Journal of Engineering
Fayoum University
Faculty of Engineering
Vol. 2
No.1 2

The Effect of Technological Development on Architecture

Nanotechnology and Architectural Design

Fatma Ahmed Elbony
Department of Architecture/ El-Gazeera High Institute for Engineering
fatma_bony@yahoo.com

Abstract

Technological development has played a significant role in architectural design throughout history. Nanotechnology is a rapidly developing field of technology with numerous current and potential applications in architecture and building construction discipline. It can promote architectural creation through forth ways affecting many aspects of architectural design; such as architectural thinking, structural design, building material applications, and construction process. The aim of this paper is to investigate the effect of technological development on architectural design, from the view point of form and shape, through two parts; the **first part** represents a literature review of the architectural history and technological development, and the **second part** investigates the more recent technological development represented in Nanotechnology as a concept, nanomaterials and new construction method, that has a wide effect on architectural design producing a new style of architecture called nano-architecture.

Key wards

Technological development, Architectural design, Nanotechnology, Nanomaterials, New way of thinking, Nano-Architecture

1- Introduction

Technological development has played a significant role in architectural design throughout history: whether new building materials either natural or artificial, new methods or processes of construction and new conceptions, theories and design principles.

Architecture and design are applied sciences that utilize research and development in technology to propel their work to new heights, presenting buildings and products that are not only more interesting, but more responsible and useful as well(1). Applying technological development in architecture aims at bring together artistic, practical and procedural skills; the fusion of three separate worlds as shown in (Fig.1). The artistic component is the domain of the designer – creative, difficult to quantify objectively and always subjective. The practical component is the domain of the builder – assembling physical materials, technical, physical and quantifiable. The procedural component is the domain of the manager – pulling together artistic and practical skills in an ordered and effective – manner (2). In the context of nanotechnology this paper argue the artistic component of technological development represented in nanotechnology concept, the practical component represented in the construction method (Molecule Nanotechnology MNT) and the physical in Nanomaterials

Nanotechnology is a field of applied science and technology covering a broad range of topics. The definition given by the German Federal Ministry of Education and Research (BMBF) summarizes nanotechnology as follows: "Nanotechnology refers to the creation, investigation and application of structures, molecular materials, internal interfaces or surfaces with at least one critical dimension or with manufacturing tolerances of (typically) less than 100 nanometers. The decisive factor is that the very nanoscale of the system components results in new functionalities and properties for improving products or developing new products and applications [(3)].

Nanotechnology is the design, the manipulation, the building, the production and application by controlling the shape and size, the properties-responses and functionality of structures, and devices and systems of order or less than 100nm[(4)].

Implementing nanotechnology and nanomaterials through architectural design produce Nanoarchitecture (the architecture of future). Nanoarchitecture is a new style, which affected by the concept of nanotechnology and uses nano materials, products, devices, or even Nano-shapes in the treatment of structure and construction process. It is obvious that Nanotechnology affects architectural design through four ways; the first one is through the innovated nanomaterials, the second is through the nanotechnology's concept (new bottom-up approach in building construction), the third is the new construction process, and the fourth is the way of thinking.

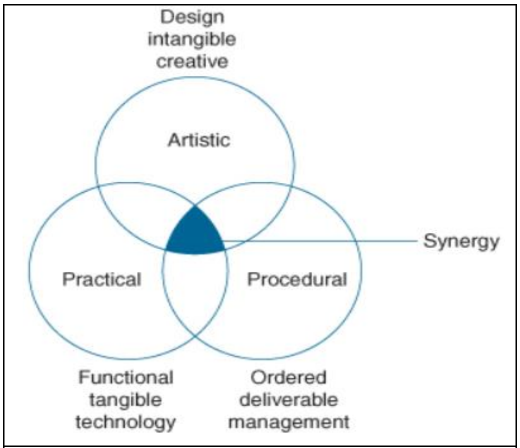


Fig.1: Architectural technology[(2)]

