science is — Process of Problem Solving and explanation Seeking

Church - interested in explanations and not predictions. Was willing to let Galileo solve problems using any theory, but did not accept his solutions (they called them mathematical hypotheses)

Problem solving is a process that takes place entirely in the human minds

The fact is that all our problems and solutions are located within ourselves, having been created by ourselves.

∴ What does scientific problem got to do with Reality?

(We cannot say anything about the Reality of Heliocentric or geocentric theory)

Depends on the vantage point of viewing

Geocentric theory cannot explain planetary motions without complications of Heliocentric theory.

Geo is convoluted elaboration of Helio

Solipsism self-destructs.

Explanations are not justified by the means by which they are derived. They are justified by the superiority of ability, relative to rival explanations

There is no hierarchy of reliability from mathematical to scientific to philosophical arguments.
Even mathematical arguments derive their reliability from scientific and philosophical theories that underpin them. ∴ not certain. (Chapter 10)

* Not only explanations change, but also our criteria and ideas about what should count as explanation are changing

* Criterion for Reliability: If something can kick back, it exists.
  not only Johnson's rock, but also theories.
* We prefer SIMPLER explanations to more COMPLEX ones. Why?

pg6

SELF-SIMILARITY: Some parts of physical reality (such as symbols, pictures, or human thoughts) resemble other parts.
Resemblance may be concrete or abstract.

* Virtual Reality:
  Computers are physical objects and computations are physical processes.
  What computers can or cannot do is determined by physical laws alone. and not by pure mathematics.

Science and Civilisation in China

(Joseph Needham) CUP

" Certain it is that no people or group of peoples has had a monopoly in contributing to the development of Science. Their achievements should be mutually recognised and freely celebrated with the joined hands of universal brotherhood."

(Vol 1. Preface)

From Giants of Science.
(Philip Caine and Samuel Nisenson
Pyramid Books. NY (1961)

p23

Archimedes: (287 bc)

- The ability to observe what happens, to understand what is observed and to use information to discover new ideas in the mark of the Scientist
- Archimedes took a bath and came out with the idea - now called "Specific Gravity"
- Mathematics of the Lever.
- Archimedian Screw

"One man and one intellect - a host in itself"

Polybus, historian

P(1) Pythagoras b(582) Greek.

- driven to Southern Italy.

"Self discipline, purity, temperance and obedience" - his watchwords.

- Pythagoras gave the first inkling to Copernicus that the Sun was the Centre of the Universe

Euclid (Greek Mathematician) ~ 300 BC.

(date and place of birth not known)

father of geometry "Elements"

Geometry (= land measuring)

Science of Deduction (Conan Doyle (Sherlock Holmes)

"From a drop of water, a logician could infer the possibility of an Atlantic Ocean or a Niagara Falls without having seen or heard of one or the other. So all life is a great chain, the nature of which is known whenever we are shown a link of it. Like all other arts the Science of Deduction and Analysis is one which can only be acquired by long and patient study"

Euclid's Contribution:

* Starting with simple definitions called "axioms", Euclid combined them into statements called "Theorems" which are proved by "Logic"

p14

Father of Modern Medicine

Hypocrates (c 460 bc) Greek.

Successor to School by "Thales" 600 BC. (mathematician)

The oath:

" I Swear that I will carry out this oath. I will use treatment to help Sick according to my ability and judgement, never will I use to wrong doing, to none will I give a deadly drug, even when asked to do so. Into whatsoever houses I enter, I will enter to help the Sick. Whatsoever I shall see or hear in the course of my profession, if it should not be published, I will never divulge it."

- Hypocrates believed only in facts ascertained by observation and experiments. He tried to overcome superstition as regards disease and its cure.
- Study of anatomy most important ~~for~~ aspect for medical study.

(p19)

ARISTOTLE

Greek Scientist - Philosopher.

b(384 BC)

His father was Court physician to Alexander the Great.

went to Athens in 367 BC when he was 17. Studied under PLATO. but did not agree with him on many issues.

- Aristotle taught Alexander the Great. When the latter was 14 yrs old.
- Aristotle produced 400 - 1000 books
- Forerunner of modern biological methods - first to dissect animals.
- ARISTOTLE WHO WAS SO CAREFUL IN BIOLOGY WAS WOEFULLY WRONG IN HIS PHYSICS

