

# The role of inspiration and imagination in design

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The implications of the non-material inspiration and imagination of a design process are, arguably, a neglected area for theoretical science, though experimental scientists themselves exercise a similar process. This paper will by necessity examine only some aspects of inspirational and imaginative design, the sources for it and possible implications, due to the complex and subjective nature of human thought. Also, to be explored is why designers' thought processes are hard to quantify due to the irreducibly complex role of creativity-intelligence in design outcomes. The purpose of this paper is to explore the design process: creativity and in particular inspiration 'leaps' compared to imagination 'steps' in design. The existence of inspirational capacity poses a challenge to explanations regarding the origins of life that do not include a Creator. In the present observable world mere analogy does not explain why it is that designers who take inspiration from nature are seen as inventive and why, conversely, acts of inventive creation open new ways to understand the natural world.

The observation of the mental processes that people use to make novel discoveries (*observations*), whether in the design of a scientific experiment or the design of a building, have proven hard to capture. Designers often claim to have a source of inspiration for a novel design. Well known is how the Sydney Opera House was modelled from the architect's experience of earth (base), sky (white clouds) and horizon<sup>1</sup> and pieces from an orange shaped the form of the sails (figure 1).<sup>2</sup> Sometimes inspiration comes from nature. A famous example is the iron and glass Paris Metro entrances by Hector Guimard (figure 2). Other times inspiration is amalgamated thoughts or sometimes it's based on the work of predecessors. It may be a literal interpretation or an abstract concept verging on the fringes of unreal such as the Jewish Museum in Berlin by Daniel Libeskind that he called "between the lines".<sup>3</sup> A study of architects in action in real world situations confirmed that ideas from 'outside' the frame of analysis or 'problem' were often 'highly influential'. Peter Rowe, after three detailed case studies and analysis, concluded:

"Quite often references are made to objects already within the domain of architecture. On other occasions an analogy is made with objects and organizational concepts that are further afield outside architecture."<sup>4</sup>

What, then, is inspiration? *Is Inspiration simply imagination constructing old things in new ways, or can something new be created by a 'leap' of thought?* A brief overview of those studying sources of inspiration, design thinking and processes for 'good' design suggests some aspects of novel creation that are worthy of consideration by creationist science.

## Design process and novel creation

The scientific method based on case studies has made findings about routine design processes by designers of varying skill. But can this method quantify the capacity to make an original design, or the moments of inspiration, where unique novel ideas arrive as if revealed? Rowe reports that sometimes an architect's initial dominating idea comes from outside architecture. For novel design the initial idea may seem inspired, as if revealed in a moment fully formed to the designer.

Arthur Koestler in an attempt to propose a theory to understand the act of creation in art, architecture, and science presents numerous cases of sudden complete solutions to problems being found after waking or while the people were not consciously thinking in the field of mathematics and experimental science. He includes Karl Friedrich Gauss, who after 4 years wrote:

"At last two days ago I succeeded, not by dint of painful effort but so to speak by the grace of God. As a sudden flash of light, the enigma was solved ... I am unable to name the nature of the thread which connected what I previously knew with what made success possible."<sup>5</sup>

After surveying these notable examples Koestler observed:

"Thus at one end of the scale we have discoveries which seem to be due to more or less conscious logical reasoning, and at the other end sudden insights which seem to emerge spontaneously from the depth of the unconscious."<sup>6</sup>

While the existence of notable examples is easy to establish, it appears that both experiences are not uncommon. It could be that a novel idea or a discovery

or a new design is the result of collected thoughts and/or experiences amalgamated. Another view which will be explored is of design as the realisation of an imaginative thought process. The following will begin to examine this process.

### 'Good' design

Once an object has been made, it may be evaluated by those who see it or use it. Designed things may be thought of as 'good'. One attempt at an explanation of what makes good design is that it is a creation in unity and truth.

