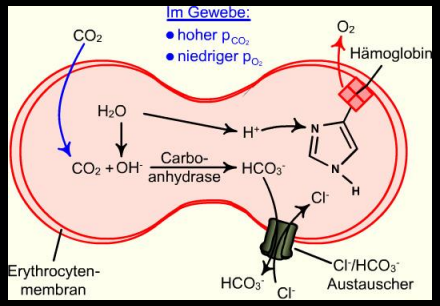
WORT UND WISSEN.

Wissenschaft in einer geschaffenen Welt

Is Fine-Tuning an Argument for a Creator?

An early Harvard Pioneer on Chemical and Biological Design Arguments



Dr. Harald Binder, Konstanz

Studiengemeinschaft
Wort + Wissen

„Science in
a created
World"

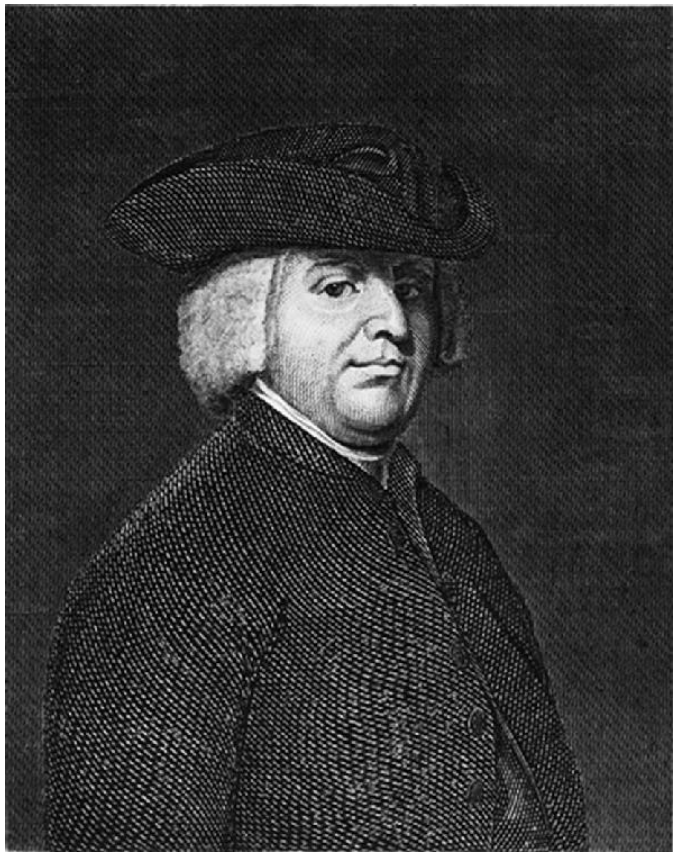
wort-und-wissen.org

L.J. Henderson

1. Biographical lines
2. Scietific working and development of his thinking
3. "The Fitness of the Environment" and "The Order of Nature"
4. Reflection on Fine tuning as an Indication for a Creater

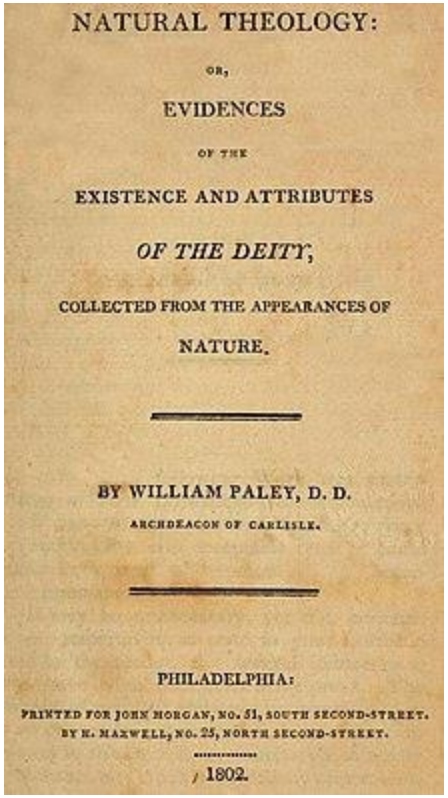
Lawrence Joseph Henderson
1878 - 1942

Natural Theology



William Paley
(1743 – 1805)

Watchmaker argument


NATURAL THEOLOGY:

OR,

EVIDENCES

OF THE

EXISTENCE AND ATTRIBUTES

OF THE DEITY,

COLLECTED FROM THE APPEARANCES OF

NATURE.