=

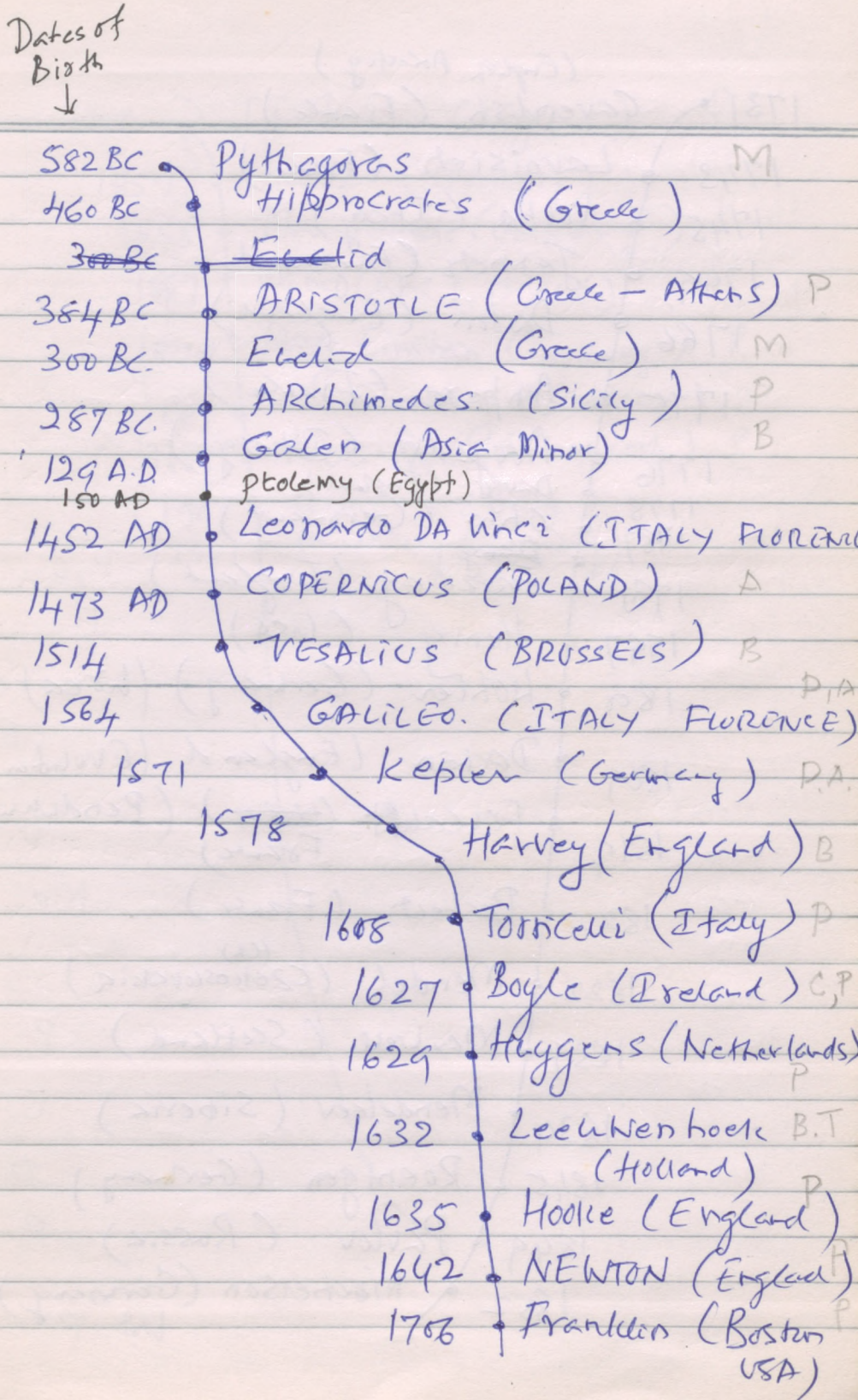
(p29)