"The timeless principle of good design may be stated quite simply. It is integrity: wholeness, unity. It is *the creation* of a microcosm of Nature, of truth, by the arrangement of the functional and material components."<sup>7</sup>

This opinion states that 'good' design seems to have a source of inspiration—in this case, nature. Another definition of design states "design is any purposeful modification to the physical environment by humans"<sup>8</sup>

Nikolaus Pevsner notes that there was debate in the late 1800s regarding 'artistic genius and some special form of inspiration' vs William Morris's denial of a need for it and emphasis on 'craftsmanship'.<sup>9</sup> Morris's ideal of craftsmanship was that of artisans finding joy in their skilled work. J.M. Richards defined good architecture of the 1800s as the "result of ... the architect's imagination and his artistic sense ... exercised within the limits set by a universal architectural language"<sup>10</sup>

By contrast, good architecture of his own era was "the honest product of science and art" by "honest craftsmen in our own materials"<sup>11</sup> Richards puts his comments in perspective by saying, "the individual genius is a law to himself in any period"<sup>12</sup>

Kenneth Frampton defined what he saw as good design in advice that "practice should re-address itself to the issue of *place* creation, to a critical yet creative re-definition of the concrete qualities of the built domain"<sup>13</sup> He echoes Christian Norberg-Schulz's argument that architecture should help make existence meaningful.<sup>14</sup> "[G]ood objects are designed and have a maker or creator. *This is a belief system based on observation* [emphasis added]."<sup>15</sup>

Innovative design also requires intelligence. Therefore, it is an observation that good design is the result of inspiration, intention, purpose, and ultimately a thought process or intelligence. Design can be intuitive, and if random thoughtless interventions are added to the equation, poor or ill-conceived design is the result.

"[I]n many design problems, the generation of possible solutions and their gradual improvement is the only way forward. That is design."<sup>16</sup>

There is evidence of consistent observation that good design stems from creativity which will be the next point to explore.

### Creativity

What is this illusive and hard to quantify 'thing' called creativity? Dorst notes that, "We use the word creativity for anything that we experience as new, when we cannot easily explain where it came from."<sup>16</sup> Put another way, as Cross showed from studies of creative thinking from scientists, artists and designers:

"In fact, as most people have also experienced, these highly creative individuals generally report that they experience a very sudden creative insight that suggests a solution to the problem they have been working on."<sup>17</sup>

So, creativity according to Dorst and Cross is somewhat elusive in nature and results in 'illumination', or the revelation of the germ of an idea. In other words in the spectrum of creativity those considered most creative report a process most closely associated with a 'leap' of inspiration.

Woolfolk concluded that creativity is:

"Having a rich store of knowledge in an area is the basis for creativity, but something more is needed. The ability to break-set, restructuring the problem to see things in a new way, which leads to sudden insight."<sup>18</sup>

This states that creativity requires knowledge, and a means and the will to apply this knowledge in a fluid and succinct way with decisive steps to lead a design forward, but also requires intuitive inspiration. Woolfolk says insight *in addition to* knowledge is needed. If insight was random (which the logic of decisive steps precludes), the result would not have meaningful thought or intention behind it. Further, you can "equate creativity with divergent thinking. Divergent thinking is the ability to propose many different ideas or answers."<sup>18</sup>

What is important about divergent thinking is summarised eloquently by Dorst, who uses the term 'creative leap'. "What seems to be needed for a real creative leap is single-mindedness and dedication towards solving a problem or making a new development."<sup>16</sup>

Divergent thinking is the ability to compile many solutions and then pick the best solution to the problem. Convergent thinking, or dedication to solving a problem, after divergent thinking can lead to new solutions. Creativity is founded on wide knowledge and experience gained in the designer's life. As such, with knowledge and experience intuitive steps in a design process can be made. There must be knowledge and divergent thinking for creativity which leads to sudden new insight. This sudden insight, or creative 'leap', has a shroud of mystery around it:

