RICE UNIVERSITY

A STUDY OF FUNCTIONALIST THEORIES IN ARCHITECTURE

by

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ABSTRACT
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This thesis is an analysis of functionalist theories and not of functionalists themselves. I will determine what the theories cover hoping to clear up to some extent the misunderstandings and limited aspects pertaining to the theories.

Functionalism is the underlying order in architecture. It embodies and synthesizes the life principle with the universal laws of science; it humanizes architecture and gives it meaning.

These thoughts are constantly recurring in the writing of the functionalists, who did not disregard imagination but sought to give it order and meaning in relation to man's physical, intellectual and spiritual needs.

The main lesson we can learn from the functionalists is not what they did so much as what they said. Functionalism is not an object, it is a philosophy; a basis for architecture. No one building can be held up as the perfect embodiment of
functionalist principles and many (done by functionalists) are quite bad. Start with first hand knowledge rather than second hand experience; that knowledge based on inductive reason and the sense experiences.

The conscious following of rules is the surest way to kill freshness. Principles should be fused into the subconscious element of our thought and become one with feeling and intuition; an integral part of our everyday experiences.

The functionalists are concerned with the rational approach emphasizing the physical needs of man because this approach is easily explained and demonstrated. The metaphysical aspects of the intellect and spirit are less satisfying since it is impossible to "drive a point home" with a conclusive example. The functionalists repeatedly allude to the intellectual and spiritual needs of man but in compliance with the physical needs.

The main difference between functionalism and formalism (form for form's sake) is that through functionalism expression and delight evolve in accordance with the total needs of man. Whereas formalism is an end in itself, compromising the needs of man.
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction</td>
<td>1</td>
</tr>
<tr>
<td>Functionalism</td>
<td>5</td>
</tr>
<tr>
<td>Physical</td>
<td>17</td>
</tr>
<tr>
<td>Intellectual</td>
<td>27</td>
</tr>
<tr>
<td>Spiritual</td>
<td>39</td>
</tr>
<tr>
<td>Demonstration</td>
<td>50</td>
</tr>
<tr>
<td>Conclusion</td>
<td>61</td>
</tr>
<tr>
<td>Bibliography</td>
<td>63</td>
</tr>
</tbody>
</table>
INTRODUCTION

This thesis is a study of functionalist theories rather than the functionalists themselves. The use of names is not a categorization of those men as their minds were too diverse to fit precisely under a label. Few of the scholars, in fact, can be labeled "pure functionalists"; instead they occupy varying positions on the functionalists end of the functionalist--formalist continuum of architecture. In writing this thesis I hope to achieve the following points:

Analyse the functionalist theories and determine what they cover and what they should encompass in fulfilling the total needs of man.
Apply these ingredients to a cross section of existing building types.

The concept of architecture is space and the content of space is man. Space by itself is not architecture, it must be organized.

Vincent Scully said, "Space governs the designs and solids are entirely at the service of its dramatization."¹ More precisely,
space is the design—the concept. We should organize and articulate space in accordance with our physical, intellectual and spiritual needs. Too many architects achieve space, not as a goal, but as an accidental result. Space can provide a unifying order for architecture. The greatest order in architecture however, is the human psyche which is composed of three ingredients:

Physical
Intellectual
Spiritual

These ingredients represent both his strength and his needs. He draws upon their resources and revitalizes them through his everyday experiences. The visual expression of function must satisfy these needs if that function has anything in common with man. The combination of these ingredients gives a uniquely human characteristic. They form a tripod upon which conceptual thought should rest; each concept answering its particular set of circumstances.

If we have lost contact with reality it is because our intellect or scientific reasoning has outstripped our emotions. Science has achieved immense prestige at the expense of humanism, and an effort should now be made to synthesize the two.
Geoffrey Scott said:

The scientific perception of the world is forced upon us; the humanist perception of it is ours by right. The scientific method is intellectually and practically useful, but the naive, the anthropomorphic way which humanises the world and interprets it by analogy with our own bodies and our own wills, is still the aesthetic way; it is the basis of poetry and it is the foundation of architecture. 

The analogies that Scott alludes to can be grouped into five categories:

- organic
- empathetic
- mechanistic
- vitalistic
- moralistic

Many artists wandered among these analogies picking up bits here and there with no concentration on any particular one. The artists with firmer convictions, however, cling to larger portions of a specific analogy. These analogies will be discussed in the sections to which they apply.

When I speak of architecture I will be speaking of: The intuitive organization of space and time to fulfill the physical, intellectual and spiritual needs of man.

The following section will be a general discussion of functionalism followed by three sections dealing specifically with the physical intellectual and spiritual needs of man and their relation to the functionalist theories.
NOTES: INTRODUCTION


FUNCTIONALISM

Let us look at how various architects' thoughts relate to functionalism.

Frank Lloyd Wright:

I felt sure that architecture which was really architecture proceeded from the ground and that somehow the terrain, the native industrial conditions, the nature of materials and the purpose of the building, must inevitably determine the form and character of any good building.

William Morris:

...it is impossible to ornament duly an ugly or base building...on the other hand I am forced to say that the glorious art of good building is in itself so satisfying that I have seen many a building that needed little ornament, wherein all that seemed needed for its complete enjoyment was some signs of sympathetic and happy use by human beings.

Paul Jacques Grillo:

The real truth is that everybody is afraid of honest simplicity, because it hides nothing.

Horatio Greenough--concerning his admiration of a sailing vessel:

...what imitation of the Greeks produced this marvel of construction? Here is the result of the study of man upon the great deep, where nature spake of the laws of building,
not in the feather and flower, but in winds and waves, and he bent all his mind to hear and obey...Could our blunders on terra firma be put to the same dread test that those of shipbuilders are, little would be now left to say on this subject.4

Socrates:

To put it shortly, the house in which the owner can find a pleasant retreat at all seasons and can store his belongings safely is presumably at once the pleasantest and most beautiful. As for paintings and decorations, they rob one of more delights than they give.5

These quotes from the present and past should suffice as an introduction to functionalist theories. From this small number of quotes thoughts have been revealed that will develop into trends of thought as we progress.