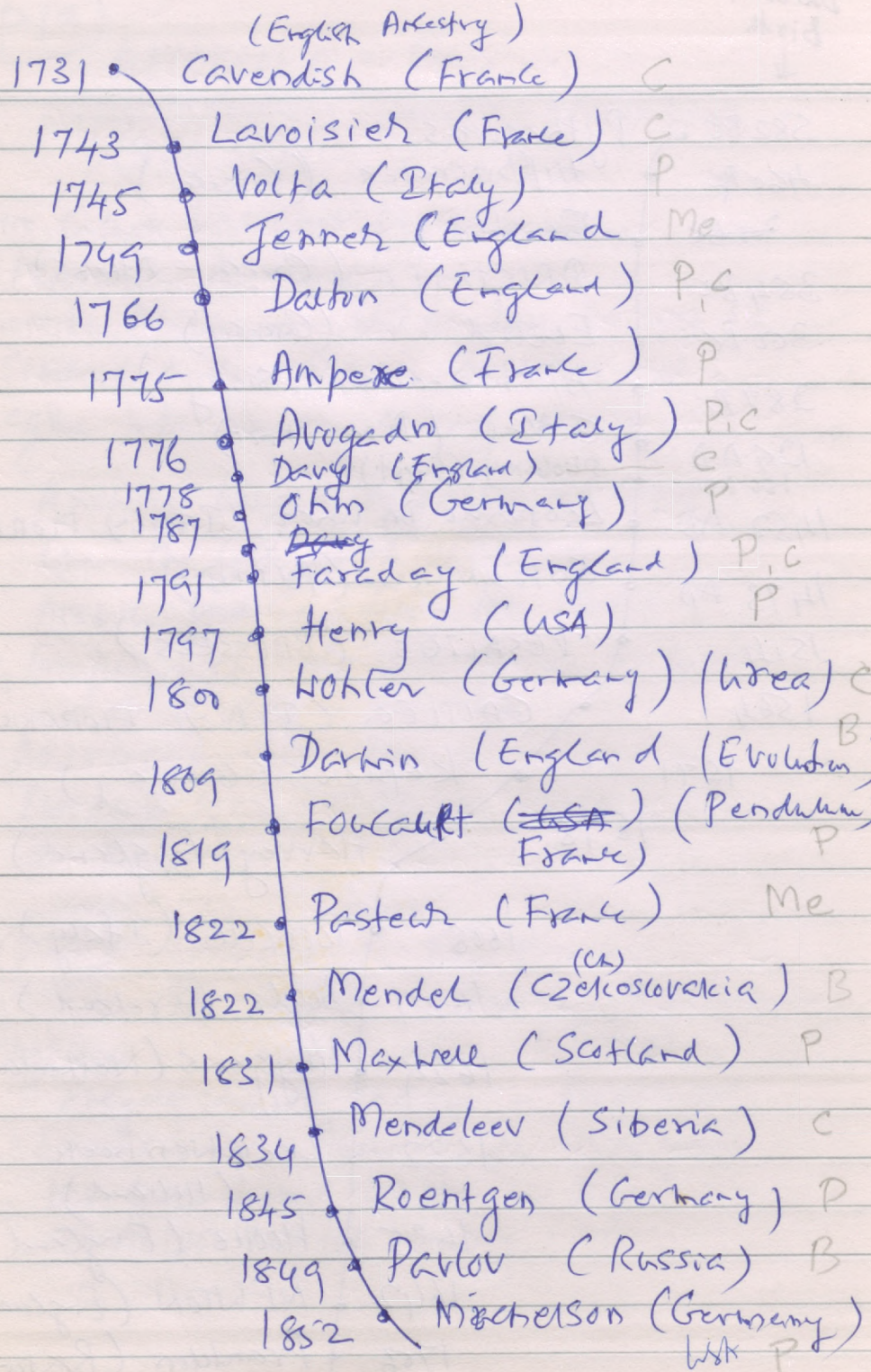
GALEN

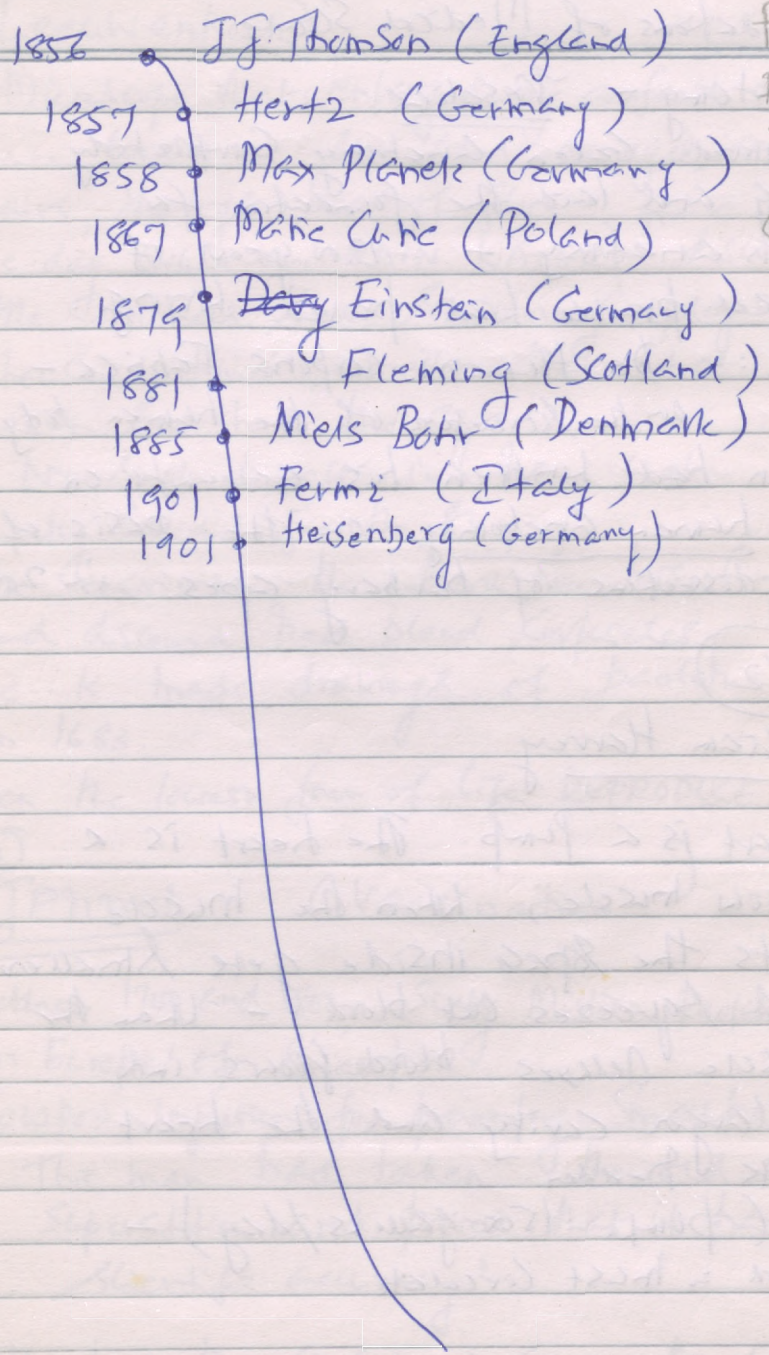
db - 129 A.D (Asia Minor (Black Sea - Mediterranean) (Turkey)

Physician.

Encyclopedia of Medicine - Anatomical Exercises - Authority for 1500 years. but later proved WRONG. — by VESALIUS in 16th. Century.