2- Technological Development and Architectural design throughout history

Reviewing architectural history illustrate that technological development has a great impact on architectural ideas and forms throughout history, and this is evident through the various civilization styles. Through the Middle Ages architecture relied on and celebrated the impact of building technology and technical design on the final built form as in (Fig.2) and (Fig.3). This influence of technology and architecture would dramatically change with the rise of Industrial Revolution, since building technology took another major evolutionary surge forward. Technologies during this period allowed the creation of many more wonderful architectural achievements and can also in theory be linked directly to current building design. New technologies allowed greater innovations in architectural design, with the advent of Modernism, shaping new architectural styles like futurism and functionalism as well as new-age philosophies and theories on society. The first skyscraper with a steel frame construction

(Home Insurance Building, William Le Baron Jenney) was built in 1884 in Chicago (Fig.4).

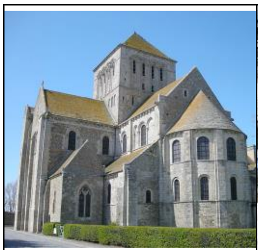


Fig.2:LESSAYABBEY, Normandy, France[5]

Fig.3: Flying buttresses of Amiens Cathedral 1270[5

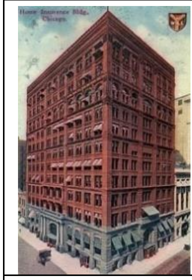


Fig.4: Home Insurance Building, 1884[5]

Fig.5:Buckminster Fuller, Montreal Biosphere, 1967[5]

Another design presented at the Expo-67 gave rise to awe the audience and futuristic Utopian hopes. It was the Montreal Biosphere, designed by Buckminster Fuller, who developed and implemented the concept of geodesic domes designed by German engineer Walther Bauersfeld, shown in (Fig.5)[5].

Adoption of technology has peaked in the second half of the 20th century with the discovery of new materials has led to emerging new styles and patterns of thinking in architecture.

The integration of technology and Architecture through the post modernism, the architectural design was driven by the concept of showing how technology can improve the world by placing technical features of a building on a building's exterior as shown in (Fig.6)[6], (Fig.7) and (Fig.8)

High Tech was a development in British Modernist architecture from the late 1960s. It Was a concept of design, based on engineering, construction and other aspects. High tech was marked by a preference for lightweight materials and sheer surfaces, readiness to adopt new techniques from engineering and other technologies, and the celebratory display of a building construction services[6].

Beginning of the twenty first century has witnessed a tremendous upsurge of scientific activity in the field of 'Nano-science' and 'Nanotechnology', whose seeds were sowed in the last century [7].

3- Nanotechnology and Architectural design

The term Nanotechnology is used to refer to engineering at the atomic or molecular level. It covers an array of technologies that enable the manipulation of matter at nanoscale to create innovative materials, structures, and devices [8]. In the building sector, nanotechnology is an "enabling technology", a fundamental technology that helps to make other technological developments possible [3].

Nanotechnology could be integrated with architectural design as a concept, products, and devices producing Nanoarchitecture which is a new contemporary architectural style of the 21th century. Nanotechnology and nanomaterials affected either the way architects think or how they inspire their ideas. This paper concern with discuss how nanotechnology and consequently nanomaterials will revolutionize every architectural aspects; way of thinking, architectural forms and concepts, new construction methods and building materials.

Fig.6: Lloyd’s Building, London, is a perfect example of high tech architecture. 1986 [6]

Fig.7: Nicholas Grimshaw, British Pavilion, Expo 92, Sevlle (1992) Duccio Malagamba [5]

Fig.8: Stadion Olimpijski Frei Otto Monachium 1972 [5]

3-1 Concept of Nanotechnology

Nanotechnology is not completely new concept; it is as an extension of existing science that deals with molecules on nanoscale. It is the design, characterization, production and application of forms, mechanisms and systems through controlled manipulation of shapes and dimensions at nanoscale that produces forms and systems with at least one improved or new property [9].