“Creativity is often seen as the unique human capacity to think up something new out of nothing, a magical gift that all creative minds possess. Creativity is surrounded by myths about sudden inspiration the ‘Eureka’ moments and ‘Ah-ha’ experiences.”<sup>16</sup>

Keep in mind that this sudden illumination occurs after a large amount of cerebral process is applied:

“The illumination or insight is also usually just the germ of an idea that needs a lot of further work to develop into a proper, complete solution to the problem.”<sup>17</sup>

The illumination is the result of all the cognitive processes, churning ideas and discriminating features and weighing solutions until the mind generates an idea which appeases all considered variables or gives new insight that satisfies the most important criteria. But who is a creative person?

“The creative individual is a person who regularly solves problems, fashions products or defines new questions in a domain in a way that is initially considered novel but that ultimately becomes accepted in a particular cultural setting.”<sup>19</sup>

Design is often explained as defining a problem then optimising a derived solution to the problem. The designer’s role is to embody the problem and solutions then create something of worth after deep thought and investigation. Another way to state this is:

“Similar kinds of thought sequence occur often enough in creative thinking from physiologists to suggest that there is a general pattern to it. This general pattern is ... . Recognition-preparation-incubation-illumination-verification.”<sup>17</sup>

It is where “creative design is 1% inspiration and 99% perspiration”.<sup>17</sup>

Cross proposed:

“The creative event in design is not so much a ‘leap’ from problem to solution as the building of a ‘bridge’ between the problem space and the solution space by identification of a key solution concept.”<sup>17</sup>

Creativity, though often intuitive, requires reasoning and intention which leads to ‘illumination’. Illumination is the summation of an integral creative process resulting in an ‘apparent’ solution. There are cases of genius when the ‘illumination’ is sudden and novel. “True the great geniuses seem to find life fairly easy, but for most of us ideas come only after considerable effort, and may require much working out.”<sup>20</sup>

There are those who are naturally gifted which results in their design ability being remarkable: “Giftedness is unusually high ability or aptitude in one or more areas.”<sup>21</sup> For most designers creativity requires hard work and dedication: “It seems creativity requires extensive knowledge, flexibility and the contextual reorganisation of ideas. Motivation and persistence play important roles in the creative process.”<sup>18</sup>



Figure 1. ‘Clouds over a plaza’ was the idea behind the design of the Sydney Opera House by Danish architect Jørn Utzon.

Observations of creative thinking are limited in that we cannot both use our mental capacity to be creative and objectively analyse that process at the same time. Those who have made observations, either after having created something new or by watching people creating, present a spectrum of opinion showing at one end a laborious process of thinking and action, and at the other end, sudden realisation embodied in a single thought.

### Thinking and intelligence

Creativity and intelligence allow problems to be solved in novel ways:

“The notion of solving problems that are important for a particular culture is also a part of Gardner’s definition of intelligence. So creativity, talent and intelligence are related: they allow us to solve important problems.”<sup>18</sup>

Problem solving, intelligence, and talent are bound in a relationship and rely upon each other, interlinked in a dynamic way. Using Sternberg’s Triarchic theory of intelligence, he suggests:

“... intelligent behaviour is the product of applying thinking strategies, handling new problems creatively and quickly adapting to contexts by selecting and reshaping our environment.”<sup>18</sup>

Intelligence and adaptation are due to creative thought processes. Creativity is about thinking, which is unobserved due to a veil of normality. Because thinking is normal and may occur while routine daily tasks are being performed *it is somewhat ignored*.