Dates of Birth
582 BC Pythagoras
460 Bc Hippocrates (Greece)
~~300 Bc Euclid~~
384 BC ARISTOTLE (Greece – Athens)
300 BC. Euclid (Greece)
287 BC. ARChimedes (Sicily)
129 A.D. Galen (Asia Minor)
150 AD Ptolemy (Egypt)
1452 AD Leonardo DA Vinci (ITALY FLORENCE)
1473 AD COPERNICUS (POLAND)
1514 VESALIUS (BRUSSELS)
1564 GALILEO. (ITALY FLORENCE)
1571 Kepler (Germany)
1578 Harvey (England)
1608 Torricelli (Italy)
1627 Boyle (Ireland)
1629 Huygens (Netherlands)
1632 Leeuwenhoek (Holland)
1635 Hooke (England)
1642 NEWTON (England)
1706 Franklin (Boston USA)


(English Ancestry)
1731 Cavendish (France) C
1743 Lavoisier (France) C
1745 Volta (Italy) P
1749 Jenner (England Me
1766 Dalton (England) P, C
1775 Ampere (France) P
1776 Avogadro (Italy) P, C
1778 Davy (England) C
1787 Ohm (Germany) P
1791 Faraday (England) P, C
1797 Henry (USA) P
1809 Darwin (England (Evolution) B
1819 Foucault (USA) (France) (Pendulum) P
1822 Pasteur (France) Me
1822 Mendel (Czechoslovakia (CA)) B
1831 Maxwell (Scotland) P
1834 Mendeleev (Siberia) C
1845 Roentgen (Germany) P
1849 Pavlov (Russia) B
1852 Michelson (Germany) USA P


1856 J.J. Thomson (England)
1857 Hertz (Germany)
1858 Max Planck (Germany)
1867 Marie Curie (Poland)
1879 Einstein (Germany)
1881 Fleming (Scotland)
1885 Niels Bohr (Denmark)
1901 Fermi (Italy)
1901 Heisenberg (Germany)

p47

Foundations of Medical Science.

Anatomy - Vesalius.

He proved Galen Anatomy completely wrong and laid the foundation for modern anatomy - 1300 years of medical practice was proved wrong.

books: De Humani Corporis Fabrica - On the Structure of the human body.

* Galen had written his accounts on the human anatomy on the basis of his dissections of barbary apes. in 200 AD

p62

William Harvey

Heart is a Pump. The heart is a hollow muscle; when the muscle acts the space inside gets smaller and squeezes out blood - when the muscle relaxes blood flows into the larger cavity and the heart gets bedder.

(pumps 1500 gallons/day) -

blood is must circulate

p81

Leeuwenhoek

Microscope that enlarged by a factor of 100.
Lee.. looked at silk fibres, ox-eyes, animal hairs, the legs, head of fly.. from a puddle one day looked at RAIN WATER — discovered little animals ~~Static~~ swimming, playing, .. thousand times smaller than what you can see with the eye.
No such beasts in rain water directly collected from the sky.
He examined the blood from his finger and discovered red blood corpuscles.

- Lee.. it made drawings of bacteria in 1683.
- Even the lowest form of life REPRODUCE.

p130

Jenner (Vaccination)

- Between 1700 and 1800 Sixty Million People died in Europe of Smallpox
- Cowpox injection for preventing Smallpox

" This man had taken the old Country Superstition and proved that it had Scientific accuracy"

- "He had the Considered Courage to infect humans with a mild disease to protect them from a terrible Scourge"

p172

Friedrich Wöhler

" I can make urea in the laboratory without the help of a man, or a dog or a kidney.

Synthesized urea in 1828.

Led to the idea of isomers by Berzelius

" Compounds which have the same chemical composition in exactly the same proportion, but have different arrangement of atoms in their molecules are called ISOMERS.

"People have a hunger for knowledge of ultimate things, and Science and Spirituality are the two main paths they traverse in trying to get it"

"Weisloget"

The world's Cultural education is impoverished if Scientists and theologians aren't encouraged to talk.

P257 The Ascent of Scale (Brian Silver)

Living World:
- Concept of Cells
- Concept of Species
- Concept of Heirarchy

} John Ray (1627?-1705)

Species: A collection of individual animals or plants that reproduced among themselves to give individuals similar to themselves. (Aristotle had similar ideas)

Classification of animal kingdom (Linnaeus)

- Monera: Single Cells without nuclei (bacteria, algae)
- Protista: ~~the higher plants~~ Single cells with nuclei
- Fungi mushrooms - do not use sun light as source of energy
- Animalia - animals.
- Plantae - higher plants

Buffon - Rebel against Linnaeus

- Role of DNA - Rebirth to classification of Species.

p260

(1632 - 1723)

Single Lens Microscopes - Leeuwenhoek
assistant - Johann Ham

Magnification of 500.

- Spermatozoa - Creator of life. Smaller than egg.
- Ovum larger than the Sperm - (Swammerdam)

Robert Hooke - Compound Microscope with two Lenses

* Hooke was the first to employ the term CELL in the Context of living matter

* Marcello Malpighi - founder of microscopic anatomy
(1628 - 1694) (missed the significance of Cell)

- Fracois-Vincent Raspail (1794 - 1878)
"Plant Cell, like Animal Cell, is a type of 'laboratory' of Cellular tissues"
He realized that the membranes around the Cell acted as what he called a "Sorter" selectively allowing certain substances to pass.

The credit for the origin of the Cell theory is however, given to the German Scientists Theodor Schwann (1810 - 1882)

p261

and Mathias Jakob Schleiden (1804 - 1881)

Schwann: (I) All organisms built from cells, a cell is a layer around the nucleus - the membrane covering the nucleus.

(II) Organism develops by differentiation of the orginal clump of undifferentiated cells.