The vision of revolutionary bottom-up nanotechnology is based on a concept of molecular assembly technologies where nanoscale materials and structures self-assemble to micro-scale structures and finally to macroscopic devices and products. Molecular self-assembly is a powerful approach being explored for novel supra-molecular nanostructure and bio-inspired nanomaterials [11]

The concept of the bottom –up approach is that one starts with atoms or molecules, which build up to form larger structures. In this context there are three important enabling bottom-up technologies, namely: supramolecular and molecular chemistry, scanning probes, and biotechnology. The supramolecular and molecular chemistry route is based on the concept of self-assembly. This is a strategy of nanofabrication that involves designing molecules so that they aggregate into desired structures. The third relevant route for producing nanostructures using a bottom-up approach is the use of biotechnology. By 1998, biotechnologists were able to make DNA sequences and assemble artificial viruses which are examples of molecular engineering [10].

3-2 New Construction Method

The essence of a new construction method proposed by the Architect John Johansen regarding the combination of organic properties with the inorganic properties of technology in the creation of nano-architecture, is “molecular growth”, it is a development from simple to complex molecules.

3-2-1 Molecular Nanotechnology (MNT):

Molecular Nanotechnology (MNT) represents a new phase in the evolution of manmade structures. The central thesis that nanotechnology is "capable of producing almost any chemically stable structure that can be specified" was first advanced by the physicist Richard Feynman in 1945. This then prompted physicist-designer William Katavolos to start studying the effect of MNT to the growth of architecture, foreseeing the production of a large floating city. Katavolos remarks, "We are rapidly gaining the necessary knowledge of the molecular structure of these chemicals with the necessary techniques that will lead to the productions of materials that will have a specific program of behavior built into them."[12].

3-2-2 Artificial DNA, or Coding

Artificial DNA, or coding, is essential to the process of molecular nanotechnology. If molecular structures are to reproduce and build products, they must be given directions as to what to build, how, when, and where. "It is important to know that molecular assemblers cannot build anything by themselves," writes Bill Spence. "All products familiar today and inventions of future products to be built by MNT must be re-designed, engineered, molecularly modeled ...and translated into functional software"[12].

3-2-3 Molecular Building Process

The molecular building process is not biological, but mechanical; living cells are replicated by dividing, assemblers replicate mechanically, by building others. As Drexler has written: "The great difference is that nanotech use not living ribosome but robotic assemblers, not veins but conveyor belts, not muscles but motors, nor genes but computers, not cells dividing but small factories producing products and additional factories" [13].

Assemblers are robots, or "nanobots," with communicative powers that in collaboration can build anything they are programmed to build. They are organized by their "foreman," the seed computer, into specialized building crafts that operate as part of a vast construction project. Mechanical assemblers are expected to employ a greater variety of tools and use them with greater force, control, and precision than ribosomes can in nature [13].

3-2-4Growth at the Building Site

The notion of growing architecture was proposed in 1961 by Katavolos, and expanded by Vittorio Giorgini, in “Early Experiments in Architecture Using Natures Building Technology," in 1997. The process begins as the hardy molecules position their roots in the vats. Growth emerges, growing upward and outward as their code directs. For larger, out-of-vat products, growth is dependent on the linear, vertical delivery of nourishment. It is noted that "large plants and animals have 'vascular systems' and intricate channels to carry materials to molecular machinery working through their systems. In similar fashion, artificial assembly systems could also employ this strategy ... to build a scaffold, then working through its volume incorporating materials from the central source, in this case, the vat"[13].

4- Nanomaterials for New Architecture

For centuries and before the industrial revolution the designer’s choice of materials was largely limited to locally sourced materials. The principal structural materials were stone, brick and timber, with organic materials such as reeds used for finishes [3]. Cast iron, concrete, steel and glass gave engineers opportunities to build great structures.