A great deal of thought goes into design,

*“Thinking is a hard cerebral process. It mustn’t be imagined that any of these problems are solved without a great deal of thought. You must drain yourself. The thing must be observed in the mind and turned over and over again in a three-dimensional sort of way. And when you have gone through this process you can let the computer in the mind, or whatever it is, chunter around while you pick up another problem [emphasis added].”*<sup>20</sup>

Intelligence is a primary factor for design outcomes, with novel ideas not arising by chance without intense thought. “Design therefore requires an intelligent agent capable of expressing purpose or intention.”<sup>22</sup>

The point is that knowledge in a particular field and intelligence go hand in hand with creativity. This is true as design is the result of cerebral processing, intent, and ultimately intelligence. If not, the result is randomness which



**Figure 2.** Porte Dauphine Paris Metro entrance, France by Hector Guimard. Plant forms inspired his innovative forms and the creative detail.

won’t satisfy the needs of the design goals or the user. If no process to develop a solution has been used, the design is void of purpose or reason: “[A] pragmatic viewpoint that without intelligent and expert input, the things humans make do not function very well.”<sup>23</sup>

We need design to create and we need intelligence along with cerebral processing for design. Essentially this is a symbiotic relationship. Thinking, intelligence, and creativity work together to form solutions in the mind of the designer, the solutions which realise the constraints, the users, and purpose in its entirety. Novel items in the physical world cannot arise without novel thought.

### Imagination and inspiration

Designers may be inspired with a “Eureka” moment rather than actively using their imagination to generate novel design. Or are inspiration and imagination linked? Inspiration may be seen as a sudden arrival of a novel idea, a ‘leap’, whereas imagination makes much smaller ‘steps’ in a ‘process’. Rowe, in *Design Thinking*, proposed theoretical discourse as the major source of organising principles that architects used in the steps of the design process<sup>24</sup>, and that analogy was used to ‘constrain the problem space’ including from the natural world.<sup>25</sup> Ruskin a century earlier argued that inspired work in design takes inspiration from the works of nature which far surpass human effort in complexity, wholeness, and unity. Nature is good design, therefore a springboard for inspiration:

*“... for whatever is in architecture that is fair and beautiful, is imitated from natural forms ... . These are the two great intellectual Lamps of Architecture: the one consisting in a just and humble veneration of the works of God upon the earth, and the other in an understanding of the dominion over those works which has been vested in man [emphasis added].”*<sup>26</sup>

So, inspiration might come from nature or from contemporary designers who use nature for inspiration or respond to the natural environment. The other sources of analogy Rowe found used by architects were anthropomorphic, typologies and formal languages (such as classicism)—an example of this may be seen in figure 3. Curiously, a rigid design process made of ‘steps’ is recognised as preventing novel ideas:

*“Design education, then, is a delicate balance indeed between directing that student to acquire this knowledge and experience, and yet not mechanising his or her thought processes to the point of preventing the emergence of original ideas.”*<sup>20</sup>

Emergence of original ideas, spawn from a source typically inspirational, are a small ‘leap’ of some sort. Once inspired the designer imagines solutions in a thought process

that amalgamates the inspired source, the problem and the solutions into a tactile entity.

An important question is whether we can design without inspiration and use only pure conscious thought in a rational process? According to Hertzberger, apparently not:

*“Everything that is absorbed and registered in your mind adds to the collection of ideas stored in the memory: a sort of library that you can consult whenever a problem arises. So essentially, the more points of reference you have to help you decide which direction to take, your frame of reference expands [emphasis added].”*<sup>27</sup>

This leads to the conclusion that to make novel things first there is inspiration from a source and then there is imagination to fit all the pieces together. Therefore, novel design occurs when inspiration then imagination is followed by amalgamation. This suggests that inspiration and rational process are bound together in a unity to create things seen as good design, yet some form of inspiration, whether a ‘step’ or a ‘leap’, is essential.

### The design paradigm—nature and creation

The established thought is that good design requires creativity, intelligence, intent, inspiration then amalgamation, which is elaborated in that, “most people in Western society experience an environment made by people whose thinking is dominated by the view that a good environment is ‘created’ by a designer”.