This is the basic axiom of Embriology

(Schwann - academically active only for 5 years. He drifted into Mysticism)

Schleiden: "foundation of the vegetable kingdom." Similar ideas

- Rudolf Virchow: (1860)
  Omni Cellule e Cellula
  All Cells are from other cells

** (German Students dominated in this field)

* Turning point in the history of Biology

Advance in Cell Biochemistry } Molecular Biology

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"The metamorphosis of biology into a science came into full fruition with the elucidation of the nature of genes and their mode of action. The story begins in a quiet Austrian garden"

Brian Silver.

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Gregor Mendel (1822-1884)
interested in inheritance of characteristics. colour of Pea plants.

"Mendel knew nothing about genes, but by attributing the inheritance of single characteristics to a "factor" that could take a dominant or recessive form he could explain the statistics that emerged from his painstaking work"
The founder of Genetics published his work in 1865 in a minor scientific journal and also wrote to some eminent biologists

His work was neither dismissed or ignored. Mendel was crushed he gave up trying to publish his results.

Mendel had read Darwin's "Origin of Species", but strangely did not see the relevance of his work to evolution.

Darwin had seen reference to Mendel's work, but did not refer to Mendel's work.

In 1900 De Vries in Holland, Von Tschermak in Austria and Correns in Germany independently confirmed Mendel's work.

All three discovered reference to Mendel and acknowledged Mendel's prior claim.

- Mendel had died 16 years earlier

[According to R.A. Fisher – Mendel cooked his results to suit his story!]

- His confessions must have been intrigue for a while!

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Evolution:

In December 1831 - 22 year old Charles Darwin - set sail on HMS Beagle. 5 year journey.

- Species evolved into new species.
- Theory of Natural Selection - Survival of the fittest

(He worked for 20 years before publishing)

1858 - Received a letter from Alfred Russel Wallace - "Fitter breed survive." The letter contained his ideas on evolution - identical to Darwin's.

***His Sense of fairness made the thought of publishing before Wallace repugnant

Linnean Society Meeting 1st July 1858 (both papers presented. both were not present). The annual report of the president of the Society for 1858

"This year has not been marked by any of those striking discoveries which at once revolutionize so to speak the department of Science on which they bear"!!!

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At the root of the modern theory of evolution is the genome, the collection of genes that determine the physical characteristics of every individual living organism

- Mechanism of evolution - appearance of new variants of genes. - mutation and sexual reproduction

- Evolution is an automatic process. It involves "no will" on the part of the organism

- Was there enough time?

- Is the will superfluous for Evolution?

There is no evidence that anything except man demonstrates will.

The fact that animal fights for its life is not evidence for existence of will.

But • Nietzsche: Will a kind of animate force directing nature.

"The effect of environment is over-rated in Darwin .. the essential factor in the process of Life is precisely the tremendous inner power to shape and create new forms., which merely uses, exploits environment."

Schopenhauer saw unconscious will as the ultimate reality, a purposeful irrational force that manifests itself in the ~~natural~~ phenomena of the natural world.
He believed that it was will that drove the evolution of the cosmos, the geological history of the earth, and biological evolution.

(will = Life force ?)

Darwin (in Descent of Man)

"The Old Testament has no more to be trusted than the Sacred books of the Hindoos or the Beliefs of the Barbarians"

* Lamark (invented the word Biology)

Jean-Baptiste de Lamark had suggested the concept of evolution half-a-Century before Darwin. The trouble was that Lamarck's mechanism for evolution was Completely wrong
Lamarck believed in the inheritance of acquired characteristics.

The striving of individuals for improvement was the mechanism of evolution.

(p 284) Darwin never used the phrase "Survival of the fittest". This was done by Herbert Spencer in 1870's. Spencer was Lamarckian.

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Eugenics (Francis Galton)

The policy of encouraging "good" human specimens to breed at the expense of "less good".

293 The Gene Machine.

- DNA discovered in 1869

"The most perfect machine that God ever made"

In DNA history:

Rosalind Franklin X-ray photographs.

Griffith (1928) - genetic information. transfer one type of bacteria to another

Oswald Avery - 1945 - DNA was the material for genetic transformation

Crick and Watson (1953) Double Helix

Rosalind died of cancer in 1958.
Crick and Watson got Nobel Prize in 1962.

Human DNA contains 6 billion atoms.
(Carbon, Nitrogen, oxygen, hydrogen and phosphorus)

p314.

Life

Darwinian Evolution.
Mendelian Genetics.
Genetic Code.
Cell
Germ theory

Books in NTAS Library.

(1) The Scientific Revolutions and the Origins of Modern Science. John Henry

(2) Greek Science in Antiquity. Marshall Clagett

(3) The Ascent of Science. Brian Silver

(4) Science and Philosophy. Derek Gjertsen.

Sept 2003
Toronto

G0528/0285

The End of Physics
the hunt for a Unified Theory
David Lindley 1993
(Basic Books)
Harper Collins.

This is My Philosophy - Twenty of the World's Outstanding Thinkers Reveal the deepest meaning they have found in the Universe

Bertrand Russell,
Sartre, .. Oppenheimer,
Hocking · Radhakrishnan
Ed. Unity Burnet CITADEL (1957)

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p104 Robert Oppenheimer
(1904- 1966)

Science and Values

Larry Laudan

University of California Press (1984)

I CHING or Book of Changes

Wilhelm ~~Ott~~/Bayness

PANTHEON Books 1950, 1966

What is phenomenology?