There are referrals and allusions to:

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<tr>
<th>fitness for purpose</th>
<th>nature of materials</th>
</tr>
</thead>
<tbody>
<tr>
<td>nature</td>
<td>qualified acceptance of ornament</td>
</tr>
<tr>
<td>clarity</td>
<td>appreciation of history</td>
</tr>
<tr>
<td>expression of purpose</td>
<td>social aspect (Morris)</td>
</tr>
<tr>
<td>honesty</td>
<td>moralistic</td>
</tr>
</tbody>
</table>

As expected, clarity, fitness and nature finished strong. They will be joined by others as we progress. Undoubtedly "expression of purpose" fared better than many expected since it relates to the spirit and intellect. It was with much chagrin that Greenough noted the architects' ability to flaunt nature and escape its wrath, indicating his intense admiration for harmony
with nature's principles. The quote by Morris is particularly noteworthy in view of his propensity for ornament. He is an ardent admirer of Gothic ornament and regards a blank space as an invitation to exercise his skill.

Without exception the functionalists express interest in the principles of history and, excepting a few, were vociferous in their disfavor for eclecticism. This was the motivation for much of their writing. Speaking of the Greeks, Greenough said,

We believe firmly and fully that they can teach us; but let us learn principles, not copy shapes; let us imitate them like men, and not ape them like monkeys.⁶

A limited acquaintance with functionalist theories is the cause for many of the narrow definitions and general confusion related to most discussions on the subject. These aspects will be discussed at length in sections where they apply.

The most prevalent limited aspects are that functionalism:

- is concerned only with the physical needs of man.
- is monotonous and devoid of imagination.
- monotony due in part to complete purge of ornament.
- is purely mechanistic.

A common misconception is that architecture can exist without sympathy to the needs of man, thus without meaning. From their writing, functionalists show an awareness of the profoundness of man's needs; needs involving also the mind
and spirit. It takes much more imagination to provide the delightful fulfillment of man's needs than to merely provide "delight".

Any philosophy on architecture should remain focused on the full range of human needs. Lacking this, it can only be viewed as a principle or theory. These human needs or ingredients for life have been established as being:

- physical
- intellectual
- spiritual

Jean Labatut:

The three ingredients—the physical, intellectual and spiritual—whatever their quantity or whatever their proportion always should be recognized as present in the visual expression of function, if that function has something in common with man. 7

For illustrative purposes, I will utilize these ingredients as three legs of a tripod upon which conceptual thought is "supported". I will categorize the functionalist theories in terms of their relation to it. The environment or physical ingredient can be as simple as a brick, or a space such as a classroom which is adequate for performing a physical function—holding thirty children. Reason is interchangeable with intellectual and is an analytical process of the mind. I am not using spiritual in a religious sense and it is too profound to be
adequately covered by the word "emotional", although emotion is certainly part of it. It is a refined feeling or intuition that allows the mind to perceive the spirit of an object through the senses.

I do not advocate the self-conscious transferal of these theories from paper to design. This is no different than the migration of a Doric column from 400 B.C. to the present. The principles should be assimilated and fused into the sub-conscious element in conceptual thought. They should become a feeling. This feeling or intuition cannot refer to a list of rules and maintain the quality of freshness.

Gio Ponti follows this approach when he advocates an unconscious adherence to function. He claims further that functionalism, should be taken for granted in every building. Ponti advocates modern architectural forms achieved by simple compliance with the actual purpose of the building.

Many statements do not lend themselves to accurate interpretation by the casual reader, but have the undertones of double meanings, (perhaps on purpose). At one point Gio Ponti says,

Form is said to correspond with function. I am tempted to deny it and say that form is an ideal contribution, independent of functionality and originated from concepts of essentiality.
and truth and that functionality, always implicit in everything, has nothing to do with the matter—that it is only through a process of our mind that function conditions a form, the form of a thing.¹

The key to his statement is the fortunate use of the word "tempted", in light of the apparent inconsistencies. Form cannot be independent of function if it originates from concepts of essentiality and truth. The essential aspect of any building will be to fulfill the needs of the people, i.e. integrity of purpose and the expression of that purpose. Moreover, if functionality is implicit in everything then it will be related to everything. Finally, the process of our mind with which function conditions a form is the intellectual element of the tripod.

The phrase "form follows function" is often repeated from lack of anything else to say and without awareness of all that the phrase encompasses.

Louis Sullivan was the first architect to fully exploit the potentialities of the steel frame. He showed the way to an honest, functional, deeply human approach. It is his name that is most readily associated with the phrase, "form follows function", but he never meant pure physical function. He included the sum of all the intellectual, emotional and spiritual
as well. Bruno Zevi adheres to a very narrow interpretation of functionalism. To him can be attributed such statements as:

... but he had succeeded in broadening the functionalist attitude and in giving to the simple forms of modern building a sense of novelty and gaiety and playfulness... very different from the monotony of flat roofs and naked walls.

He was speaking of buildings designed by Eric Asplund for the Stockholm exhibition of 1930. His barbs were directed at the Internationalists. As I shall point out later these men designed buildings not in accordance with the needs of man but with concern toward arrangement of surfaces and cubes. This neglect of human needs is no more functionalism than is a pile of forms heaped together in confusion which also embodies Zevi's adjectives of novelty, gaiety and playfulness.

As I shall subsequently point out, there is not one of the functionalists in history that adheres solely to theories of physical function, devoid of expression and imagination. Neither are there any functionalists who stress novelty and imagination at the expense of human needs. A. van Eyck amplifies this by stating,

The more tangible functions--those implied by the word functionalism--are only relevant in so far as they help to
adjust man's environment more accurately to his elementary requirements. But this, after all is no more than a necessary preliminary.¹²

Monotony is also produced by an ensemble of variety; of attempts at originality. This could be likened unto a cocktail party where everyone wanted to be the life of the party. The result is a din where the only words one hears are those that he himself utters. There is no interchange of ideas or advance of any kind. In short it is a fiasco--a world's fair. Of course this does not apply to the brilliant successes by a few acknowledged masters whose intuitive creations evolve from a set of ordered principles.