“The Design Paradigm established was where architects strived to reflect the Divine Being and were inspired in the work by the patterns and proportions of nature.”<sup>22</sup>

One such proportion is the ‘Golden Ratio’. This ratio in nature is:

“... aesthetically superior to all other proportions, which claim is said to be supported by an immense quantity of data, collected from both nature and the arts ... This golden ration (1.62 or 1.618) seems to be naturally pleasing to the human eye ... . No one yet seems to know why dividing these Fibonacci numbers should give proportions which happen to be pleasing to the eye.”<sup>28</sup>

These natural patterns are pleasing to the eye and also modern. “Computer modelling has apparently shown that the way in which a group of circles of varying sizes is most efficiently packed is in a series of spirals that have this Fibonacci patterning—but no one yet seems to know why.”<sup>29</sup> These ratios exude intent and purpose thus being efficient, elaborate, and beautiful. Are these not values we associate with good design? There are “... unexplained linkups between things which are

mathematically beautiful and things which are beautiful to the human eye”.<sup>30</sup>

The word ‘created’ implies a conscious thought process directed to a goal or purpose, not the result of randomness. The divine intelligent designer of nature was an exemplar for architects. Nature exudes complex interrelations at every level as if a pattern book of design intent is there. An early observation from science, when it was called Natural Philosophy, from Isaac Newton is: “For it became Him who created them to set them in order. And if he did so it is unphilosophical to seek for any other origin of the world, or pretend it might arise out of chaos, or by the laws of nature.”<sup>31</sup> When Newton wrote ‘unphilosophical’ he meant ‘unscientific’ or illogical. ‘Out of chaos’, or randomness, is a complete contradiction in the field of human design.

Designed objects are made using thought in logical steps toward an intent or purpose: for example a tool. All things require intent and a process to obtain good purpose or better stated: good design. Newton saw the laws of nature were not prescriptive and could not have made the order in the universe by themselves. The laws of nature expressed an intent but didn’t themselves govern the way they were used. Like human design, the universe is not random and looks full of intent and goal orientated.

Design is not random gathering of matter as that would be a contradiction. The design process requires inspiration, imagination, and amalgamation by a thinking, or intelligent, being:

“... on one hand, our culture is seeking to eliminate a Great Designer, while at the same time, unconscious of the inconsistency, we are beginning to understand the need for design expertise in the face of increasing



**Figure 3.** The designer of the Stockholm Public Library, Gunnar Asplund, was inspired by the dome as a symbol of the human cranium. The dome idea was replaced later by the cylinder.

man-made complexity.”<sup>32</sup>

To assume a random construct of matter will fulfil the needs of humans in this constantly changing technological world is false. An evolutionary design process (the result of random improvement) doesn’t work as design intent is considered essential for good design to be attained. “If an evolution paradigm was applied to the built environment, there would be no need for any special expertise and no need for intelligence: therefore, there would be no need for scientists, engineers or architects.”<sup>32</sup> This however is not the case. Designers bring together all the needs of users, material, constraints, intent, and purpose of the artefact:

“In every case [of creative work] one must achieve the simultaneous solution of opposites. . . . Nearly every design task involves ten, often hundreds, sometimes thousands of different contradictory elements, which are forced into a functional harmony.”<sup>33</sup>

Without intent the things designers make are not design but fabrication of chance. Matter assembled by pure chance is not design. Design is a product of intelligence applied with intent. For example use of a style, appeal to a particular demographic, and consideration of how a structure might endure harsh weather, are all intentions with purpose and cultural meaning. This intent is clearly articulated:

“Our culture, by elevating the profession of architecture is saying clearly that they would prefer the world we live in to be designed and meaningful rather than the result of unthinking, unplanned, ad hoc event. They place value in the Design Paradigm [emphasis added].”<sup>32</sup>

Design is essentially to plan and construct meaningful objects that are intended to be used and interact with people in useful and constructive ways. Design is the result of intelligence, imagination, amalgamation and theory, or cultural understanding of ‘good design’. In our culture the Design Paradigm has meant that designers are being taught to intuitively use natural analogy as inspiration for design yet, the world perspective of the most powerful sources of inspiration, nature, is viewed as the result of randomness.