Pierre Thevanaz

Ed. James M Edie

Quantum Paperback (1962)

Kant's Transcendental Idealism

Henry Allison (1983)

Yale University Press

Phenomenology:

- Arose in creative critiasm of British Empiricism by Brentano and Husserl.
- New approach to the phenomena of our lived existence (James - radical empiricism
- There is a vast range of facts and patterns to which objective Science has no acess but which are open to the new discipline of phenomenology.
- In philosophy, phenomenology has led to a radically new way of understanding man - new speculations in the field of traditional ethics, metaphysics, and philosophy of Religion

---

- When philosophy ceases to be looked upon as the storehouse of inadequate answers to man's eternal questions and becomes an enterprise of questioning beyond questioning
- Husserl's ideas - turning point in 20th. Century of philosophy - to make philosophy a
- Rigorous Science - Such Schemes given up after ~~Kant~~ Descartes, Kant and positivist philosophers
- British philosophers - Whatever philosophy may be, it cannot be Science.

Husserl to from Vienna.
(meaning of Science and foundations of Science have always interested Vienna – Brentano, Husserl, Schlick, Carnap and even early Wittgenstein)

—

The merit of Descartes is to have discovered Subjectivity as the apodictic foundation of the elaboration of a philosophy of experience. – established metaphysics of experience on a solid foundation

Husserl: Primary Structure of Consciousness is intentionality.
Intentionality of Consciousness requires the absolute and empirical (in the sense of experienced) Coincidence of Self with Self which is the very definition of Self-Consciousness.

Husserl restricted himself to the analysis of fully reflexive Consciousness precisely because it is no longer "Pure Consciousness", but experience of the world which is the Subject of their analysis.
reflexive Consciousness = Cogito in Cartesian and Kantian Sense.

Hussert: phenomenology = transcendental idealism
Lebenswelt, the Life-World = Correlate of C.
Hussert is neither Cartesian nor Kantian

—

Sartre - Pre-reflexive Consciousness
It is the same C which is reflecting, and it is because of this reflecting that it can ever become aware of itself reflexively in the very act of reflexion.
Thus in the primary Reflecting (not yet Reflected) consciousness we reach Absolute C. as the source of all reflexive and thematic awareness.
Sartre: C is Self-Relational, Self-identical, Self-coincidental, immediate C (of) itself.

Existential Transcendentalism:
Difference between Existentiel and Existential
Ontic and ontological
ontic - Existentiel phenomena - 'death' 'care', 'anxiety', 'guilt', 'debt', "freedom"
- they reveal the 'ontological' structure of the Dasein = "Human Experience"
Existential categories = objects not a category of the mind, of the Reflexive thinking

Galileo did Scientific Research without being able to state clearly or thematically that he was doing. Phenomenology is in a similar position. It has to become gradually clarified.

Heidegger:

The Dasein is the being who asks the question of Being. It is through Dasein that the question of Being is made manifest. Dasein is the foundation of the possibility of the experience of beings and hence it can be called the 'opening' of Being.

Being in Heidegger's philosophy is a 'transcendental' in a very special and new sense. It is not a transcendental category of experience. It is not an existential. It is not a "transcendental idea" in the Platonic sense. It is not God. Heidegger has not told us what it is and the reason is that he cannot.

Heidegger's Being is not an abstraction. It is the very to be of beings, the ultimate ground of not only of experience but of being.

The problem that haunted Husserl until his death: "Foundations"
This is the guiding thread of his thought mathematician turned philosopher - Questioning himself of the foundations of mathematics, he is sent back to their logic, then to epistemology, then to ontology and even to philosophy of history - irrepressible movement of perpetually going-beyond.
giving Science an "absolute foundation"

Sciences in spite of the fact that their actual results are always approximative and imperfect, are oriented, in intention, towards an absolute objectivity. -
It is this "idea" of Science, not its results that is truly worthwhile.
There lies the meaning of Science and it is from this perspective that any inquiry into the foundations of Science must begin.
Thus it is the intention of the Scientist, which is to say intentionality of C that must be analysed. - The foundation has not be found

except on the side of the subject.

① Search for an absolutely objective foundation
② Analysis of subjectivity of consciousness

- Psychology is incapable of founding or even clarifying the absolute objectivity inherent in the idea of science.
New direction opened by Husserl → phenomenology

- The mathematician is used to manipulate ideal values or essences without ever having to ask himself whether or not they correspond to factual reality.

- The phenomenologist asks the question — What do we mean by ---? What is the meaning of that we have in mind when we judge, affirm, dream, live etc phenomenology never is an investigation of external or internal facts. On the contrary it silences experience provisionally, leaves the question of objective reality or of real content aside, in order to turn its attention solely and simply on the ~~real~~ reality in consciousness — "ideal essences"

To understand this he must completely forget the Kantian opposition between phenomenon and the thing-in-itself. Phenomenon according to Husserl is that which manifests itself immediately in consciousness

- From a non-psychological analysis of consciousness, Husserl passes to the analysis of non-psychological consciousness - to transcendental consciousness phenomenology becomes transcendental philosophy.

=

- Going Beyond Metaphysics:

Metaphysics is contested by Sophists, philodoxists, or misologists, by Skeptics, Relativists, empiricists and positivists, by men of Science theologians, by artists and by honest men!