There are a number of analogies which the functionalists use in explaining their thoughts. I will discuss five of them and their relationship to the tripod.

| empathetic | spiritual | expression |
| organic    | physical  | fitness    |
| vitalistic | spiritual | life force |
| mechanistic| physical  | fitness    |
| moralistic | intellectual | clarity |

Keeping in mind that the human ingredients cannot be entirely separated. I related the analogies to the ingredients and qualities which are dominant. The analogies will be analysed in the section to which they pertain.

The functionalist theories relate to space just as readily
as to form and mass. The problem is that too few regard
space as the content of architecture. It is regarded as the
void inside or around the mass; something to be taken for
granted since, "we obviously need space (air) in which to
move". A relationship of space to functionalism is dismissed
as an attempt to elevate functionalism. It is paradoxical
to take space for granted as a result rather than a goal, and
as being necessary for man's physical movement within the
mass; then to say in the next breath that space is too spiritual
or intangible to relate to functionalism. In the following
sections I shall analyse and categorize space according to
the functions for which it is created: fulfilling the physical,
intellectual and spiritual needs of man.

Neither functionalism nor space by themself is architecture.
Architecture is an end result; space is the raw material and
functionalism provides the means to the organization of the
space. Architecture is the functional organization of space.
Simplifying it further: Architecture is functional space--the
functional aspect being the organization (and articulation)
required to fulfill the physical, intellectual and spiritual needs
of man.
In summarizing, the purpose of this section was to serve as an introduction to functionalist theories, the limited aspects some people have concerning them and the relationship between them, space and architecture. The following sections will be an elaboration of the points introduced in this section.

The functionalists rest on a rational approach to architecture. They find the intangible area of human experience difficult to accept and include in their theories because they cannot fully explain or demonstrate proof of how they work, or how they can be made to work.

The following chart is a categorization of the various analogies and qualities as they relate to the physical, intellectual and spiritual ingredients. A section will be devoted to each ingredient and those areas that comprise it.

Categorization of Functionalist Theories.

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<thead>
<tr>
<th>ingredients</th>
<th>physical</th>
<th>intellectual</th>
<th>spiritual</th>
</tr>
</thead>
<tbody>
<tr>
<td>medium</td>
<td>space to move in</td>
<td>space to see</td>
<td>space to feel</td>
</tr>
<tr>
<td>analogies</td>
<td>organic</td>
<td>vitalistic</td>
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<td></td>
<td>mechanistic</td>
<td>empathetic</td>
<td></td>
</tr>
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<td>qualities</td>
<td>fitness</td>
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The main difference between functionalism and formalism is that through functionalism expression and delight evolve in
accordance with the total needs of man. Whereas in formalism
the needs of man are compromised, or totally neglected,
in the search for form for forms sake--as a end in itself.
NOTES: FUNCTIONALISM


6Greenough, op. cit., p. 16.


9ibid., p. 174.

10Zevi, op. cit., p. 61.

11ibid., p. 61

PHYSICAL

The physical ingredient is our tangible environment.

The prime consideration is to solve the physical necessities of man along the dimension of time. Time is intangible but very real as a physiological as well as psychological influence. Time signifies movement and life. It is the main factor of physical organization and the efficient use of it should be the goal of any design.

There are two analogies in the physical category with different approaches reaching the same end: fitness for purpose and economy of time and means. We have the:

- Organic analogy
- Mechanistic analogy

Essentially both analogies say that the first duty of any building is to be an efficient, physically practical part of everyday life. Here are two of the conditions of "well-building" i.e. solidity and commodity, (delight is the third).
The "mechanists" see the universe as an organization of masses that operate uniformly in accordance with universal laws that can be described mathematically. Regarding the universe as a well working machine, the mechanists tend to devalue individual difference in favor of universal forms and laws. They emphasize machined forms that are precisioned and highly finished, value efficient planning and regard exposure of structure as a moral virtue.¹

Interest in the beauty of mechanical efficiency developed concurrently with the industrial revolution. The two proceeded hand-in-hand, not as cause and effect. Actually, admiration for the machine-aesthetic existed prior to the industrial revolution.

The appreciation of utilitarian simplicity and efficiency as related to tools and transportation is apparent throughout history. The industrial revolution added more objects and changed the nomenclature.

We can go back to Socrates who admired things for their fitness for purpose. He dismissed as trash the richly ornamented, gold-plated breast-plates which did not fit their wearers. He stretched this thought to the limit by reputedly saying that a
dung basket is beautiful and a golden shield is ugly, "If the one is well made for its special work and the other badly."\(^2\)

Alberti stated the fitness for purpose theory:

The proper way to study architecture is to study the uses of buildings and the nature of the men for whose uses the buildings were intended.\(^3\)

Horatio Greenough epitomizes the through-going functionalist when he says, "If a flat sail goes nearest the wind then a billowing sail, though picturesque must be given up."\(^4\)

Greenough was completely enraptured by the principles of fitness and utility and says, "Seek the essential; when the essential hath been found, then, if ever will be the time to commence embellishment."\(^5\) He ventures to predict that when the essential is found it will complete. Alberti rambles considerably but is more explicit in saying:

Buildings should be a clear statement of good proportion with things related as to nature and convenience and uses for which the structure was intended so that the entire composition will reflect nothing more than man's answer to necessity and convenience. "If the composition answers in all these respects, the beauty and richness of any ornament will fit well upon it; if not, it is impossible it should have any air of dignity at all.\(^6\)

These quotes by Greenough and Alberti allude to the "slenderest means" theory and are contrary to the limited aspect that "functionalism means stripping of ornament".

19
Functionalists advocate the stripping of superfluous ornament which has no meaning except as embellishment to cover up bad design or "to add interest". They say that it will be unsuccessful in this capacity anyway and is a waste of time, money and effort.

Leonardo da Vinci could be regarded as Le Corbusier's forerunner in many respects. They both admired engineering and machines. Leonardo was an engineer while Le Corbusier continually asserted the superiority of the "engineer's aesthetic" over eclectic design. They both set down rules for anatomical proportion and were capable of leaving with equal sureness the "world" of essentials and utility for that of art. "Leonardo made studies of a church designed for administering to a congregation and described it as 'a plan of a place for preaching in.'" Perhaps it is no coincidence that the house became "a machine for living in".

