

Computer Based Medical Art Applications In 3D Animated Films case study: “The Inner Life Of The Cell”

Yasemin KILINÇARSLAN *

Abstract

At the present day interdisciplinary studies has been gaining big importance. Especially scientific studies has been using the computer based designs. In historical period, medical illustrations had been created to express the scientific inventions and observations about human body. The first attempts of these can be seen in the drawings of Leonardo da Vinci's illustrations. He is the first medical illustrator and artist. Medical art sustains an information about medical and scientific discourse to everyday life in which public opinion is formed. Additionally, the space aimed discoveries is transformed to human body. It is an important cosmos changing. Unknown has been searching for in the human body instead of outside of the world. It is apparent that, different philosophical paradigms should be evaluated in the field of both medical and visual arts. In this study, the scientific artistic production of 3D animation film of “Inner life of the cell” which was produced and created by Harvard University will be analysed in the light of scientific artistic dimensions. Every activations inside of a cell is like a simulation of the real world in which all the live organisms and social life relations are shaped. Hence, it can be seen as a scientific artistic dramatic production. In this study, all these dimensions will be analysed through visual materials.

Keywords: Animated film, cell, computer, anatomy

Introduction

When the historical process of medical illustrations is observed,

“Early persian civilization produced crude biological drawings which were made principle as ornaments or portraiture on vases columns and tablets. The chinese were prevented by both moral and civil law from dissecting bodies and consequently from making anatomical drawings. Greek culture was characterized by mysticism and superstition and drawings that related to medical sciences were less exact than the sciences; however there was an attempt to organize the illustration and give emphasis to a key subject. As time went on, The Greek art pushed ahead of medicine. The artists saw great beauty in the human form, and their art forms did not imitate previous ones. They strove diligently to create. In their quest for pleasing portroyal of the human form, they were extremely conscious of body proportions. Doubtless, then, The Greeks contributed to medical illustration most because of detail to topography.” [Loechel,2009]

Today, the process of producing the medical illustrations consist of computer based designs. There is a complicated situation about defining the characteristics of these designs. Are these scientific-medical productions or medical-artistic artworks? In this point, the hybrid studies of medical and artistic professions are a certain situation. In this new communication technology era, communication arts combine with medical researches and they foster each other hence, they create a new scientific artistic knowledge phase.

Expressions of scientific researches are explained to public through these medical designs which have 3D effects. These 3D effects and designs make possible to understand the scientific discourses. By the way, communication style of medical area is transformed to artistic narrations in which scientific knowledge have mediatic conceptions. In these article, whether computer based illustrations and designs, leads to a new interdisciplinary paradigm or not will be discussed and hybrid positions of these dimensions will be analyzed through the an effective 3D animated film which is called as “the inner life of the cell”.

Historical Process of Visualization of Human Anatomy as an Artifact

The most important scientist of the Hellenistic period was Galenos of Bergama who had collected the anatomy and medical information of the antique era. Scientists of that term had asserted that there were different spirits in the organs of living organisms which are under the effect of mystic beliefs. They had examined the structures of muscles and bones of human body. The most important one of the 42 books which were attributed to Hermes trimegista was table of Tabula Smaragdina. According to this table, there was an analogy between the elements of the world and their body parts of the creatures of the world. [Gürel and Doğa Bilimleri Tarihi,2001] The complexity of an organism can be understood only through the obser-

* Assist Prof. Dr. , Usak University, Department of Radio Television and Cinema, Turkey .
E-mail: yasemink2010@gmail.com

vation of its behaviour, namely a dozen of different functions which must be done by it, along its life. But the quantity of complexity can be determined through the minimum information content in its genetic material. Life book is very rich and, a typical DNA chromosome molecule of a human occurs with the combination of approximately five milliard pair nucleotide. The genetic instructions are written by the same language according to same code book [Sagan, 1986] There are chromosomes which look like DNA in the most of cells of our bodies. 23 of them are derived from chromosomes of our mothers and 23 of them are derived from chromosomes of our fathers. Every chromosome is originated from countless genes. Our cells consist of two copies of every gene because of we get one chromosome set from our parents [Wills, 1997] Researches and curious attempts had caused a lot of studies about human body and its inner life along the medical history. Renaissance naturalism was a projection of human spirit above the nature. The whole nature had been described like huge shadows and dreams of psychic energies which have reflections on a curtain. It was the most vivid era of naturalism. Human had been searching the information about life principles [Westfall, 1994] Afterwards technologic progressions sustained different examination and study styles about human body. New medical technology and its equipments made possible to observe the invisible parts of living organisms. Recombinant DNA technology of 1970's and human genom project of 1990's were a genetic plan processes which will express "WHO WE ARE" [Keller, 2004] This DNA technology created a new Hero which is responsible for everything in the human body. It was "CELL". Histology, is the research of extracellular matrix of the cells and membranes. Because of smallness of the dimensions of the cell and matrix, components of histology depend on microscope using and the technical progression about this case. [Junqueira et al, 1998] Cells are the smallest independent elements of the organism. Hence, the whole vital actions of organism derive from chemical activities of the cell which is the smallest unit both functional and structural. There are 100-150 trillion cells in different forms and sizes in human body. Although of these differences, the whole cells are made by a dozen of basic structural elements which have an important role for the continuity of the life of the cell. [Yıldırım and Anatomisi, 2000] Macroscopic anatomy is an anatomy method by which human body is observed with naked eye and on this phase, the whole systems and organs which form the body systems can be observed. In microscopic anatomy; cells and tissues which can not be seen with naked eye and magnifying glass are observed by microscope. It is called as sitology. Except these there is popular and artistic anatomy." [9] As a result, human body has been observing both from outside and innerside. It looks like the explorations of the deepest places of the world in the oceans and the unknown places of the universe.