Nobody has the courage any more or taste to undertake again the enterprises of a Plato, a Spinoza or a Hegel

"Gaia hypothesis"

The earth is an organism whose harmonious balance, temporarily disrupted by humanity, will eventually be restored"

Kant' Transcendental Idealism

Henry E. Allison (1983)
Yale University Press

According to standard picture: Kant's Transcendental Idealism is a metaphysical theory that affirms the unknowability of the "Real" (things-in-themselves) and relegates knowledge to the purely subjective realm of representations (appearances). It thus combines a phenomenolistic account of what is actually experienced by the mind and therefore knowable, with the postulation of an additional set of entities which, in terms of the very theory are unknowable. In spite of the obvious difficulties it creates, this postulation is deemed necessary to explain how the mind acquires its representations or atleast the material for them (their form being imposed by the mind itself) The basic assumption is simply that the mind can only acquire these materials as a result of being 'affected' by things in themselves. Thus such things must be assumed to exist, even though the theory denies any right to say

anything about them (presumably including the claim they exist).

According to Strawson, who echoes the standard picture, defines transcendental idealism as the doctrine that "reality is supersensible and that we can have no knowledge of it."

(the new cannon of Thought)
TERTIUM ORGANUM
P.D Ouspensky (1970)
Vintage Books N.Y
"A KEY TO THE ENIGMAS OF THE WORLD"
This is a great philosophical work from Russia.

Ouspensky - born mathematician and a mystic
Bridges Western Rationalsim with Eastern Mysticism.

According to Ouspensky - the dimensionality of space corresponds to the development of consciousness.

TRANSCENDENTAL LOGIC: (p233)

"In the world of infinite and fluent magnitudes "a magnitude may not be equal to itself, a part may be equal to the whole and of two equal magnitudes one may be infinitely greater than the other.

All this sounds as absurdity from the stand point of mathematics of the finite and constant numbers. But the mathematics of finite and constant numbers is itself the calculation of relations between non-existent magnitudes i.e. an absurdity. and therefore only that which from the stand point of mathematics seems an absurdity, can be the truth.

Logic now goes along the same path. It must now renounce itself, come to perceive the necessity for its annihilation and out of it new and higher logic can arise.

In his "Critique of Reason" Kant proved the possibility of transcendental logic.

* Before Bacon and earlier than Aristotle, in the ancient Hindu scriptures the formulae for this higher logic were given, opening the doors of mystery. But the meaning of these formulae were lost. They were preserved in ancient books, but remained there as some strange mummies of extinguished thought. Words without real content.

Now thinkers again discovered these principles and expressed them in new words, but again they were incomprehensible

and again they suffered transformation into some unnecessary ornamental form of words. But the ideas persisted. A consciousness of the possibility of finding and establishing the laws of the higher world has never lost. Mystical philosophy never regarded the logic of Aristotle all-embracing and all-powerful. It built its system outside of logic or above logic, unconsciously going along those paths of thought paved in remote antiquity.

The highest logic existed before deductive and inductive logic was founded. This highest logic may be called "Intuitive Logic" — the logic of infinity, the logic of ecstacy.

Not only is this logic possible, but it exists and has existed from time immemorial and has been formulated many times; it has entered into philosophical systems. The most precise and complete formulation of the higher logic I find in the writings of Plotinus in his On intelligible Beauty. I have called this higher system of logic Tertium organon because for us it is the third canon — third instrument of

thought after those of Aristotle and Bacon. The first was organon, the second Novum organon. But the third existed earlier than the first.

Man, master of the instrument, of this key may open the door of the world of causes without fear.

The New Logic: (Axioms)

- A is both A and not A

or · Everything is both A and Not A

or · Everything is All

These axioms in effect should be absolutely impossible. They are not axioms of higher logic they are merely attempts to express the axioms of this higher logic in concepts. In reality the ideas of higher logic are inexpressible in concepts. When we encounter such an inexpressibility it means we have touched the world of causes

The Meaning of it All (1918-1988)
Richard Feynman (1963 Lectures)
Thoughts of a Citizen Scientist. (University of Washington Seattle)
PERSEUS BOOKS

Science, Society and our precious ignorance

Scientist = An acrobat walking tight ropes of logic (beautiful)

=

(i) Uncertainity of Science.
(ii) " of Values
(iii) This Unscientific Age

Nature of Science - Doubt and Uncertainity

What is Science? Not good to be precise.
(i) Special method of finding things out
(ii) Body of knowledge from things found out
(iii) New things you can do when you have found something out - Technology

Most obvious character of Science is application
No industrial Revolution without Science
Power to do things has a value - good or bad depends on the user.

"To every man is given the key to the gates of heaven.
The same key opens the gates to hell"
So it is with Science

A characteristic of Science is Objectivity.
Observation is the judge of truth of an idea.
Where does the idea come from?
observations themselves do not suggest laws.
In Science, there is no interest in the background of the author of an idea. or his motive in expounding it.
The various ideas of Science must be Consistent.
* It is not a characteristic necessity of science that it must be mathematical.
Why nature is mathematical is a mystery.
Why did we assume that "mass" does not depend on speed?
" It is necessary and true that all of the things we say in Science - all of the conclusions, are uncertain because they are only conclusions. They are guesses as to what is going to happen and you cannot know what is going to happen because you have not made the most complete experiments
• Scientists are used to dealing with doubt and uncertainty.
• All Scientific knowledge is uncertain.

you to have to leave the door to the unknown ajar. you have to permit the possibility that you do not have it exactly right.

This freedom to doubt is an important matter in science and I believe, in other fields. Doubt is clearly a value in science.

=

The uncertainity of Values:

- Potential vs accomplishments
- Scientists are working in secret laboratories to develop the diseases which they were so careful to control!

Meaning of Life: • we do not know. we do not know the direction necessarily to go permit a possibility of alteration, of thinking, of new contributions and new discoveries for the problem of developing a way to do what we want ultimately, even when we do not know what we want.