The machine image led to the revolt against Art Nouveau at the turn of the century. This twentieth century revolution was led by such men as Otto Wagner, Adolf Loos, Henry van de Velde and Walter Gropius who took inspiration from Peter Behrens and England's Arts and Crafts movement (led by William Morris).

Morris laid the foundation of the modern style which was
ironical since he abhored the evils of the machine. Gropius synthesized the new movement.

By 1917 this movement, composed mainly of Dutch artists and architects was called de Stijl and advocated mechanistic principles. Their spokesman, Theo van Doesburg defined architecture as, "the total expression of all physical and spiritual needs embracing every individual structural, artistic and economic problem". 8

However the needs of the people and structural composition soon took second place to the consideration of spatial relationships and the harmony of cubes, planes and lines. 9

The de Stijl group advocated an intellectual approach to the mechanistic analogy expressing their admiration for universal laws of mathematics and pure reason. Jurgen Joedicke said:

...the de Stijl demand is constantly reiterated for architecture to free itself from the condition of purely individual emotions and adapt instead "elementary means of expression like cubes, surface and lines". 10

In acknowledging the international unity of the new style at the turn of the century, it ought not to be forgotten that in Hoffmann's elegance, in Perret's clarity, in Wright's expansive broadness and comfortable solidity or in Gropius' uncompromising directness, national qualities are represented at their best. 11
None of the modern architects, however organic they may be, disregarded the machine. However, they are not "purely mechanistic". To Sullivan, engineers loomed above other men. In his Autobiography of an Idea he said:

Louis found himself drifting toward the engineering point of view, as he began to discern that the engineers were the only men who could face a problem squarely; who knew a problem when they saw it. Their minds were trained to deal with real things, as far as they knew them, while the architectural mind lacked this directness, this singleness of purpose.¹²

The organic analogy has the belief that the universe resembles the organization of a plant or animal rather than a machine. The organicists suggest that evolutionary theory, including adaption and natural selection, gives hints as to how buildings should be organized. Hence they insist that buildings be adapted to their environment, both physical and social.¹³

The functionalists' admiration for nature stems from nature's laws of fitness for purpose and the inherent beauty stemming from utility rather than as an end in itself. The belief is that in observing the laws of nature, the evolution of architectural form will have an inherent beauty that cannot be separated from its form and structure. Richard Neutra:
If any design could be split into beauty on one side and utility on the other, as now many of us so readily assume, it would not be akin to the organic life in us or around us, which most certainly has no such divisibility. Schemes and city plans which were first thrown together or engineered for utility and then dressed up for beauty demonstrate daily that they have painfully little kinship to life and in fact are fairly foreign to it.\textsuperscript{14}

A tree springs forth from the heart of a seed; its form developing and being developed by its environment. Greenough feels that likewise a building should develop from within; from a nucleus. He said:

Instead of forcing the functions of every sort of building into one general form, adopting an outward shape for the sake of the eye or of association, without reference to the inner distribution, let us begin from the heart as the nucleus and work outward.\textsuperscript{15}

Nature seems to consult beauty to excess with its profuse ornamentation. Nature's ornament is profuse but it is not superfluous. Every leaf exists for a purpose. A close look reveals a high degree of order in the arrangement of leaves so that each receives its share of sunlight. If this order is disturbed nature will revert back to its ordered arrangement. If it is unable to do this then the leaf will be discarded since it no longer serves a purpose. Greenough contends that, "The law of adaptation is the fundamental of law of nature in all structure."\textsuperscript{16}
Horatio Greenough:

Let us consult nature, and in the assurance that she will disclose a mine richer than was ever dreamed of by the Greeks, in art as well as philosophy. If, as the first step in our search after the great principles of construction, we but observe the skeletons and skins of animals...are we not as forcibly struck by their variety as by their beauty? There is no arbitrary law of proportion, no unbending model of form. ...It is neither the presence nor the absence of this or that part, or shape, or color that wins our eye in natural objects; it is the consistency and harmony of the parts juxtaposed, the subordination of details to masses, and of masses to the whole.17

The epitome of utilitarian simplicity is a grain elevator, cotton gin and lighthouse.

These are clear, machined statements of components proportioned and arranged to answer the physical needs of necessity and convenience.

Domes such as the Geodesic and those over arenas and observatories are designed for maximum coverage with "slenderest means". As the space becomes larger or more intricate, the structure must adhere ever more closely to economics. Here we find a "complete banishment of make-believe". An observatory dictates design through its intricate functional requirements. Its dome design and size are predicated by the nature of the particular telescope being housed. It is literary a "machine for looking". A railroad
maintenance shop or "round house" such as the one in Baton Rouge by Buckminster Fuller is an excellent example of designing for a particular function. The turn table for positioning cars represents the utilization of mechanical advances to the highest degree. In these examples intuition assumes a secondary role; being directed by physical necessity.

Summary- The organic and Mechanistic analogies and their relation to the physical needs of man can be summed up in one phrase: "fitness for purpose."
NOTES: PHYSICAL


2De Zurko, op. cit., p. 16.


4Greenough, op. cit., p. 22.

5ibid., p. 80.

6Alberţi, op. cit., Book VI, Chap. V.

7De Zurko, op. cit., p. 52.


9ibid., p. 100.

10ibid., p. 99.


13Burchard and Bush-Brown, op. cit., p. 20.


16ibid., p. 58.

17ibid., pp. 57 - 58.
INTELLECTUAL

Intellectual is a reasoning process of the mind; an analytical approach devoid of emotion.

The purest forms of intellectual manifestation are in mathematics; the Tellstar satellite is an intellectual mass. The intellect in its purest form of natural law is not concerned with man or emotion; only with discovering truths. As we enter other areas of science we become more related to man; Richard Neutra said,

There is no 'pure reason', just as there is no 'pure beauty'. Emotion most naturally tinges every mind operation, be it a mathematical task or creative design.¹ However, there is a difference in the intellectual performance as connected to art and that connected to mathematics. The intellect is the creator of formulas but not of paintings. Intuition creates, reason theorizes on the creation. Mathematics and painting are the extremes with architecture being the synthesis of the two. Mathematics is quite closely related to
beauty, and thus to art, through nature.