BY WILLIAM PALEY, D. D.

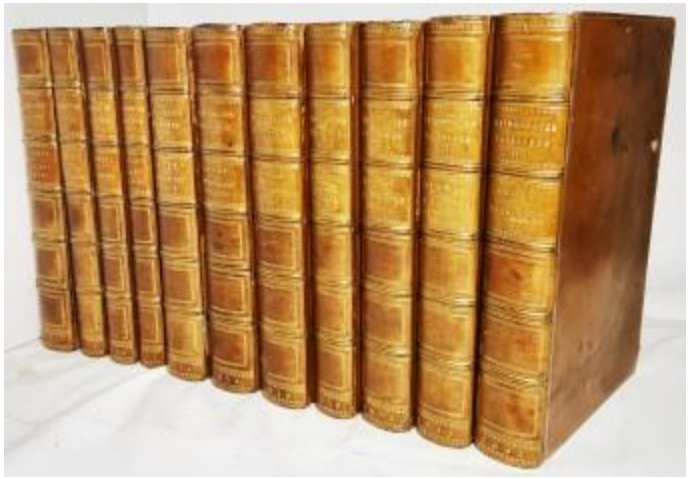
ARCHDEACON OF CARLISLE.

PHILADELPHIA:

PRINTED FOR JOHN MORGAN, No. 51, SOUTH SECOND-STREET.
BY H. MAXWELL, No. 25, NORTH SECOND-STREET.

1802.

Natural Theology
(1802)



Bridgewater Treatises I-VIII
1833 - 1845

Francis Henry Egerton,
8th Earl of Bridgewater
1756 - 1829

Henderson L.J.: Family background

Born: June 3th 1878, Lynn, Massachusetts, USA

Father: Joseph Henderson (Merchant)

Mother: Mary Reed (Bosworth); biographic remarks: marked ability and independence of character, brought up in a strong Calvinistic family

„Theology is a thing which in the last 2000 years has caused more misery and suffering—woe of body and mind—in the world than almost anything else, unless perhaps the inordinate pursuit of riches and power. I have hated creeds since I was a child."

2 younger brothers (twins), one died in infancy.