" It is in the admission of ignorance and admission of uncertainity that there is hope for continuous motion of human beings in some direction that does not get confined

confined, permanently blocked as it has so many times before in various periods in the history of man. I say we do not know what the meaning of life is and what are the right moral values and we have no way to choose them and so on.

Religion: No discussion can be made of moral (p34) values, of the meaning of life and so on, without coming to the great source of systems of morality and description of meaning, which is in the field of Religion.

* Relation of Science and Religion
  church-going kind of Religion not the elegant theology that belongs to it
  There is a conflict between this kind of Religion (everyday) and Science
  Most Scientists do believe in 'personal God'.

The unScientific age:

"FLOW" The Psychology of optimal experience

Mihaly Csikszentmihalyi (Chicago)

(1991) Harper and Row NY.

'Flow' reminds us that the true approach to making ourselves feel and function better is to look within ... an inspiring worthwhile read.

Psychology, philosophy and humanism come together for society's sake as well as our own.

addresses seemingly unanswerable question of 'What is happiness?"

Flow = positive aspect of human experience

= joy + creativity + total involvement with life.

How to transform meaningless life to one of full enjoyment.

Aristotle (2300 Years ago)

- More than anything else, men and women seek happiness - health, beauty, money or power are for making us happy.

But, we do not know what happiness is any better than what Aristotle did.

Happiness is not something that happens.

It does not depend on outside events, but rather on how we interpret them.

People who learn how to control their inner feelings - inner experiences - will be able to determine the quality of life.

You cannot reach happiness by consciously searching for it.

- Control the content of your consciousness

* We all have experienced times when instead of being buffeted by anonymous forces we do feel controlled of our actions, masters of our own fate. On the rare occasions that it happens, we feel a sense of exhilaration, a deep sense of enjoyment that is long cherished and that becomes a land mark in memory for what life should be like. -

This is what we mean by <u>Optimal Experience</u>

* How to make optimal experience happen?

The best moments happen when a persons body or mind is stretched to its limits in a voluntary effort to accomplish something difficult or worthwhile.

Sometimes it can be painful.

Flow experience not the peculiarity of affluent. Flow is being used to generate ideas and practices in - Clinical psychotherapy, the Rehabilitation of Juvenile delinquents organization of activities in old people's home. . . .

Optimal Experience - order in Consciousness.

- Autotelic Self: translates potential threats into enjoyable challenges. and maintains harmony.

The Fabric of Reality

David Deutsch (1997)
(Penguin Books)

"Although history has no meaning, we can give it a meaning"

Karl Popper (The open Society and its elements vol 2. p278)

p321

*The old fogies of Scientific 'establishment'"
They behave irrationally .. They refuse criticism.
.. they try to suppress innovative ideas.
This Steriotype has been ~~estabtis~~ elevated into a philosophy by Thomas Kuhn (Structure of Scientific Revolutions)

World-view = paradigm = collection of theories = psychological and theoretical approach through which its holders observe and explain everything in their experience"
those that don't fall in — anomaly. fraud, error etc

Normal Science and Revolutionary Science
= change of paradigm

Kuhn makes the mistake of explaining the succession of paradigms to another Sociological or psychological ~~paradigm~~ terms rather than merit of rival explanations.

Unless one understands "Science as a quest for explanations" the fact that does find successive explanations, each objectively better than last, is inexplicable.

According to Copenhagen interpretation the equations of quantum theory apply to the unobserved aspects of physical Reality. At the moment of observation a 'different' process takes over involving a direct interaction between human Consciousness and Sub-atomic physics. One particular State of consciousness becomes Real the rest were only possibilities.. As for the unobserved events that interpolated between Conscious observations was one 'not permitted to ask' for physicists even during what way hey day of positivism and instrumentalism, Could accept such an 'insubstantial' Construction as the orthodox version of a fundamental theory is a question for historians.

* Its motivation was to Conclude that Reality was not multivalued.

20 yrs later Hugh Everett, Princeton graduate Student of Wheeler set out the many-Universes implications of QT.
Wheeler did not accept them.

Darwin's Evolutionary Theory:

* Unlikely that such complex adaptions could have evolved in the given time
  Heap of spare parts of Boing 747 → 747 (?)
But billions of years all over earth in the case of evolution.
Dawkin's - wants not to be surprised that complex adaptions have happened spontaneously. (No explanation?)
His selfish gene theory is full explanation (How?)
QM →
physical variables can store information.
they can store information. can interact with each others and replicate through transfer. stable and depend on QT.
virtual reality generation and universality.
Consequence of Turing principle that links physics and theory of computation

Popperian Epistemology:
No theory of knowledge should attempt to explain why we are successful in our attempts to explain things.
But, if we once we understand that the growth of knowledge is a physical process, it cannot be illegitimate to try to explain how and why it occurs.
- Epistemology is a theory of (emergent) physics.
The explanation must involve Quantum physics

and Turing Principle and the Theory of Evolution.

The Four Strands (QT, Evolution, Turing Principle, Epistemology)

Quantum Theory : Polkinghorne.
Oxford UP (2002)

WWW.OUP.CO.UK/VSI

By no means all the quantum world dissolves into elusiveness
Exclusion Principle → Structure of Periodic Table
QM — Stability of the atom

The Whole SHEBANG (1998)
Timothy Ferris
TouchStone Book NY

A State of the Universe(s) Report.