The truth associated by the functionalists to the intellectual ingredient is humanistic and reflected in the moral analogy.

The moral analogy has several aspects:

Architecture should reflect and contribute to the moral or ethical ideals of men.
A building should be true, not dishonest.
Forms must be what they seem to be.
Integrity of materials and structure honestly expressed.
Rejection of superfluous ornament.

Connected with this analogy are qualities of:

expression of purpose
clarity
truth

William Morris had great concern for the social implications of art in his time. He classified work into three categories: mechanical toil, intelligent work and imaginative work. The people that do the first type are "machines" only. The second category is one in which the work hours are more pleasantly spent in the making of crafts. The third is a craftsman that uses his imagination in the creative process. Morris constantly sought ways to cultivate these peoples' taste so that they would cast off the manacles of the machine.

William Morris:

So I say, if you cannot learn to love real art, at least learn to hate sham art and reject it. It is not so much
because the wretched thing is so ugly and silly and useless that I ask you to cast it from you; it is much more because these are but the outward symbols of the poison that lies within them...and all this for trifles that no man really needs.²

The "poison" was the esoteric nature of art and clients; the hierarchy of wealth and its "taste" for shams. Morris was attracted by the fitness, morality and beauty that he saw in Gothic architecture. He said:

We should take Gothic architecture by the hand and know if for what it was and what it is: a magnificent manifestation of organic order. Proceeding from such a tradition, one avows a principle of structure that evolves its forms in the spirit of truthfulness, following the conditions of use, material and construction.³

Pugin classifies the Renaissance as the Dark Ages and speaks about the "emergence", after a gradual decay of four centuries. He speaks about the one bad idea (style) being succeeded by confusion.

Private judgement runs riot; every architect has a theory of his own, a beau ideal he has himself created; a disguise with which to invest the building he erects. This is generally the result of his latest travels. ...Styles are now adopted instead of generated, and ornament and design adapted to, instead of originated by, the edifices themselves.⁴

Pugin referred to this as the "carnival" of architecture and condemned the weak attempts and spirits, "so besotted in their mongrel compositions, that they tremble at the ascendancy of truth."⁵
John Ruskin envisaged and advocated a functioned, organic architecture erected according to, and itself illustrating, moral principles. Ruskin denied that the beautiful is the useful but, like Pugin, accepted the principle that form should follow function as vital to good architecture. He was more insistent than Pugin, however, in expanding the meaning of function to include religious, moral, and ethical elements. The highest functions of art according to Ruskin are:

- to enforce the religious sentiments of man.
- to perfect the ethical state
- to do material service

He also admired simple architecture and at one point he grouped simplicity, usefulness, and truthfulness as the three qualities which make great art. Though admiring Gothic architecture, Ruskin placed many restrictions on ornament. Under no circumstances should "beautiful form" of any sort be used "as a mask and covering of the proper conditions and uses of things."  

Ruskin admired the ingenuity of some machines but never their beauty. He never drew any analogies between mechanical and architectural beauty but his demand for a new architecture which would be moral, truthful and minister to the health, practical needs and moral happiness of the masses of people
was an inspiration for later functionalists.  

Richard Neutra:

Can we successfully separate Sunday from six times as many weekdays? Can we have two kinds of conduct, two kinds of design, one, a somewhat dwarfish set for Sabbath consumption and dedicated to beauty, ideals, goodness and truth; another, a vast work-a-day set, meant for supposedly practical utility, wit, ugliness, shoddiness, and a new brand of barbarism rolled into it, and permissible by general consent.

These early implications that there existed something essentially moral in simple functional forms will be supported by architects such as Wright, Le Corbusier, Loos, Berlage and Van de Velde.

The Greeks used the simple, functional, round column which, because of its serene sense of self-containment, speaks of active support. The diameter is much larger than needed to help clarify the impression of support and to achieve good proportions. The impression of easy carriage is further enhanced by the application of fluting which accents the vertical and gives a cohesive feeling to the column. The fluting is ornament also but is applied with thought to principles and expresses the purpose of the column.

In contrast to this are some of Ledoux's columns composed of stacking and alternating short cylinders and square blocks.
of the same height. The active function of support gives away to the passive one of burden. One knows that the columns are able to bear the weight due to the simple fact that nothing has collapsed. Our senses are disturbed however by the inert expression and by the apparent weakness to any lateral force. In short by the lack of structural vividness.

Ledoux's literary works however, proclaimed all of the functionalist theories. He said for example, "All that is not indispensable tires the eyes, hinders the mind and adds nothing to the whole." Here again is the tripod in different words. Using our expressions we could say that the existence of superfluous material negates delight and the expression of purpose by disrupting the clarity of parts and their relation to the whole.

Expression of purpose is embodied in the idea of symbolism. This is an associative process arising from the fact that traditional forms are functional forms in that they help express the purpose of a building. This is most commonly related to eclecticism, with its application of Greek columns to banks, Renaissance domes on government buildings, and church spires. The more positive aspect is to define traditional not as eclectic but as in the spirit of our times. Large domes
indicate sports stadiums, auditoriums have a category of forms, atomic reactors relate to the circle as do railroad round houses. I will call these "positive symbols" and in this respect traditional forms are desirable functional forms. Functionalists advocate using new materials and technology to create new forms for the new functions of our society now and in the future.

The Renaissance dome was a positive, symbol of that period and was effective in proclaiming the function of which it was a part. Many times Michaelangelo referred to home not as "Florence" but as "The Duomo". These landmarks gave men an identity with a place and an assurance of belonging.