Henderson L.J: Education and Academic Career

1894 Entering Harvard College; active interest: physics and physical chemistry

1898 A. B. degree *magna cum laude*

1898 Entering Harvard Medical School: to learn biochemistry

1902 M. D. degree

1902 Laboratory of Franz Hofmeister at the University of Straßburg: Study: Characterization of Haemoglobin

1904 – 5 Laboratory of Richard; Lecturer (BC), Harvard Medical School

1905 – 10 Instructor

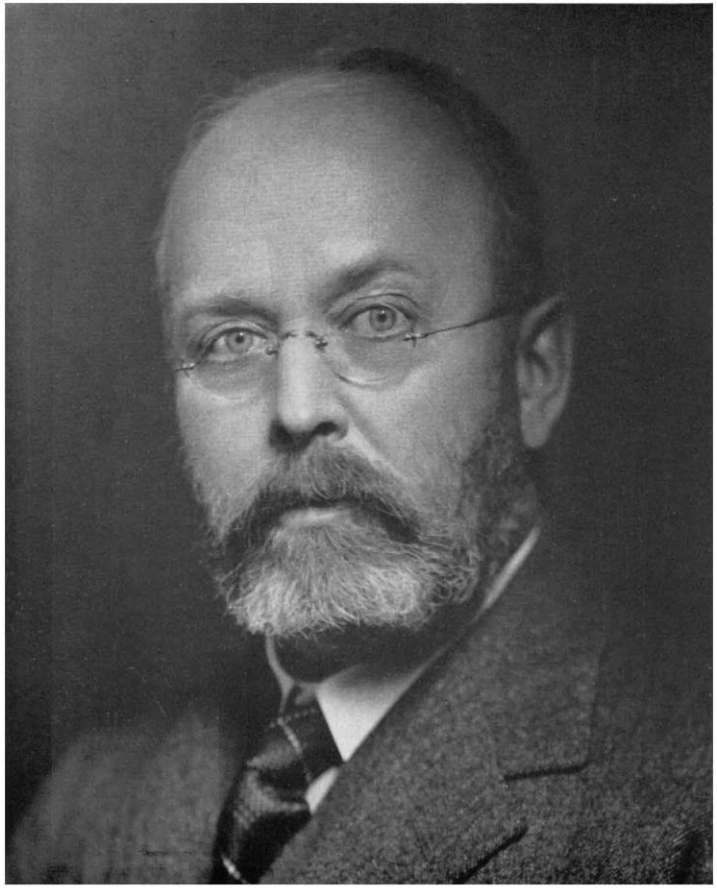
1910 – 19 Assistant Professor in Biological Chemistry

1919 - 34 Professor

1934 – 42 Abbott and James Lawrence Professor of Chemistry

Harvard University

1636 established
1639 named after John Harvard
1943 purpose: „to advance learning and perpetuate it to posterity, dreading to leave an illiterate ministry when our present ministers shall lie in the dust."



Lawrence Joseph Henderson
1878 - 1942

Henderson L.J: remarcable Publications

1905 Review about combustion heat of chemical substances

1908 Publications about Acid-base equilibria in Organisms:
Phosphate- und Carbonate – buffer systems

1913 The Fitness of the Environment: an inquiry in the biological significance of the properties of matter.

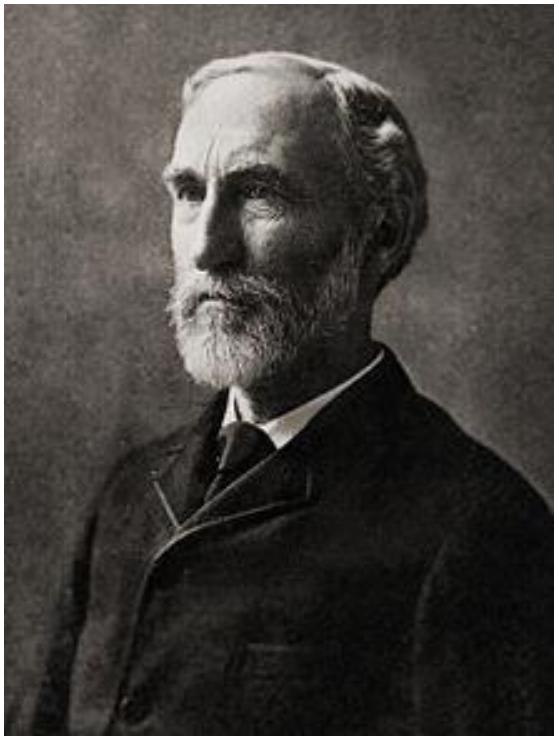
1917 The Order of Nature: An Essay

1928 Blood: a study of general physiology

1935 Pareto´s General Sociology

Henderson L.J: Developement of his ideas

Research in thermodynamics and mathematical physics;
Phase rules
Multi-phase systems
„On the Equilibrium of heterogeneous Substances" (1875/1878)