Medical Technical Artistic Combinations As Hybrid Creations; Using Of 3D Programmes For Illustrating The Human Body

Computer arranges ideal communication instruments for the purpose of controlling the both systems which have effect on each other and dynamic movements which constitute the world of ecosystems, cells, organs, organisms and genes. Life reality does not consider of the pleasure principle of the reality behind the screen. In this imaginary world, fantastic possibilities of avatars and unlimited experiences have attractive for individuals. Evolutive communication instruments are not only computer rules for controlling the living systems. Multi-active language of computer is being inoculated to biologic systems. Genes come together through these common language of these computers which constitute the continuous tissue between knowledge and life sciences in a strong technology revolution. Computer language has been transforming itself to biology language [10] Computer, language, text and software are communication instruments which will solve the codes of genetic resources of the world for sustain benefit. Computer is a part of communication matrix of biotechnology century. Knowledge and life informations which consist of computer and gene combinations are herald of approaching new era.. [11] Just as all medical biomedical arts it is critical to get the facts correct. The client can put the artist in touch with experts and provide reference materials. It is crucial to gather as much reliable reference as possible before putting. Pencil to paper. Usually a client supplies the animator with a script from this a storyboard is developed. Storyboards are to animation what a sketch is to a 2D illustration. Animators create a storyboards for motion pictures, TV commercials, interactive presentations, and many other visual presentation formats, Story board serves as a tool used to map out, the course of the animation project, [Hodges, 2003]

Anatomy for the artists does not imply doctor's understanding of the body, internal organs, blood, vessels, muscles, and bones that are not visible at or below the skin surface are not a concern to the 3D modeller. The 3D animators should have knowledge of skeletal /muscular system and the manner in which it works as a mechanical device. Without this understanding it is very difficult to portray, the human character in its various attitudes and movements [Ratner, 2004] The use of computer graphics in scientific illustration involves four types of software;

- a. post scripts language programs for design and drawn (also called vector or object programs)
 - b. Paint or bit mapped programs that
- (some programs combine both and paint functions)
- c. 3D animation programs
 - d. Multimedia or authoring programs a description of each program with example follows. [14]

Methodology

Analyses of animated films can be considered according to it's genre because every different animation genre has own authentic narration form and character functions and objectives. In an animation film analysis, the most important point is visual effects;

“Slow motion / slomo (Zeitlupe): Movements on the screen are slower than in real-life. Slow motion is used e.g. to increase the impact of a dramatic fight like in Matrix. The opposite is fast motion (Zeitraffer): Movements on the screen are faster than in reality, often used for comic effects. Freeze frame (Standbild): An unmoving picture, that is used e.g. to create the impression that all action has suddenly stopped. Morphing: Changing an image with the help of CGI (Computer Generated Image) software, e.g. robots changing into humans in the Terminator movies.” [15]

The other analysis element is mimetic and diegetic construction of narration. “Diegesis” and “mimesis” terms are related to literature and especially to narration. Mimesis is direct presentation of action and speech, diegesis is oral presentation of events. Mimesis is about word but diegesis is about “telling the events”. For analysing the animated films, usually diegesis analysing application is used when the absence of speech is exist. (look at the table 1.)

