



W. Ross Ashby (London, 6 September 1903 – 15 November 1972) was an English psychiatrist and a pioneer in cybernetics, the study of [complex systems](#) . His first name was not used: he was known as *Ross Ashby*

His two books, *Design for a brain* and *An introduction to cybernetics*, were landmark works. They introduced exact, logical, thinking to the nascent discipline, and were highly influential.

Biography

William Ross Ashby was born in 1903 in London, where his father was working at an advertising agency. ^[1] From 1917 to 1921 William studied at the Edinburgh Academy in Scotland, and from 1921 at Sidney Sussex College, Cambridge, where he received his B.A. in 1924 and his M.B. and B.Ch. in 1928. From 1924 to 1928 he worked at the St. Bartholomew's Hospital in London. Later on he also received a Diploma in Psychological Medicine in 1931, and an M.A. 1930 and M.D. from Cambridge in 1935.

Ross Ashby started working in 1930 as a Clinical Psychiatrist in the London County Council. From 1936 until 1947 he was a Research Pathologist in the St Andrew's Hospital in Northampton in England. From 1945 to 1947 he served in India where he was a Major in the Royal Army Medical Corps.

When he returned to England he served as Director of Research of the Barnwood House Hospital in Gloucester from 1947 until 1959. For a year he was Director of the Burden Neurological Institute in Bristol. In 1960 he went to the United States and became Professor, Depts. of Biophysics and Electrical Engineering, University of Illinois at Urbana-Champaign, until his retirement in 1970. ^[2]

Ashby was president of the [Society for General Systems Research](#) from 1962 to 1964. He became a fellow of the Royal College of Psychiatry in 1971.

On March 4–6, 2004, a W. Ross Ashby centenary conference was held at the University of Illinois at Urbana-Champaign to mark the 100th anniversary of his birth. Presenters at the conference included [Stuart Kauffman](#) , [Stephen Wolfram](#) and [George Klir](#) .^[3] In February 2009 a special issue of the

[International Journal of General Systems](#)

was specifically devoted to Ashby and his work, containing papers from leading scholars such as

[Klaus Krippendorff](#)

,
[Stuart Umpleby](#)

and

[Kevin Warwick](#)

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Work

Despite being widely influential within [cybernetics](#) , [systems theory](#) and, more recently, [complex systems](#)

, he is not as well known as many of the notable scientists his work influenced including [Herbert Simon](#)

,
[Norbert Wiener](#)

,
[Ludwig von Bertalanffy](#)

, Stafford Beer and

[Stuart Kauffman](#)

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Journal

Ashby kept a journal for over 44 years in which he recorded his ideas about new theories. He started May 1928, when he was medical student at St. Bartholomew's Hospital in London. Over

the years he wrote down a series of 25 volumes totaling 7,400 pages. In 2003 these journals were given to The British Library, London, and since 2008, they were made available online as The W. Ross Ashby Digital Archive. [\[6 \]](#)

Cybernetics

Ross Ashby was one of the original members of the [Ratio Club](#) , a small informal dining club of young psychologists, physiologists, mathematicians and engineers who met to discuss issues in cybernetics. The club was founded in 1949 by the neurologist

[John Bates](#)

and continued to meet until 1958.

Earlier, in 1946, [Alan Turing](#) wrote a letter [\[7 \]](#) to Ashby suggesting he use Turing's [Automatic Computing Engine](#)

(ACE) for his experiments instead of building a special machine. In 1948 Ashby made the [Homeostat](#)

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Variety

In *An Introduction to Cybernetics* Ashby formulated his Law of Requisite [Variety](#) [\[9 \]](#) stating that "variety absorbs variety, defines the minimum number of states necessary for a controller to control a system of a given number of states." This law can be applied for example to the number of bits necessary in a digital computer to produce a required description or model.

In response Conant (1970) produced his so called "[Good Regulator](#) theorem" stating that "every Good Regulator of a System Must be a Model of that System".