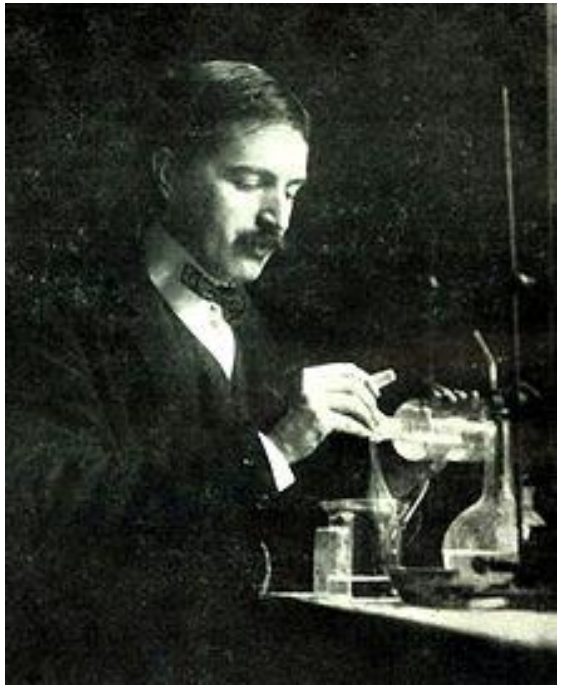


Josiah Willard Gibbs
(1839 – 1903)
Fundamental work for establishing physical chemistry

Henderson L.J: Development of his ideas

1905 Henderson returned from Europe to Harvard entering the Laboratory of T.W. Richards.

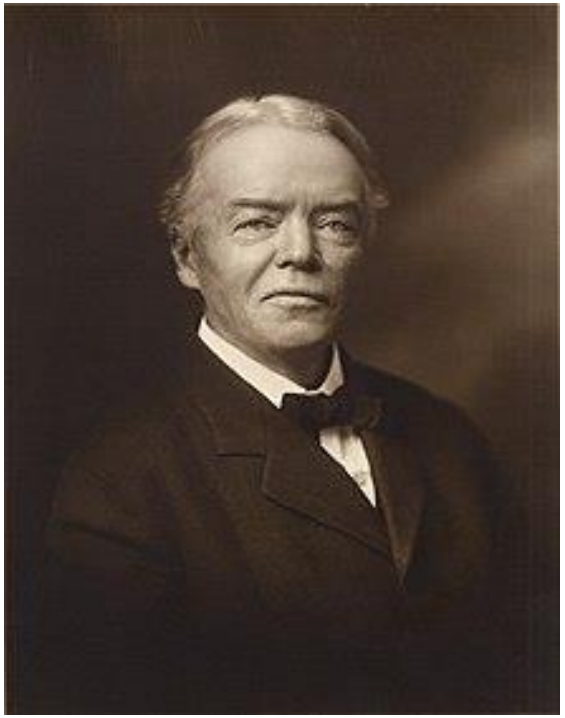
Exact determinations of the atomic weights



Theodore W. Richards
(1868 – 1928)
1914 Nobel Prize

Henderson L.J: Development of his ideas

1908 Seminar: Logic (Josia Royce)



Josia Royce, philosopher
(1855 – 1916)

Henderson L.J: Development of his ideas

1912 Contact, discussion with Christian Bohr

Christian H.L.P.E. Bohr
(1855 – 1911)
Danish Physiologist
(Father of N. Bohr)

Henderson L.J: Development of his ideas

1908 Publication on the Acid –base equilibrium in organisms;

Phosphate- und Carbonate – buffer systems

$$[H^+] = k \frac{[HA]}{[A^-]}$$ *Henderson – Hasselbalch Equation*

John T. Edsal (1973) (Student and fellow of L.J. Henderson)

Comment to Henderson's discovery and description of the buffer system:

$$CO_2 + H_2O <=> HCO_3^- + H^+$$

These "basic facts pointed clearly to a ´teleological order´ in the universe." Henderson "explicitly disavowed any attempt to associate this order with notions of design or purpose in nature, and considered his views fully compatible with a mechanistic outlook on the problems of biology"

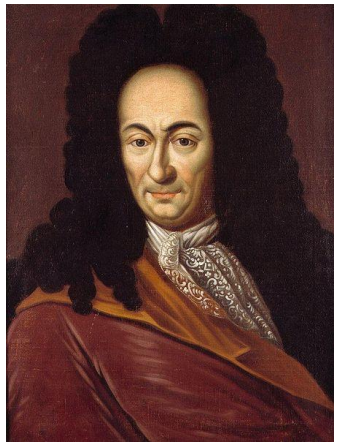
Henderson L.J: Development of his ideas

1911 Henderson starting lectures at Harvard on the History of Science

1924 Founding the History of Science Society
(together with George Sarton)

1913 The Fitness of the Environment

„the actual environment is really „the best of all possible environments for life."



