The purpose of analogy is to familiarize us with new ideas by linking them to ideas we already understand. It is not uncommon, however, for new theories to be linked analogously to ideas which are hardly understood by anyone, but which have captured the popular imagination by their progressive appeal. Perhaps also the less accurate impression that more impressive does audience understands of a subject used as an analogy, the more impressive do the arguments appear. This results, if I may fall into the same trap myself, from some error in the argument appear. Now that we are celebrating the centenary of the words 'germ' and 'evolution', how that we can examine the influence of the publication of The Origin of Species, it may be useful to examine the influence of biological analogies on architectural theory, and try to assess the usefulness with respect to the architecture of our own day.

The origins of the biological analogy, like so many ideas which have influenced modern architectural doctrines, can be traced to about the year 1750. At that time, two epoch-making scientific books were published: Linnaeus' Species Plantarum (1753), in which the entire vegetable kingdom was classified binomially; and Buffon's Histoire Naturelle (1749), which attempted to incorporate all biological phenomena into a general interpretation of the laws governing rate of progress. Linnaeus' work does not immediately present inquiry. The universe, Linnaeus' work does not immediately concern this present inquiry. The universe, Linnaeus' work does not immediately concern this present inquiry.

Buffon, however, is of considerable relevance. Since he disagreed both with Linnaeus' immutable species, and with his whole doctrine of classification by artificial means, he had already been emphasized by Winckelmann, Montesquieu and de Gouges respectively, although they did not, as far as I know, go so far as to say that it actually caused evolution direct. This, however, was the essence of Lamarck's revolutionary argument. 'It is not', he wrote, 'the organs -- that is to say, the form and character of the animal's bodily parts -- which have given rise to its habits and peculiar properties, but, on the contrary, its habits and manner of life and the conditions in which its ancestors lived that has in the course of time fashioned its bodily form, its organs and its qualities.'

The word 'biology', or science of life, was invented by Lamarck; in about 1800; at the same time, the word 'morphology', or science of form, was invented by Goethe, who in his own day was as famous a scientist as he was as a poet. Being a poet, however, he understood the term morphology in a much wider sense than we do today (when the subjects of its study are confined to the comparison and relationships of living structures and their development), and included non-living forms such as rocks. This, as we shall see, was to be another element of confusion in the biological analogy in that, from its inception, there was uncertainty as to whether morphology was concerned with structures which live, or with structures which grow. Félix Vicq d'Azay, for example, at the end of the eighteenth century, had refuted the old comparison between the growth of organisms and the growth of crystals, contending that crystals are mathematically regular in shape and homogenous in structure, whereas organisms are of rounded shapes and complex composition. On the other hand Jacob Schleiden, fifty years later, considered that life was nothing more or less than a 'form-building force', and he considered the growth of crystals and organisms to belong to the same category of phenomena. As late as 1898, Herbert Spencer could still assert that the growth of crystals and organisms was 'an essentially similar process'. Since it was Spencer's biological works which mainly influenced Frank Lloyd Wright, the possible effects of this ambiguity will be obvious.

The nineteenth century, however, 'organic' came to be regarded less as a quality of 'life which moves'; it was thus the asymmetry of plants and visera, rather than the symmetry of animal skeletons, which came to be accepted as characteristic of organic structures, whereby biology could still be adduced to support the architectural fashions of the age.

The most important enunciation of evolutionary theory at this time were those published by Lamarck. Lamarck was essentially a botanist of the school of Buffon, but when, at the age of fifty, he was appointed professor of Zoology by the National Convention without any previous experience at all, he was obliged to transfer his attention to the study of anatomy. As a result of this combination of disciplines, he was eventually led to conclude that living forms had not evolved retrogressively as Buffon had believed, but progressively. This change of attitude was only to be expected. Buffon, living in the age of Rousseau, and at a time when the Book of Genesis was literally accepted, naturally favoured a hypothesis implying a Fall from perfection. Lamarck, in the age of Revolution, and at a time when the idea of Progress was literally accepted, naturally favoured a contrary view.

Similarly, it was not entirely strange that Lamarck should suggest that evolution was due to environment. The importance of this influence on art, law, and society had already been emphasized by Winckelmann, Montesquieu and de Gouges respectively, although they did not, as far as I know, go so far as to say that it actually caused evolution direct. This, however, was the essence of Lamarck's revolutionary argument. 'It is not', he wrote, 'the organs -- that is to say, the form and character of the animal's bodily parts -- which have given rise to its habits and peculiar properties, but, on the contrary, its habits and manner of life and the conditions in which its ancestors lived that has in the course of time fashioned its bodily form, its organs and its qualities.'
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Several criticisms relevant to the present enquiry may be made concerning Coleridge's views. One is that the process of artistic creation is explained by him as virtually an unwilled and unconscious process of mind. The second is that however violently he might attack the 'mechanical' theory, it has been frequently used by biologists to explain how living organisms actually work. It was not only early philosophers such as Descartes who regarded the animal body as a machine. One of the most famous of Cuvier's disciples, Henri Milne-Edwards, stated that he had 'tried to grasp the manner in which organic forms might have been invented by comparing and studying living things as if they were machines created by the industry of man'. Finally, it is worth noting that no explanation of morphological development was more mechanistic than Darwin's 'Natural Selection'.