Many nanomaterials are already available, and also, nanoparticles could integrate into conventional materials to attain multifunctional nanocomposites and have new properties. Nanostructured materials are constituted as traditional materials -steel, cement, glass, polymers- admixed in a mass or surface with nanomaterials (nanocomposites) or modified in its chemical and physical structure at the nanoscale level [14].

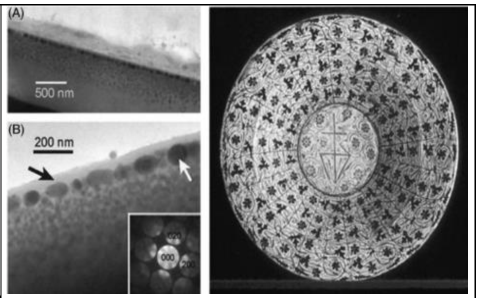
Nanomaterials have the potential to provide one of the key technologies of the new world. Nonscientists created revolutionary materials like: Coatings a single atom thick, carbon nano tubes- sheets of graphite just one atom thick, formed in cylinder- are up to 50 times stronger than steel and 10 times lighter. Nano tubes are already the building blocks for hundreds of applications, used to reinforce concrete. Nano composites, which combine nanomaterials with more traditional one such as steel, concrete, glass, plastics can be many time stronger than standard materials [15].

4-1- History of Using Nanomaterials in Architecture

Nanoparticles are a natural phenomenon and it is therefore no surprise that their properties have been made use of throughout history. Among the earlier examples in which "nano" plays a role are the red color of Roman glass trophies and the red coloring of stained glass in medieval church windows. The deep red coloring of the gold that was used for this purpose is partly responsible for the illustrious color of the stained glass windows. The color of gold particles changes depending on their size and form and can appear red, blue or violet (Fig.9) [3]

- Many Medieval and Renaissance ceramics have surfaces characterized by a remarkable iridescent metallic shine, shown in (Fig.10). This form of ceramic decoration (Fig.11), a type of luster, appeared in the Middle East in the ninth century ad subsequently spread through Egypt, Spain and other countries.

Another example is the “tin-glazed pottery of 15th and 16th century Italy and the “copper-glazed lusterware porcelains of Wedgwood in early 19th century England. Results of researches have indicated that various luster characteristics could be a result of the presence of different levels of silver or copper Nanoparticles within the glassy matrix.

		
Fig.9: The intense colors of many medieval stained-glass windows resulted from nanosized metal oxide particles added to the glass[3]	Fig.10: Medieval Lusterware, 16th century, Manises, Spain, The glaze was made by firing metal oxide [3]	Fig.11: Luster ceramic from Manises, circa the 15th century [17]

4-2- The Influence of Nanomaterials on Architectural Design

The use of nanomaterial in architecture will present new opportunities to solve problems and lead the building structure and architecture to an optimum level by improving significantly the nature of building structure and efficiency and the way buildings relate to the environment [16]. These nanomaterials can add functional characteristics and novel sensing properties such as structural health monitoring, increased tensile strength, self-cleaning capacity, fire resistance, and many other capacities like heat absorbing windows and energy coatings taking building materials (coatings, panels and insulation) to a maximum capacity of performance in terms of energy, light, security and intelligence [16]. The following examples illustrate the implementation of nanomaterials in architecture.

The Nanohouse Initiative is a collaborative design between scientists, engineers, architects, designers and builders. It is a new type of ultra-energy-efficient house exploiting the new materials being developed by nanotechnology. The Nano House Initiative was designed in 2002 by Carl Masens at the Institute for Nanoscale Technology and was visualized and implemented by architect James Muir. It has the latest technology in which windows clean themselves, tiles might resist the build-up of soap scum, and timber surfaces resist UV damage as in (Fig. 12) [18].