G.W. Leibniz
1646 - 1716

There is, in truth, not one chance in countless millions of millions that the many unique properties of carbon, hydrogen, and oxygen, and especially of their stable compounds water and carbonic acid, which chiefly make up the atmosphere of a new planet, should simultaneously occur in the three elements otherwise than through the operation of a natural law which somehow connects them together. There is no greater probability that these unique properties should be without due cause uniquely favorable to the organic mechanism. These are no mere accidents; an explanation is to seek. It must be admitted, however, that no explanation is at hand.

Fitness, p. 276

L.J. Henderson (1913) The Fitness of the Environment

At length we have reached the conclusion which I was concerned to establish. Science has finally put the old teleology to death. Its disembodied spirit, freed from vitalism and all material ties, immortal, alone lives on, and from such a ghost science has nothing to fear. The man of science is not even obliged to have an opinion concerning its reality, for it dwells in another world where he as a scientist can never enter. (p. 311)

Henderson L.J: Development of his ideas

1917 The Order of Nature

Idea of physico - chemical „systems" (William Gibbs 1839 – 1903)

The organism is "an autonomous unit in which every part is functionally related to every other and exists as the servant of the whole."

dualistic view of "Life":
physico - chemical processes (mechanistical) –
organisation (selfregulation, teleological)

The whole is greater than the sum of the parts (Aristotle)

John Parascandola (1971): L.J. Henderson

"The emphasis in his work was always on the need to examine whole systems and to avoid the error of assuming that the whole was merely the sum of its parts"

Henderson L.J: Development of his ideas

1921 – 31 Blood as a physicochemical system (10 papers in J. Biol. Chem.)

1928 Blood: a study in general phyiology

Biological significant buffer systems – open buffer systems – in the blood

$CO_2 + 2\ H_2O \Leftrightarrow H_2CO_3 + H_2O \Leftrightarrow H_3O^+ + HCO_3^-$

> 50 % of the buffer capacity in the blood

Haemoglobin: Hb H^+ + H2O <=> Hb + $H3O^+$

ca. 35 % of the buffer capacity in the blood

Protein buffer (Albumin): ca. 7 % of the buffer capacity in the blood

Phosphate buffer: $H_2PO_4^- + H_2O \Leftrightarrow HPO_4^{2-} + H_3O^+$

intracellular! Ca. 5 % of the buffer capacity in the blood

Biological significant buffer systems – open buffer systems

Phosphate-buffer

Supposing that the compounds of phosphorous have been introduced into the composition of a living organism by a process of natural selection, each one in accordance with its particular properties and comformably to the simple theory of natural selection, what is to be said about the usefulness of the substances that seem to be inevitable as products of phosphorous metabolism. Is this usefulness an accident, or, if not, what is the explanation?

Henderson L.J. (1936) Memories (p. 177)

Biological significant compounds – open buffer systems

Bicarbonate-buffer

… if carbon dioxide were either an insoluble or a high soluble gas, its mobility in nature, the function of the lungs, the respiratory function of the blood, and countless other physiological properties in animals and plants would have to be very different from what they are and, so far as I could see, would be in any conceivable case much less effective.

Henderson L.J. (1936) Memories (p. 177)

Biological significant compounds

Water

… it seemed clear that these maxima and minima indicate that water is in every instance a singularly favorable substance in relation to the stability, the complexity, or the metabolism of living organisms.

Henderson L.J. (1938) Memories (p. 191)

I felt, in other words, that water clearly possesses a pattern of qualities, nearly ervery one of them unique or nearly so in magnitude, and further that each of these in itself, and all of them in cooperation, are in many respects extraordinarily favorable for any kind of living organism of which I could conceive, or, to put it in another way, favorable to extensive and varied trials and relatively numerous success in the trial and error process of organic evolution.