The reverse of this is the Pantheon in Rome with the dome submerged in the mass resulting in an indistinguished exterior profile. The space inside is immense and one is unprepared for such a spatial experience. It is a static space with no point of reference except the large "eye". It is an intellectual space as it is not in sympathy with man. The light coming through the oculus creates areas of changing light and shade. This introduced some movement, disrupted the symmetry of the space and set the stage for that extra dimension--sound. Fortunately when I was there the organist played a beautiful
number that reverberated through the space and sent sensations up my spine. The space had been humanized by light and sound. Without the sound it remained exactly what it was constructed for—a house for the gods.

A line in space is intellectual. A straight rigid line foreign to nature and expressing the will of man; his sheer power of reason and will to form. The intellectual form and space exists as an end in itself, independent of people. Versailles rejects axioms regarding site and people for those dealing with measure and precision. The materials, structure and client are concealed within a geometry so precise that even the trees and shrubs are clipped into straight lines. In so doing, Versailles approaches the intellectual.

The space most completely epitomizing the intellectual is the Barcelona Pavilion. The question of man and his physical and spiritual needs never entered the picture. The only function required of the straight classic walls were to enclose a serene, detached space by their juxtaposition with one another. This space is more filled when empty than when it is "cluttered" with people. Mies van der Rohe's addition to the Museum of Fine Arts in Houston comes quite close to the intellectual. The site is "pie-shaped" with the existing
building lines radiating from the narrow south end with the street bordering the north end being curved. This suggested a curved building to be in sympathy with the site conditions. The curves are introduced with such subtlety that they also remain sympathetic to the straight line.

The structure is kept outside the space so that nothing disturbs the interior volume, and the whole fabric, expands gently with a relaxed and classical command. Mies' lucidity and calm thus seem to offer the perfect solution in design for a generation that was confused, rather tired, and sick of complication, sociological argument, and mobility alike.

Mies van der Rohe's major contribution to architecture was an uncomplicated intellectual order. This is reflected in his serene non-directional spaces, evoking tranquillity of mind by the spaces' aloof detachment from the human element. In the museum the space is complete; its end being the exhibition of art. Man is not on exhibit here and feels no compulsion to "perform". The even north light filtering through the large expanse of glass bathes the art and renders its exhibition successful.

Mies' intellectual order can be seen in the campus of I. I. T. which played a considerable role in the urbanization of architecture. "He kept buildings separate and defined mass and void by a single module, allowing what continuity there was to expand naturally from a symmetrically conceived space,
casting aside the nineteenth century compulsion toward movement. This intellectual order played a considerable role in the urbanization of architecture.

In summarizing, the purest intellectual forms are devoid of emotion and represent a will to form; to conquer nature. There is dependence upon nothing but the universal laws of mathematics. Architecture along with nature is the synthesis of painting and mathematics.

Basically the moralists held truth to be all important and as being necessary in every object: beauty must be sacrificed if need be for the preservation of truth. Their first concern is for the needs of man and they contend that one's physical and mental well-being requires truth for its fulfillment more so than beauty. The combination of both is their ultimate goal. This in contrast to the limited aspect which claims that functionalists are concerned only with the physical needs of man.

They admire the integrity of nature where beauty is produced not because it is desired, but because it has proved useful. Uppermost of the moralists were Pugin, Ruskin and Morris whose arts and crafts movement has roots in the moral and social nature of man. The moral analogy also had meaning
for such men as Wright, Le Corbusier, Loos, Berlage, and Van de Velde.
NOTES: INTELLECTUAL

1 Neutra, op. cit., p. 129.


3 Zevi, op. cit., p. 164.


5 ibid., p. 3.

6 De Zurko, op. cit., p. 134.

7 ibid., p. 135.

8 ibid., p. 136.

9 Neutra, op. cit., p. 17.

10 Scully, op. cit., p. 35.

11 ibid., 37.
SPIRITUAL

Spiritual expression of purpose is not the comprehension but the creation of the expression.

R. G. Collingwood:

To imagine is to refrain from making a distinction which we make whenever we think: the distinction between reality and unreality, truth and falsehood. Thus imagining is not a kind of thinking, nor is thinking a kind of imagining, for each negates the specific nature of the other. Yet they are not wholly unrelated. Thinking is making a distinction between truth and falsehood; this presupposes a phase of consciousness in which this distinction wasn't made. That which we deny or think false must first be imagined, or there is nothing to deny.¹

Pure science can make a statistic out of anything. Everything from a honeycomb to an oak tree or breaking wave can be expressed in terms of a mathematical formula and while the formulas would become too wearisome to grasp, a wave or oak tree are well within the grasp of intuition. Eric Newton, an art critic and historian, says that intuition only begins to enjoy itself at about the point where measurement
is losing meaning. It can follow natural phenomena knowing that it is in contact with a mathematical world without needing to reduce this knowledge to statistics. To quote Newton:

But intuition is concerned with something besides knowledge. It is concerned with enjoyment. And in proportion as it enjoys as well as knows, it adds value to fact.\(^2\)

The world of reason (natural science) is romanticised which adds to the already immense prestige that science enjoys. Art has a decreasing role except as an expression of the mechanistic.

Human nature has gone full cycle. Man has become obsessed with the importance of pure science and space (machines) which is an end in itself. This is the very thing that functionalists have been chastised for since 1900. However the functionalists' attitude toward their "machine aesthetic" was tempered in theory by the consideration of man. Functionals who were wedded to a form of organic analogy consider the machine only in its capacity to serve the living organism, not as an end in itself.

According to Gieddion we have not been able to cope with the new reality (industry and science) as our civilization lacks any desire for tranquility and our culture lacks equilibrium
between physical and mental tensions. He says further:

Our period cannot find its equilibrium because it can neither control nor organize the possibilities that it has itself produced. There is nothing more disturbing to the balance of our inner vigor than production which becomes an end in itself.  

The empathetic and the vitalistic analogies are for all practical purpose one. The vitalistic analogy says that a good building like, a living organism, is characterized by its "living spirit"—a vital force that comes from nature and harmony of nature. The empathetic analogy holds man as a living organism and relates architecture to human functions, transcribing them into functions in terms of ourselves. These analogies are reflected in the phrase, "to enjoy beauty is an imaginative not a reflective act".  