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Stafford Beer applied Variety to found management cybernetics and the [Viable System Model](#) . Working independently

[Gregory Chaitin](#)

followed this with
[algorithmic information theory](#)

See also

- [Cybernetics](#)
- [Homeostat](#)
- [Intelligence amplification](#)
- [Self-organization](#)
- [Systems theory](#)

Publications

Books

- 1952. [Design for a Brain](#) , Chapman & Hall.
- 1956. [An Introduction to Cybernetics](#) , Chapman & Hall.
- 1981. Conant, Roger C. (ed.). *Mechanisms of Intelligence: Ross Ashby's Writings on Cybernetics* , Intersystems Publishers.

Articles, a selection

- 1940. "Adaptiveness and equilibrium". In: *J. Ment. Sci.* 86, 478.
- 1945. "Effects of control on stability". In: *Nature*, London, 155, 242-243.
- 1946. "The behavioural properties of systems in equilibrium". In: *Amer. J. Psychol.* 59, 682-686.
- 1947. "Principles of the Self-Organizing Dynamic System". In: *Journal of General Psychology* (1947). volume 37, pages 125–128.
- 1948. "The homeostat". In: *Electron*, 20, 380.
- 1962. "Principles of the Self-Organizing System". In: Heinz Von Foerster and George W. Zopf, Jr. (eds.), *Principles of Self-Organization* (Sponsored by Information Systems Branch, U.S. Office of Naval Research). Republished as a [PDF](#) in *Emergence: Complexity and Organization* (E:CO) Special Double Issue Vol. 6, Nos. 1-2 2004, pp. 102–126.

About W. Ross Ashby

- Asaro, Peter (2008). ["From Mechanisms of Adaptation to Intelligence Amplifiers: The Philosophy of W. Ross Ashby,"](#) in Michael Wheeler, Philip Husbands and Owen Holland (eds.) *The Mechanical Mind in History* , Cambridge, MA: MIT Press.

References

1. [^](#) [Biography of W. Ross Ashby](#) The W. Ross Ashby Digital Archive, 2008.
2. [^](#) [Autobiographical summary](#) , taken from Ashby's own notes, made about 1972.
3. [^](#) [W. Ross Ashby Centenary Conference](#) The W. Ross Ashby Digital Archive, 2008
4. [^](#) [International Journal of General Systems](#)
5. [^](#) Cosma Shalizi, [W. Ross Ashby](#) web page, 1999.
6. [^](#) [W. Ross Ashby Journal \(1928-1972\)](#) The W. Ross Ashby Digital Archive, 2008.
7. [^](#) [Alan Turing letter](#) The W. Ross Ashby Digital Archive, 2008.
8. [^](#) [Java applet simulation](#) by Dr Horace Townsend
9. [^](#) (Ashby 1956)
10. [^](#) Int. J. Systems Sci., 1970. vol 1, No. 2 pp89-97

External links

- [The W. Ross Ashby Digital Archive](#) includes an extensive biography, bibliography, letters, photographs, movies, and fully-indexed images of all 7,400 pages of Ashby's 25 volume journal.
- [Homepage of William Ross Ashby](#) with a short text from the *Encyclopædia Britannica Yearbook* 1973, and some links.
 - Asaro, Peter M. (2008). "[From Mechanisms of Adaptation to Intelligence Amplifiers: The Philosophy of W. Ross Ashby,](#)" in Michael Wheeler, Philip Husbands and Owen Holland (eds.) [The Mechanical Mind in History](#) , Cambridge, MA: MIT Press, pp. 149–184.
- [W. Ross Ashby](#) web page by [Cosma Shalizi](#) , 1999.
- [W. Ross Ashby \(1956\): An Introduction to Cybernetics](#) , (Chapman & Hall, London): available electronically , Principia Cybernetica Web, 1999
- [The Law of Requisite Variety](#) in the Principia Cybernetica Web, 2001.
- [159 Aphorisms from Ashby and further links at the Cybernetics Society](#)
- [W. Ross Ashby, Cybernetics and Requisite Variety](#) (1956) from *An Introduction to Cybernetics*
- [W. Ross Ashby, Feedback, Adaptation and Stability](#) (1960) from *Design for a Brain*
- [What is Cybernetics?](#) Livas short introductory videos on YouTube