Henderson L.J. (1938) Memories (p. 192)

Teleology – Natural Theology

… I know more about the literature of teleology and final causes than about natural theology. I was at least vaguely aware that a great part of what had been written on this subject is, from a scientific standpoint irrelevant, if not nonsense.

Henderson L.J. (1936) Memories (p. 178/9)

Fitness

I saw that fitness is a reciprocal relation, that adaptions in the Darwinian sense must be adaptions to something, and that complexity, stability, and the intensity of diversity of metabolism in organisms could not have resulted through adaption unless there were some sort of pattern in the properties of the environment that, as I now partly knew, is both intricate and highly singular.

Henderson L.J. (1936) Memories (p. 180)

Fitness of the Environment

But I should prefer a different style, and I find those parts of the book in which there is reference to the philosophical discusssions of teleology, vitalism, and so forth, more or less irrelevant and immature.

Henderson L.J. (1938) Memories (p. 185) about: Fitness of the Environment

My belief was confirmed that fitness is a reciprocal relation between an indicate pattern of properties of organisms, built up presumably by trial and error and natural selection in the course of organic evolution, and an intricate pattern of properties of water, carbon dioxide, and the compounds of the three elements hydrogen, oxygen and carbon. This second pattern of properties I now found to be much more intricate than I had at first supposed, and the discovery step by step of this greater intricacy had for me the weight of an induction. Moreover, it was evident that the trial and error of the organic evolutionary process could have had nothing to do with this pattern of properties.

Henderson L.J. (1938) Memories (p. 193) about: Fitness of the Environment

Fitness of the Environment

What can be said to explain the existence of this pattern, bearing in mind that it seems far too intricate to be fortuitous and that it appears to be independent of any process that can be thought of as an adaption?

The upshot of my reading and thinking was the conviction that there is, in the end, nothing more to say.

Henderson L.J. (1938) Memories (p. 195) about: Fitness of the Environment

Fitness of the Environment

I drew the conclusion and stubbornly asserted that such an intricate relation is the kind of thing that calls for scientific explanation, but I also drew the conclusion from my studies and reflections that no explanation could be given and that I couldn´t even think of the possibility of an explanation.
Years later, when I came to know Alfred Whitehead, he told me that he particularly liked the position that I had taken in that I avoided the pitfalls of the teleological view and of the mechanistic view alike, and this has always been a source of satisfaction to me ….