Vincent Scully:

Louis Sullivan is still unique among American architects in his desire and ability to develop this empathetic analogy ... He was the great perhaps the only humanist architect of the late nineteenth century, as he brought into the mass metropolis—in terms of its new program of the skyscraper office building—a dignified image of human potency and force.  

Sullivan in admiring the Marshall Field Warehouse describes it as:

A man that walks on two legs instead of four, has active muscles, heart, lungs and other viscera; a virile force, broad, vigorous and with a whelm of energy—an entire male.
He ends in a vitalistic flourish:

I mean that stone and mortar, here, spring into life, and are no more material and sordid things, but, as it were, become the very diapason of a mind rich-stored with harmony. ⁷

In shrugging off the defects that were noted in the same building he said:

...but the faithfulness is there, the breath of life is there, an elemental urge is there, a benign friendliness is there. Would you peck at the features of the moon, and ignore her gracious light that makes a path for you in the forest? ⁸

In creating his tall office buildings, Sullivan's intention was to stress the verticality and plastic density of the building. His form that followed function was not an open steel cage but rather a physical force--a life force--contained but vertically standing. ⁹

David Hume says that it is sentiment, or feeling, which governs our perception of beauty.

Reason marshals the facts and points out the relations; final judgement depends upon sympathy. ¹⁰

Hume approached the idea of empathy in aesthetic experience when he stressed the delicacy of feeling involved. One actually suffers from jarring sounds. ¹¹

Hume:

In every judgement of beauty, the feelings of the person
affected enter into consideration, and communicates to the spectator similar touches of pain or pleasure.\textsuperscript{12}

The tendency to project the image of our functions into concrete forms is the basis for creative design. "The tendency to recognize in concrete forms the image of those functions, is the true basis of critical appreciation. This is the humanism of architecture."\textsuperscript{13}

Andre Lurcat regarded architecture in a vitalistic fashion when he said:

One may regard a work of Architecture as a living organism in which all parts of its aspect, as its structure and function, must follow the same rhythm, for lacking this it runs a great risk of not being able to thrive.\textsuperscript{14}

In answer to the charge that the swelling of domes and soaring of spires are mere metaphors of speech, Geoffrey Scott says:

Certainly they are metaphors. But a metaphor, when it is so obvious as to be universally employed and immediately understood, presupposes a true and reliable experience to which it can refer. Such metaphors are wholly different from literary conceits. A merely literary metaphor lays stress on its own ingenuity of felicity.\textsuperscript{15}

Collingwood said that the experience of beauty is an experience of utter union with the object.\textsuperscript{16} This opposes the formalistic view that looks to universal math principles as the source of absolute beauty in pure geometric forms. Utter union implies identification
with an object. An object must have meaning both to warrant and to satisfy this union. In art this meaning is content; in nature it is fitness and in architecture it is a combination of both.

The shaping and organization of forms concern so many architects that they loose sight of the most effective contributor to spiritual delight—space. Even from a utilitarian point of view space is our logical end and aesthetically it is even more vital. Our senses have an innate need to expand (an extreme case is claustrophobia). Space expands according to its function. The form and mass aid in, but are secondary to this function. Le Corbusier's chapel in the monestary "de la Tourette" at Arbresle, Notre Dame du Haute and the Church of the Redeemer at Baltimore by Belluschi, employ different materials and forms but a spiritual space is common to all three. The space around the alter at "La Tourette" is as large as the seating area and quite rightly so. It is fitting for the monks to leave their cubicles and be able to expand in such a place as this. For the most part the monestary is a well functioning—expressive and gratifying (delight is too shallow) edifice. It functions physically and expresses the function in forms, scale and material (finishes).

Charles Garnier's Opera in Paris is a spiritual space designed
for the display of people. The grand staircase becomes a dynamic form in space when combined with the graceful flow of people in elegant attire. Without the people the foyer loses much of its delight.

The Guggenheim is a wonderful space with movement of forms and people. But as everyone is quite aware it was a physical failure as an art museum because the organization of its space did not evolve from the needs of man; that of viewing paintings.

Ronchamp is a delightful sculpture. It fulfills its physical functions as they were not exceedingly demanding. The exterior facilities for addressing the pilgrims are quite imaginative, however. It's greatest delight is in its uniqueness. Repetition would soon loose appeal and an increase in size would require a more efficient structure. These statements are to point out that the smaller the building and the simpler the function the freer the design can successfully become. It is a simple matter of economics for those who do not accept the functional reasons. Le Corbusier said, "To design well one needs talent-to program well one needs genius."

The spiritual ingredient in the functional tripod embodies two ingredients both pertaining to direct sense experiences:

45
creation of expression
enjoyment of expression

Collingwood said:

To imagine is not simply to allow a train of images to
drift idly across the mind, it is to make an effort to imagine,
to work at imagination.\textsuperscript{18}

In summarizing, intuition only begins to enjoy itself at
about the point where measurement is loosing meaning.\textsuperscript{18}

\textbf{INTUITION ADDS VALUE TO FACT.}

Scientific achievements have acquired immense importance
today at the expense of the life force: that principle that
pervades all nature. However, in their theories, functionalists
sought to utilize the machine to serve the living organism.

The empathetic and vitalistic analogies bring humanism and
poetry into the expression of architecture.

The element contributing most to spiritual delight is space.

Frank Lloyd Wright epitomized this imagination.

Wright's designs were overwhelmingly spatial. "The whole
fabric was integrated around this spatial idea, so that the
building broke out of the old containing skin to enhance the
continuity of its space and to embody it plastically both inside
and out."\textsuperscript{19} Wright's space was expansive and flowing, integrating
the whole composition of horizontal and projecting planes.
Wright:

In my work the idea of plasticity may now be seen as the element of continuity...Here...principle...entered into buildings as the new aesthetic continuity.20

Wright claimed to have discovered the new reality that is space instead of matter. His spaces were physically functional but more important they fulfilled the function of delight integrated with the every day experiences. Of all architects, Wright most consistently succeeded in achieving spaces that sing in which the air was alive, and it is not surprising that he is the best known American architect.
NOTES: SPIRITUAL


3Giedion, op. cit., p. 6.


5Scully, op. cit., p. 19.