Fig. 12: Nanohouse[18]

The Nano Towers were proposed as the new headquarters of the Biotech Research Park in Dubai. The tower designed for different usage and it offers 160 000 m2 office space, laboratories, hotel, and residential and associated support facilities in a 262 m high tower. The canopy at ground level provides sun shading while creating an intense entrance to the towers which is a conceptual ground plane from which the towers grow. From Architecture point of view it is interesting because there is repetition of a grid exoskeleton structure, which has non-curved beams of equal length. The entire facade of the tower is faceted, inspired by a nano scale carbon tube, the structure creates junctions where the geometry shifts from vertical to horizontal. This creates multiple opportunities for dividing the interior space along mullion lines (Fig.13) [18].

Fig.13: Nano Towers[18]

5-Nanotechnology and the New Way of Thinking

With new technologies especially nanotechnology architecture will witness an enormous revolution in all its aspects. Architect has to consider and deal with this new technology in context of their thoughts, conception of materials, construction, forms, functions, etc, and consequently contribute to the architectural inspiration to create and form new patterns of architecture and produce novel designs for the current and future generations.

With nanotechnology architects will be freed from the bind of ensuring comfort, safety, and environmental sustainability to a large extent. Structures built with these powerful materials would automatically take care of these aspects leaving the architect free to focus on aesthetics. Architects, then, are the sculptors of our living spaces, holding the blueprints to our indestructible future, and that future is small, powerful, and disruptive [19].

6-Nanotechnology and Nano Architecture

Nanoarchitecture is a new style of architecture revealed by the revolution of nanotechnology. The discipline is Nano architecture, which affected by the concept of nanotechnology and uses the nano materials, products, way of thinking, or even Nano-shapes in the treatment of structure and construction producing new architectural forms, as shown in (fig. 14)

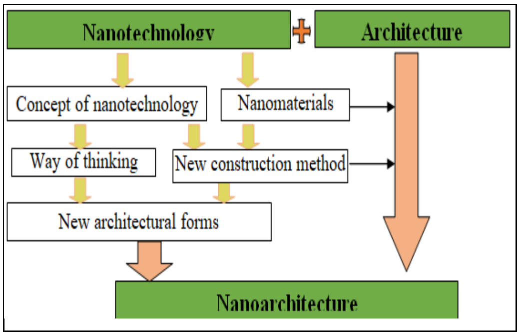


Fig.14:The integration between Nanotechnology and Architecture producing Nanoarchitecture (researcher)

There are few architects like the prominent American architect John Johansen, who have generate a conceptual city that relies on the possibilities of nanotechnology, and looks in the design entirely differently to the current approach. He said: "Nanoarchitecture will be used to create the buildings of the future - structures will function in symbiotic relationship to the environment, adapting to the changing needs of their inhabitants." [12]

The following part discusses the effect of nanotechnology on the future of architecture through reviewing the vision of the architect John Johansen.

6-1- Vision of Nanoarchitecture in the Future

According to the prominent American architect John Johansen who studied under Walter Gropius at Harvard School:

"As we anticipate the future, with buildings created from Nanoarchitecture - of phenomenal strength, lightness, integral structure, seamless continuity of surface, transparency, and in evolving, growing forms - these buildings will reshape the man-made environment. Created from the subatomic level without the use of natural resources, waste-producing factories or laborious physical labor, these masterfully-programmed buildings will not outdo the modesty of the natural world. They will exist in symbiotic harmony with the natural environment, adjusting their forms to the needs of people and the seasonal changes of light, temperature and humidity". - John M Johansen, FAIA[20].