“If a culture maintains a belief that it requires intelligence and skill to copy the functional mechanism of nature, it seems a contradiction that the same culture could believe nature was not likewise designed. It would be rational to have a consistent world view and to extend Design Paradigm to nature: that that the entire physical world has a maker or Creator [emphasis added].”<sup>23</sup>

The idea of pure chance forming matter into complex functioning forms is inconsistent with the observation of ‘good design’ which requires intent and purpose, and the most highly prized but rare attribute of inspiration, all

qualities which nature reveals. Inspiration should be drawn from the best designs. The foremost source is nature which is unparalleled in complexity, unattained in elegance, good, and great in process.

Great design is considered aesthetically pleasing, functional, and complete, like things seen in nature. The completeness of nature can inspire our imaginations to repeat this design intent, to create similar unity and wholeness. There are too many examples of nature being used to inspire invention to quote. Many examples were collected in Sarfati’s book *By Design* and two may establish the point. When physicist Edward Kelley was seeking to solve the problem of camera lens flare he wrote, “so I copied the design of the human eye, which uses liquid to fill the gap between lens and retina”.<sup>34</sup>

Levin headlined that ‘flying creatures may help create aviation of the future’ and quoted, among other aeronautical experts, Terry Weisshaar who said “it’s absolutely good design if you copy nature”.<sup>35</sup>

The following expresses a logical conclusion based on observation:

*“I personally believe there is some greater deity that’s organised it. Everything is too cleverly organised, as far I’m personally concerned, to have just happened by happenchance. Whether you say all this was constructed by God or whether you believe in some other way of doing it, I’m not quite sure, but yes, I think there is some kind of power behind it all, but what it is I have no idea [emphasis added].”<sup>36</sup>*

Because the option of happenchance is eliminated by observation of intelligent organization,

“Surely it is more logical to conclude that the connections exist because nature, mathematics and the human mind, with its subtle selection of beauty, have one supreme link—they are all products of God, the Master Designer.”<sup>37</sup>

A master designer is implied if inspiration from nature by those considered exemplar designers is to be worthy of inspiring good design. It is proposed that just as life must come from life, so inspiration comes from one who inspires, and thus it makes sense the origin of inspiration is from the greatest designer of all, God.

## Conclusion

Inspiration (the ‘Eureka’ or ‘Ah, ha’ moment) and imagination (including divergent thinking) do not seem to be mutually exclusive but are bound in a way where they rely heavily upon each other. Consequently, new design outcomes result from an amalgamation of inspiration, imagination, intelligence, creativity, and intent, with ‘steps’ or ‘leaps’ of inspiration being a critical part. None of these variables work

as individual factors but merge to form the design process which designers inevitably use. The design process uses imposed intent, purpose, and realisation to form solutions. This notion of intent resulting in fitness for purpose can be compared to nature which may be observed as fit for purpose so that it is apparent something akin to a design process has been utilised.

Therefore, it is worthy to account for intent in nature and with logic observe as a fact that it has been designed. There is a reason to adopt this notion and be inspired from nature (a result of design processes) because it is valuable to designers. To ignore this is to say good design arises by pure chance and the result of ‘randomness’ which every observation shows is not the case.

Embracing the original source of inspiration may be considered a way to produce wholeness, unity, and entirety in human-made things. It may be concluded from design, creativity, intelligence, and the design paradigm that all things have been created. For Bible believers, maintaining a holistic view of design consistent with the observed facts of inspiration and creation in science will allow all to journey into a powerful discovery of completeness, rather than being bound into false illusions of the origins of all things.