7ibid., p. 31.

8ibid., p. 32.

9Scully, op. cit., p. 19.

10De Zurko op. cit., p. 89.

11ibid., p. 91.

12ibid., p. 92.

13Scott, Geoffrey, Architecture of Humanism, p. 159.

14De Zurko, op. cit., p. 11

15Scott, op. cit., p. 161.

16Collingwood, op. cit., p. 16.


18Collingwood, op. cit., p. 19.

19ibid., p. 23.
20 Scully, op. cit., p. 20.

21 ibid., p. 24.
DEMONSTRATION

A Light Industrial Plant for an Industrial Park

Problem:

Science and its manifestations have acquired immense prestige at the expense of humanistic values. We must achieve a synthesis between science and humanism, utilizing the former as completely as possible as a means of satisfying human needs.

As industrial rehabilitation is a key to order; my proposal is to utilize electronics and other scientific advances to their fullest in providing man with a more functional environment; physically, intellectually and spiritually. I propose to eliminate all vehicles from within the park and leave it to the total enjoyment of people.

To accomplish this the problem of transportation must be solved. Transportation has played a major role in the
evolution of industry in general and the industrial park in particular. When the industrial revolution and steam power swept the country, labor was enticed into the new industrial towns. Large towns sprang up and urban industrialization was created. With the improvement of transportation it became feasible for industry to move back to the country, enjoying lower land cost while continuing to compete with urban factories. This industrial dispersion has its culmination in the industrial park.

Automation and flexibility are key words in present industry and transportation and automation must proceed at the same pace if industry is to remain healthy. James F. Munce said:

The trend in materials handling has had its effect upon the external appearance and general treatment of the factory building, and the American industrialist and his specialist group will go to almost any length, financial and structural to achieve proper handling.¹

Solution:

The scheme presented is an elevated conveyor-road on which all material will flow between the factories and the truck and rail terminal. The container units will be "moveable warehouses" eight feet wide by ten feet in length and height. The ten foot length instead of, say twenty, adapts the unit to a greater variety of vehicles. When the truck arrives, the
driver dials the unit (s) that he needs by inserting a punched card into a control unit. The proper unit is selected (similar to a juke box) the battery powered motor of its conveyor is activated and it is guided to the truck with electrical impulses. Elevators are used to conserve space and can also adjust to the impulses of the conveyor in selecting the proper level. Walls are not needed at the shipping and receiving areas as the units are weather-proof. This is a pure expression of purpose as one observes the "warehouses" suddenly springing to life and moving down the conveyor-road. These containers will load directly onto flat-bed trucks which can be back on the road only minutes after arriving. Time is also saved in having one loading point near the main road and minutes become dollars helping to offset the higher initial cost of the installation. Added to this saving is the reduction of personnel required to handle and load. Paved areas which cost money and detract from the inherent beauty of natural surroundings will be eliminated. My perspective shows the factory surrounded by nothing but grass, trees and sky. A second perspective shows the plant on a hillside since the conveyor-road has essentially freed the factory from considerations of topography.

The conveyor-road evolved through an effort at recognizing
and satisfying the needs of man reflecting the qualities of

- fitness for purpose
- efficiency
- expression of purpose
- movement
- social and moralistic
- improved environment.

William Morris endeavored to awaken the workers' appreciation for art and accepting it as a part of their lives.

One of his suggestions was:

...open skies above and green grass below until the great dramas of the seasons can touch our workmen with feelings other than the misery of winter and the weariness of summer.²

Flexibility is achieved by using a steel rectangular space frame in the manufacturing area. The frame efficiently spans eighty foot square bays and offer ease of expansion. Steel in general lends itself more readily to alterations than does concrete.

A mechanical tunnel connects all factories to a common power plant.

The open area in the park would be used for recreation and relaxation—revitalization of the physical and mental ingredients. In the park would be a parking garage related to the transit system. There is an activity center with: Swimming, bowling, dining, theater and related facilities. This concept eliminates the dead areas immediately surrounding the usual factory. It could become the community center for the surrounding area as it will enhance rather than despoil the area in which its built.
NOTES: DEMONSTRATION


Site plan A has most direct connection to trucks and railroad. However there is no defined area for recreation. Site plan B has a more defined area but compromises the physical need of movement.
Site plan C allows the efficient movement of people, raw material and finished products while enclosing a recreation area. This area provides natural relaxation of mind and senses.
Section A-A shows the raised conveyor-road passing between the factory (right) and the office building. The upper level is for the movement of raw material and finished products. The lower level is for the transit system.
This perspective shows the site free of pavement and vehicles while on the following page the plant is shown adapted to a hillside.
CONCLUSION

Functionalism is the underlying order in architecture. It embodies and synthesizes the life principle with the universal laws of science; it humanizes architecture and gives it meaning.

These thoughts are constantly recurring in the writing of the functionalists, who did not disregard imagination but sought to give it order and meaning in relation to man's physical, intellectual and spiritual needs.

The main lesson we can learn from the functionalists is not what they did so much as what they said. Functionalism is not an object, it is a philosophy; a basis for architecture. No one building can be held up as the perfect embodiment of functionalist principles and many (done by functionalists) are quite bad. Start with first hand knowledge rather than second hand experience; that knowledge based on inductive reason and the sense experiences.
The conscious following of rules is the surest way to kill freshness. Principles should be fused into the subconscious element of our thought and become one with feeling and intuition; an integral part of our everyday experiences.

The functionalists are concerned with the rational approach emphasizing the physical needs of man because this approach is easily explained and demonstrated. The metaphysical aspects of the intellect and spirit are less satisfying since it is impossible to "drive a point home" with a conclusive example. The functionalists repeatedly allude to the intellectual and spiritual needs of man but in compliance with the physical needs.

There is a general rule that is applicable here: the dominance of the physical need is directly proportional to the complexity, of the building.

With this in mind I propose that architecture include with equal emphasis: the physical, intellectual and spiritual needs of man.

The most important principle embodied in the functionalist theories is that a building should evolve not as an end in itself, but in accord with the total needs of man.
BIBLIOGRAPHY