The future of architecture is in development and such architects like John M. Johansen are creating unique perspectives on how new technologies affect the build form. John Johansen mentions the theory of programming growth molecules which once programmed would grow to become the designed structure or feature rather than it having to be built mechanically. The resultant architecture would grow in a semi organic manner [16]. The following are some key ideas of Johansen's vision for the future of architecture: [11]

1- MAKING THE TECHNOLOGY MORE HUMANE

Nano- architecture will allow for designs that better interact with the human senses. Experiencing this type of architecture could feel more "natural" and less forced than many of the designs experienced today.

2- DESIGNING YOUR OWN MATERIALS

By merging both nanotechnology and architecture, the advent of nanotechnology will give architects renewed freedoms. For example new substance, known as diamond and constructed of all carbon Nanotubes made of the highest molecular density and bonding power. Will fifty times the strength of steel and lighter in weight.

3- BUILDINGS THAT WILL "GROW"

Think of architecture as a "growing" environment as shown in (Fig.15)

4- RESPONSIVE ARCHITECTURE

An architecture that is responsive would allow for better design variations that meet occupant need. Personalization of Nanoarchitecture spaces will be a likely benefit giving occupants greater flexibility and choice.

5- BRINGING ARCHITECTURE CLOSER TO NATURE

Johansen's vision of a chapel responding to light energy is a rather beautiful idea. This one concept powerfully illustrates the possibilities that nano architecture will allow. It is likely that nano-architecture will bring architectural design a few steps closer to having buildings more synchronously harmonize with nature.

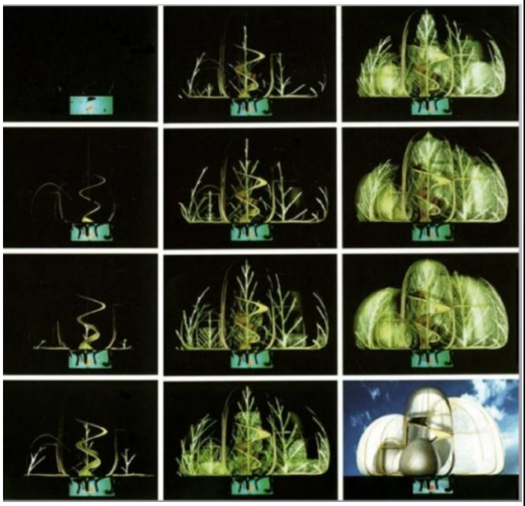


Fig.15: The growing process of the Molecular engineered House of Johansen [20]

7-Future Application for Nanotechnology in Architecture

The following examples represent some of Johansen's works inspired by nanotechnology and applications of the key ideas of his vision for the future of architecture

Inspired by nature, Johansen J. assumed by planting seeds in what many predict will be the future of architecture; Johansen firmly believed that his nano-architectural ideas and designs will someday provide the foundation for buildings that will be "grown" from the subatomic level.

"Nanoarchitecture will be used to create the buildings of the future - structures will function in symbiotic relationship to the environment, adapting to the changing needs of their inhabitants." - John M Johansen

7-1- Proposed Multi Story Apartment Building

In this project a more sophisticated structure considered, grown in stages -according to the key ideas of Johansen's vision for the future of architecture- as shown in (Fig.16), controlled by more intricate coding strategies. The project adopted the "Molecular growth" concept – assumed by Johns Johansen- that starts with roots stemming from the chemical composite reaching up and out of the vat to round level, the roots from rudimentary "grade beams" extending horizontally to the edge of the building, where they curve upward to support the superstructure. Cross ribs connect the grade beams and form the ground floor platform. Translucent membranes change from transparent to opaque to transparent, providing a view anywhere at any time desired. The molecular growth process from vats at the building site, root, stalk, branch, platform, lattice membrane, and openings develop. Light control and self-cleaning, repair and demolition system also emerge [12].

Fig.16: Illustrations by John Johansen showing States of the multistory building at its different growth stages. It is representing the key ideas of Johansen's vision for the future of architecture. [12]

7-2-The floating house

The floating house applies thin-shell structural technology. The entire home - its structural supports along with much of its built-in furniture- is sculpted from the same luminescent plastic material, giving it the bearing of a giant water flower, (Fig.17) [12].