## References

1. Norberg-Schulz, C., *Nightlands, Nordic Building*, The MIT Press, Cambridge, MA, p. 184, 1996.
2. Keiding, M., *Utzon and the new Tradition*, Danish Architectural Press, Copenhagen, 2005.
3. Libeskind, D., *The Space of Encounter*, Thames & Hudson, London, p. 23, 2001.
4. Rowe, P.G., *Design Thinking*, The MIT Press, Cambridge, MA, p. 31, 1987.
5. Koestler, A., *The Act of Creation*, Arkana, Penguin Books, London, p. 117, 1964.
6. Koestler, ref. 5, p. 120.
7. Boyd, R., *The Puzzle of Architecture*, Melbourne University Press, Australia, p. 19, 1965.
8. Rapoport, A., *History and Precedence in Environmental Design*, Plenum Press, New York, p. 12, 1990.
9. Pevsner, N., *Pioneers of Modern Design*, Pelican, Penguin Books, Middlesex, UK, p. 23, 1960.
10. Richards, J.M., *An Introduction to Modern Architecture*, Pelican, Penguin Books, Middlesex, UK, p. 16, 1970.
11. Richards, ref. 10, pp. 11, 28.
12. Richards, ref. 10, p. 19.
13. Frampton, K., *Modern Architecture: A Critical History*, Thames & Hudson, London, p. 10, 1985.
14. Norberg-Schulz, C., *Meaning in Western Architecture*, Macmillan Publishers, London, 1975. This is an extensive essay explaining how specific forms and built elements revealed contemporary social, religious and philosophical belief.
15. Henriksen, J., The design paradigm, *J. Creation* 22(2):53–59, 2008.
16. Dorst, K., *Understanding Design*, 2<sup>nd</sup> edn, BIS, Amsterdam, 2006.
17. Cross, N., *Engineering Design Methods Strategies for Product Design*, 4<sup>th</sup> edn, John Wiley and Sons Ltd, West Sussex, 2008.
18. Woolfolk, A., *Educational Psychology*, 8<sup>th</sup> edn, Pearson Education Inc, New Jersey, 2001.
19. Gardner, H., *Creative Minds an Anatomy of Creativity Seen Through the Lives of Freud, Einstein, Picasso, Stravinsky, Elliot, Graham, and Gandhi*, Basic Books, New York, 1993.
20. Lawson, B., *How Designers Think: The Design Process Demystified*, 4<sup>th</sup> edn, Architectural Press, Oxford, 2006.
21. McDevitt, M.T. and Ormord, E.J., *Child Development and Education*, 1<sup>st</sup> edn, Pearson Education Inc, New Jersey, 2002.
22. Henriksen, ref. 15, p. 53.
23. Henriksen, ref. 15, p. 59.
24. Rowe, ref. 4, p. 115.
25. Rowe, ref. 4, pp. 80, 81.
26. Ruskin, J., *The Seven Lamps of Architecture*, 2<sup>nd</sup> edn, Aphorism, New York, pp. 71–72, 1989.
27. Hertzberger, H., *Lessons for Students in Architecture*, 010 Publishers, Rotterdam, 1991.
28. Wieland, C. and Grigg, R., Golden numbers, *Creation ex Nihilo* 116(4):26–29, 1994.
29. *New Scientist*, 18 April 1992, p. 16; also *Physical Review Letters* 68:2098, 1992.
30. Wieland and Grigg, ref. 28, p. 29.
31. Newton, I., *Opticks, 1730*, 4<sup>th</sup> edn, book 3, part 1, London, 2007.
32. Henriksen, ref. 15, p. 58.
33. Pallasmaa, J., Quoting Alvar Aalto, *Taide ja tekniikka [Art and technology]*, lecture 1956, *Architectural Design* 77(2):19, 2007.
34. Sarfati, J., *By Design*, Creation Book Publishers, Australia, p. 31, 2008.
35. Sarfati, J., ref. 34, p. 63 (quoting Levin A, USA Today, 13 February 2007).
36. Dr Michael Gore of the Nation Science and Technology Centre, Australia, in a speech in *Quantum* television program, Australian Broadcasting Commission, 13 November 1991.
37. Wieland and Grigg, ref. 28, p. 26.

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