It has already been pointed out that by 1859 there was nothing novel in the idea of evolution as applied to the theory of life, even though the term 'evolution' was not used in this sense until 1835. This is equally true with regard to the theory of architecture. The classical architects of the early eighteenth century believed implicitly in evolution, since they believed that the moderns had improved on the Romans, just as the Romans improved on the Greeks. Even mid-nineteenth-century writers on architecture such as Fergusson, who specifically criticized Lamarck's theories, believed in architectural evolution because they believed in Progress. For biologists the novelty of Darwin's theory was that it attributed evolution to the selection of existing forms (or, to put it another way, the elimination of obsolescent forms) by Nature herself. It thus inevitably weighed the balance in favour of the 'function follows form' school by presupposing 'that the forms existed in the first place'. Lamarck had claimed that a change in environment actually modifies the form of animals, and that these changes are transmitted by heredity. Darwin claimed, on the contrary, that the changes were arbitrary and accidental, and that species changed only because the unfavourable functional forms never survived. He compared the evolution of natural selection to that of a man building a house from field-stones of various shapes. The shapes of these stones, he said, would be due to definite causes, but the uses to which the stones were put in the building would not be explicable by those causes. Yet as Charles Singer has pointed out, when a man builds a house, there is the intervention of a definite purpose, directed towards a fixed end and governed by a clearly conceived idea.

The builder in the proper sense of the word selects. But the acts of selection—mental events in the builder's mind—have no relation to the 'causes' which produced the stones. They cannot therefore be compared with the action of Natural Selection.

Architectural theorists who are guilty of similarly inexact analogies between build- ing and botany may find consolation in the thought that a classic precedent was furnished by the Master himself.

If in fact we look at those phenomena which scientists consider as biological, we shall see that the number of exact parallels which can be drawn are slight. Vico classified organic functions into nine categories: digestion, nutrition, circulation, respiration, secretion, osillation, generation, irritability, and sensibility, and of these only circulation would seem to have any analogy with the function of build- ing. Similarly, if we examine morphological systems of classification, whether it be...
the Linnaean system (based on one selected feature), Cuvier's system (based on what he called the 'spatial relationship' of organic elements, i.e. radii, longitudinal, and vertebre), there seems little evidence that is separate of suggestive of buildings, massive, and vertebrate), there seems little evidence that is suggestive of suggestive of suggestive of subject the design],[general and poetic, and in fact the features held in common seemed limited to four: the relationship of organisms to their environment, the correlation between organs, the relationship of form to function, and the principle of vitality itself. The relationship of form to function, and the principle of vitality itself.

The most comprehensive analogy concerns the influence of environment on design, an idea which undoubtedly derived its main stimulus from Darwin, although it first emerged in the work of Alexander von Humboldt, who opposed the strict Linnaeus and suggested that plants should be classified according to the climates in which they were found, rather than according to inherited characters determinable in a museum. Being of a romantic and aesthetic disposition, he sought a system of classification through the impression made by landscapes when simply looked at by the ordinary observer. He was very interested in architecture and described in detail the pre-Columbian buildings he found in Central America. He nowhere seems to have suggested, however, that the design of ancient structures was best suited to mountainous ground. This idea was taken up enthusiastically by Herbert Spencer, from whose writings (so Frank Lloyd Wright tells us) Louis Sullivan derived many, if not all, his biological ideas. However, since nobody has ever denied the obvious fact that form and function are in some way related, it is worth considering how this relationship does fit in with a theory of design.