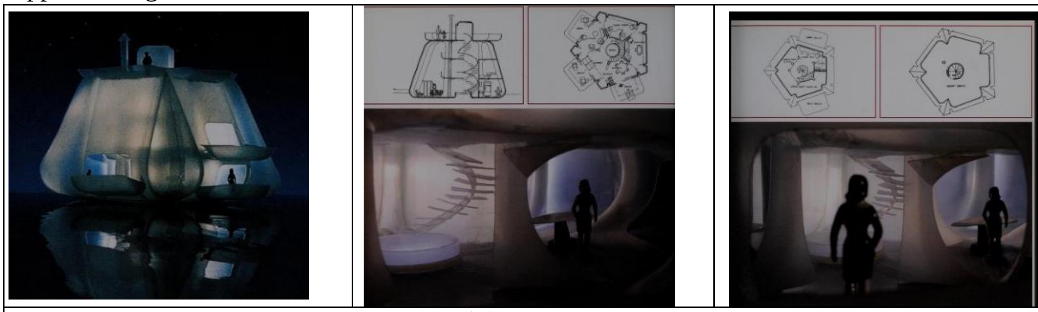


Fig.17: The Floating House by John Johansen [12]

Conclusion

Reviewing architectural movements throughout the history illustrate that architectural design and technological development have a special relationship. This relationship could be traced back to the Enlightenment and the Industrial Revolution. It had a significant role in shaping and form architecture in different styles and movements. Nowadays nanotechnology as a contemporary and future technology is affecting all aspects of architecture from early stages of design to the final touches of finishes and throughout the building's lifetime.

The concept of Nanotechnology, the new approach of construction – bottom to up- and the molecular Nanotechnology (MNT) as a new construction method**,** represented a revolution in the way of thinking in architectural design.

Nanotechnology is bringing incredible changes to the materials and process of building. Nonscientists created revolutionary materials like: *Coatings* a single atom thick, *carbon nano tubes*- sheets of graphite just one atom thick…

Nanoparticles are a natural phenomenon and their properties have been made use of throughout history. Nowadays, nanotechnology and nanomaterials offer interesting new opportunities in architecture.

Contemporary architecture has opportunities to adopt new materials for generative design approaches by helping of nanotechnology.

Nanotechnology has the potential to transform the built environment, architecture of the future (Nanoarchitecture), in ways almost unimaginable today, to express with Johansen's words [11], "Much of yesterday's fiction is now reality, and much of today's fiction may be reality of the future."

References

1- Influences of technology on architecture and design, https://www.easyrender.com/3d-interior-design/influences-of-technology-on-architecture-and-designaccessed November2019

2- Emmitt, Stephen, Architectural technology, John Wiley & sons, 2012, second edition.

3- Sylvia Leydecker. Nano Materials in Architecture, Interior Architecture and Design, 2008, Birkhauser, Germany

4- Stergios Logothetidis, Nanostructured Materials and their Applications, Springer- Verlag 2012, Berlin Heidelberg.

5- Worldmuseum, History of Architecture- Postmodernism, https://www.historiasztuki.com.pl/kodowane/003-02-02-ARCHWSP-POSTMODERNIZM-eng.php , accessed November, 2019

6- What Is High Tech Architecture?, https://www.worldatlas.com/articles/what-is-high-tech-architecture.html, accessed November, 2019