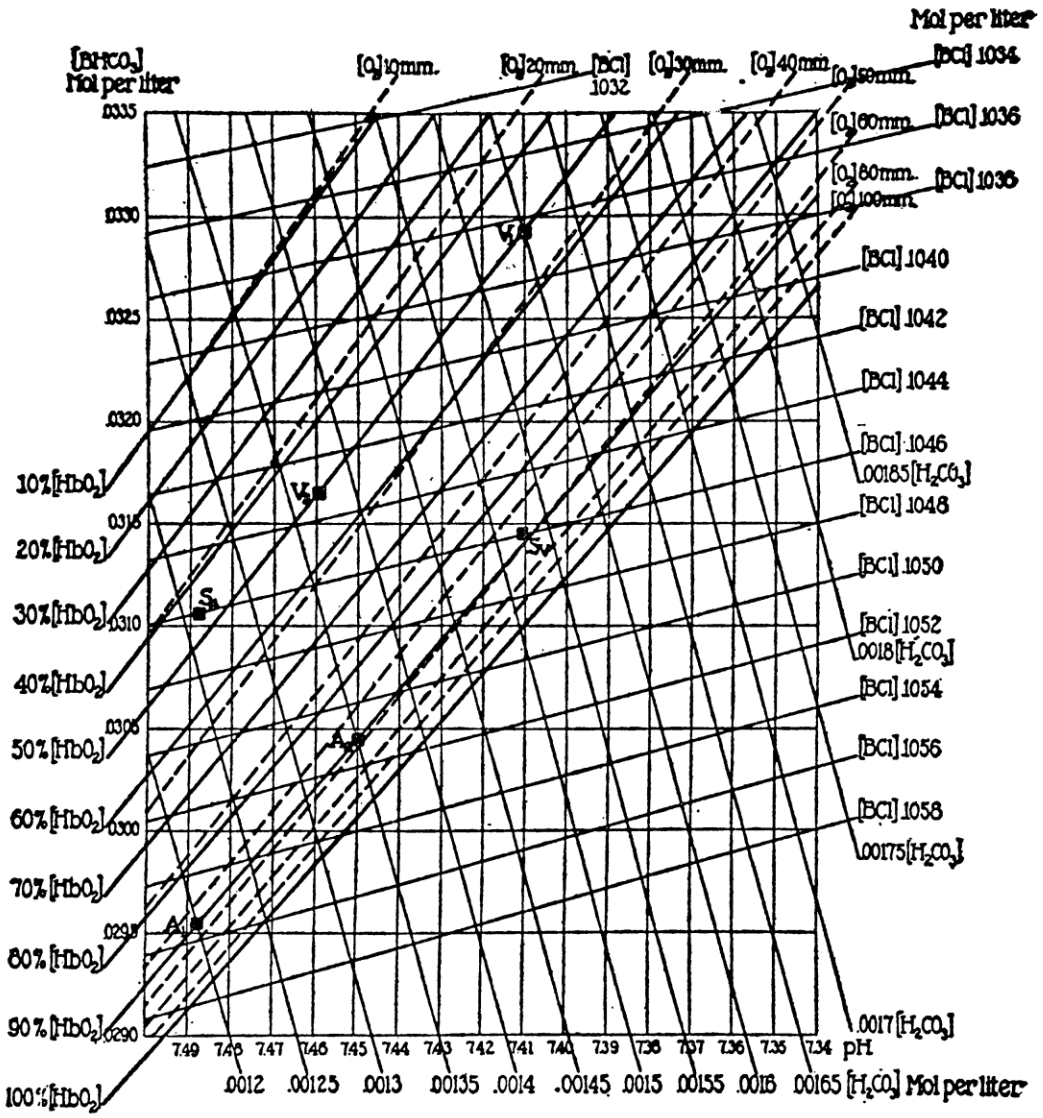
Henderson L.J. (1938) Memories (p. 196) about: Fitness of the Environment

Reflexion

In my scientific work I have three ideas:

- the general theory of the acid-base equilibrium
- the general theory of the fitness of the environment
- the synthetic treatment of blood as a physico-chemical system

Henderson L.J. (1939) Memories (p. 256)



Cartsian Nomogram
Blood of Mammals
(Henderson (1928)
Blood: A Study in general Physiology, p.98);
aus J. Parascandola (1971)
Organismic and Holistic Concepts in the Thought of L.J. Henderson.
J. Hist. Biol. 4, 63-111.

L.J. Henderson (1928) Blood

For these facts I have no explanation to offer. All that I can say is that they exist, that they are antecedent to organic adaptations, that they resemble them, and that they can hardly be due to chance" (p. 355-6)

Mechanismus – Vitalismus

1918 Meeting of the Am. Philosoph. Ass.

Conflict between Mechanism and Vitalism

L.J. Henderson \
H.S. Jennings (Zoologe) \|
H.C. Warren (Psychologe) > **Basis of Reference** (1918)
W.T. Marvin (Psychologe, Philosoph) \|
R.F.A Hoernle (Philosoph) /

Henderson (1918) Mechanism, from the Standpoint of Physical Science

(1) Can biological organization be accounted for in physicochemical terms?
(2) What is the origin of this organization?

Fry I. (1996) On the Biological Significance of the Properties of Matter: L.J. Henderson´s Theory of the Fitness of the Environment. J. Hist. Biol. 29, 155-196.

For what can be known about God is plain to them, because God has shown it to them. For his invisible attributes, namely, his eternal power and divine nature, have been clearly perceived, ever since the creation of the world, in the things that have been made. So they are without excuse.

Roman 1,19+20

By faith we understand that the universe was created by the word of God, so that what is seen was not made out of things that are visible.

Hebrews 11,3