In case it should be objected that such a topic is not part of the 'Organic' theory at all, but of the 'Functional' theory, it is opportune to suggest that whereas in the functional analogy, the relationship between form and function is considered as necessary to beauty, in the biological analogy, it is considered as necessary to life. Historians are generally agreed that credit for this new interpretation must be given, as far as architectural theory is concerned, to Louis Sullivan, although it may be noted that he never expressed it or applied it until after he had met Wright. It had been foreshadowed by Greenough and Baudelaire, who, perhaps with von Humboldt in mind, suggested that the best critics were those who had travelled alone through forests and prairies, contemplating, dissecting, and writing. 'They knew,' he wrote, 'the admirable, inevitable relationship between form and function.' Similarly, Viollet-le-Duc, like Ruskin before him, drew attention to the way medieval sculptors had studied the morphology of vegetable, and how they understood that the contours of plants 'always express a function, or submit themselves to the necessities of the organism.' He did not, however, draw any major philosophical conclusions from this observation, except to say that the mason's 'sought to bring out in the structures of their buildings those qualities they found in vegetables'. The French Rationalists were in fact more interested in the idea that form follows structure (which they found quite intelligible without the use of elaborate analogies), so that there can be little doubt that it was Sullivan who first made biological analogies the foundation of a total architectural doctrine. Sullivan seems to have derived little inspiration from Viollet-le-Duc's theories,
since his main interest was in composition rather than in construction (which he
left to Adel). Yet following the anti-academic fashion of his age, he objected to the
term 'composition', although in the circumstances it is difficult to see why. Since
'decomposition' is the chief characteristic of organisms which are dead, it might
reasonably be inferred that 'composition' is the chief characteristic of organisms
which are living. But, like so many theorists who have found the biological analogy
stimulating, he never really pursued it very deeply, and made little distinction as to
whether it referred to the object created or the process of design. Whilst some of
his writings suggest a Lamarckian interpretation of evolution (as when he wrote
that 'it was not simply a matter of form expressing function; the vital idea was that
that it had been created by direct adaptation to functional requirements demonstrates that form does
organ already specialized, the more obvious danger of their misuse, and nothing can
better serve the advancement of architecture than that examples of this should be
publicly singled out.

An even more cogent reason for the new critical attitude is that, just as biolo-
gists have become very conscious of 'biotic' environment (i.e. the influence of free
organisms on each other), so we are becoming much more aware that 'environment'
does not only comprise natural scenery, but also the accumulated legacy of the
buildings in our towns. The urban scene, especially in America, is in many dis-
tricts predominantly 'contemporary', so that modern architecture has no longer an
excuse for ignoring its neighbours. On the other hand, with the general acceptance
of functionalism, there is no need to perpetuate the early functionalist's aggres-
sive disdain for the so-called 'beaux-arts' styles. Such buildings, when juxtaposed
against our own, bear gratifying testimony to the victory of the fittest, but they also
carry the awful warning that, in architecture, it is not necessarily only the Fittest
which Survive.

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ous now as when the slogan was first formulated, and apart from holding that
architecture must be a living art, we cannot go much deeper into the mystery of life
than when The Origin of Species was first given to an astonished and excited world.
Within the last few years, however, one surprising change has occurred in the
philosophy of architecture which provides a curiously apposite termination to a
study of the influence of Darwin. The nineteenth century's naive faith in evolution-
ary progress is now being seriously challenged, and a suspicion has arisen that
Buffon's approach may not have been entirely wrong. This does not of course mean
that optimism has given place to pessimism, but simply that we no longer accept,
like the followers of Darwin, the idea that every change is for the best. Recently
however it has become clear, in both Europe and America, that the leading archi-

tectural periodicals are no longer content merely to divide all new buildings into the
two categories: 'evolutionary' and 'vestigial', and leave it at that; they are subject-
ing contemporary architecture to systematic criticism in order to determine how
improvements can best be brought about.

This, of course, is the very opposite of natural selection, but it has become
necessary because we can no longer afford to regard every new 'contemporary'
building as automatically an advance on the rest. In the early years of the Inter-
national Style, there was much to be said for accepting every manifestation of the
new spirit uncritically, since premature disparagement might have stunted its early
growth. Today, when the functional forms evolved by the leading modern architects
are so widely accepted, there is an obvious danger of their misuse, and nothing can
be more poetic expression of the ideal of
logcal Analogy is that it is simply a more poetic expression of the ideal of
L'Architecture Vivante.

It is now a century since the Revue Generale de l'Architecture launched the
slogan 'Organic Architecture' in this sense, although in the time it proved prema-
technological plan forms, the possibility of growth by asymmetrical addition, the
process of creation to site and client, the use of local materials, the individual-
ly every created thing, the
functions evolved by the lead'"
organism already specialized, the most of them suggest the Coleridgean
merely 'beautifying' a building as a result of organic necessity because it is, in

The earliest use I have found of the word 'organic' with specific reference to a 'living' archi-
tecture occurs in Lamennais' beautiful essays on Gothic buildings in De l'Art et du Beau
(1822): 'Ce qui les caractérise, c'est le travail organique qui de tant d'éléments divers a fait
une seule forme, dont les inombrables parties... se fondent en un corps unique et vivant.'