7- Sulabha K. Kulkarni, Nanotechnology: principles and practices, Springer

international publishing, third edition 2015, New Delhi, India.
8- David Rickerby, Nanotechnology for Sustainable Manufacturing, Taylor& Francis Group, LLC, 2014, London
9- NanoWerk. (2014). Nanotechnology Introduction. Retrieved from Nano Werk: http://www.nanowerk.com/nanotechnology/introduction, accessed November, 2019
10- Michael F, Ashby, Paulo J. Ferreira, Daniel L.Schodek, Nanomaterials. Nanotechnologies and Design, An Introduction for Engineers and Architects, Elsevier Ltd, 2009,USA.
11- T. shimizu, Self-Assembled Nanomaterials1 Nano-fibers, 2008 Springer-Verlag Berlin Heidelberg
12- Johansen John M. Princeton, Nanoarchitecture: A New Species of Architecture. Architectural Press, 2002, New York
13- Johansen.J, 2011, NANOARCHITECTURE A DISCOURSE PART I, https://johnmjohansen.com/Nanoarchitecture.html, accessed November, 2019
14- Leone, M. F. "Nanotechnology for Architecture. Innovation and Eco-Efficiency of Nanostructured Cement-Based Materials," Architectural Engineering Technology, vol. 1, issue 1, pp.1–9. 2012.
15- Elvin, George. The Nano Revolution: A science that works on the molecular scale is set to transform the way we build. The Architect Magazine. (May1st, 2007). https://www.architectmagazine.com/technology/the-nano-revolution_o , accessed November, 2019.
16- Mohamed Atwa H, Ahmed Al-Kattan and *Ahmed Elwan, TOWARDS NANO ARCHITECTURE:NANOMATERIAL IN ARCHITECTURE - A REVIEW OF FUNCTIONS AND APPLICATIONS, International Journal of Recent Scientific Research, Vol. 6, Issue, 4, pp.3551-3564-, April, 2015
17- Ahmed Barhoum, Adel S. H. Makhlouf, Emerging Applications of Nanoparticles and Architectural Nanostructures, Current Prospects and Future Trends, 2018, Elsevier
18- Didem Akyol Altun*, Bora Örgülü, Towards a Different Architecture in Cooperation with Nanotechnology and Genetic Science: New Approaches for the Present and the Future, Architecture Research 2014, 4(1B): 1-12, DOI: 10.5923/s.arch.201402.01
19- Architecture &more, Nano-architecture: the shape of the future, http://squareone.blog/nano-architecture-the-shape-of-the-future/ , accessed November, 2019.
20- Johansen.J, 2011, THE FUTURE OF ARCHITECTURE, https://johnmjohansen.com/Future-of-Architecture.html, accessed November, 2019

Journal of Engineering
Fayoum University
Faculty of Engineering
Vol. 2
No. 2

تأثير التطور التكنولوجي على العمارة

تقنيه النانو والتصميم المعماري

فاطمة احمد احمد البونـــي
مدرس بقسم الهندسة المعمارية، معهد الجزيرة العالي للهندسة
fatma_bony@yahoo.com

ملخص البحث

لعب التطور التكنولوجي دورا هاما في عمليه التصميم المعماري علي مدي التاريخ. تعد نقنيه النانو مجال تكنولوجي سريع التطور مع العديد من التطبيقات الحالية والمحتملة في مجال الهندسة المعمارية وانشاء المباني. يمكن للنانو تكنولوجيا المساهمة في تعزيز الابداع في العمارة من خلال أربع محاور مؤثره على العديد من جوانب التصميم المعماري، مثل التفكير المعماري، التصميم الانشائي، تطبيقات مواد البناء وعمليه الباء. تهدف هذه الورقة الي البحث في تأثير التطور التكنولوجي على التصميم المعماري من حيث الشكل والتكوين وذلك من خلال جزئين: الجزء الاول يمثل مراجعه لتاريخ العمارة وتأثير التطور التكنولوجي على التصميم المعماري، بينما يبحث الجزء الثاني في التطور التكنولوجي الاكثر حداثه والمتمثل في تقنيه النانو كمفهوم، مواد نانوية، وطرق جديده للبناء، والتي لها تأثير واسع على التصميم المعماري منتجه لطراز معماري جديد يسمي العمارة النانوية.