“Diegesis: The narrative elements of a film that are shown or immediately inferred from the content of a film. Though implication is not the primary focus, diegesis is a methodological analysis for discerning the exact nature of the film including all of the action and dialogue. “Diegetic” -- refers to things which exist within the “world” of the film’s narrative. Non-diegetic or extra-diegetic elements of a film do not “exist” or “take place” in the same plane of reality that the character’s inhabit. For example, presumably the characters within an action film do not “hear” the rousing theme music that accompanies their exploits. that music is extra-diegetic, but still part of the film.}Narrative: A term denoting a story in any form of human expression where no single individual is telling the story.” [16]



Mimesis	Showing	Direct Presentation
Diegesis	Telling	Indirect Presentation

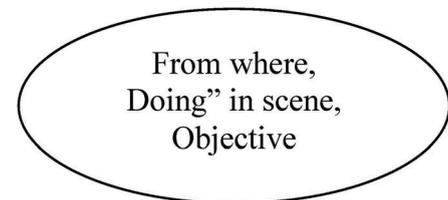
Table 1. Diegetic and Mimetic Table

Character Functions of Medical Animations;

Internal factors shape the characters in a medical animation and these are forms. Character functions or roles in any medical animated film are; love interest (with the assistance of music and collaboration)

- confidante
- partner
- mentor

Character Background;



Character Objectives in Medical Animated Films;

- There are not a lot of characters – per scene
- In medical animations actions are slow and easy to be animated.
 - Scientific animations don't require needs and feelings for characters but this kind of situations can be created by music
 - Characters always play their objectives in every scene
 - There is only behaviour for a character.

Film Analysis Of “The Inner Life Of The Cell”

In the diegesis of this film; there are events, (the mission of the organelles of the cell) spaces (environment in which organelles of the cell are shaped and moved) and the characters (the organelles of the cell). Audiences construct a diegetic world which is inspired of the cell material which is presented in narration through the film. Every action of the characters look like an imitation of natural events. These are the repetition of the actions of creatures of the world. In addition, there are flashbacks in diegetic time for remembering the process of the cell events because of the medical narrations can be difficult to understand and to keep in the mind about what happens in living organisms. By the way, editing is the “transition” from one shot to another shot and the editing style of the film is simple editing.



Image 1.
Characters: Leukocytes and Erythrocytes
Analysis: The beginning of the journey of the cell in the vessel. (Intravenous)



Image 2.
Character: P- selectine
Analysis: Combination of Leukocytes with P- selectine. Leukocytes attaches to P- selectine, stays touch afterwards it detaches from it.



Image 3.
Characters: Lipid rafts and cholesterol
Analysis: Trip on the lipid rafts like on a sea.

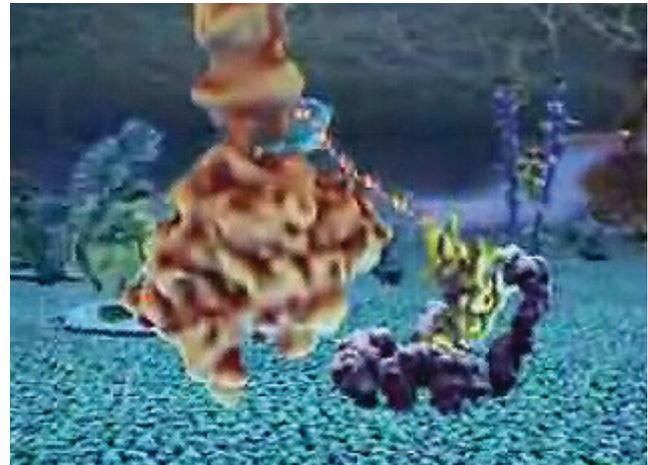


Image 4.
Character: Chemokine, Proteoglycan and Receptor
Analysis: It can be observed that there is a labour division between these organel. Chemokine is a messenger molecule, it connects with receptor and warns the cell.

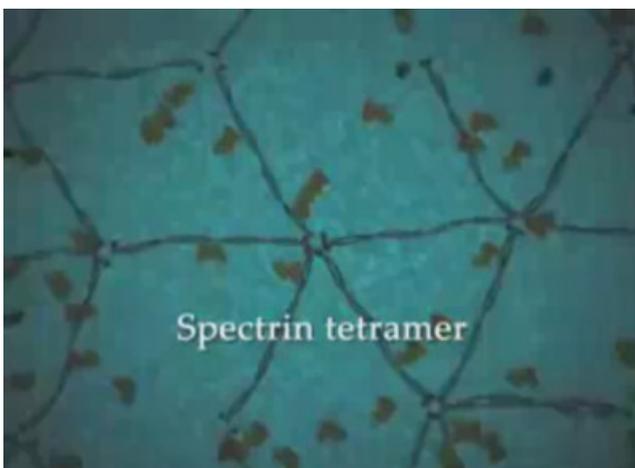


Image 5.
Characters: Spectrin Tetramer
Analysis: It is the geometric combination of spectrin tetramer. There are tetras and hexos. They construct a network in the cell.

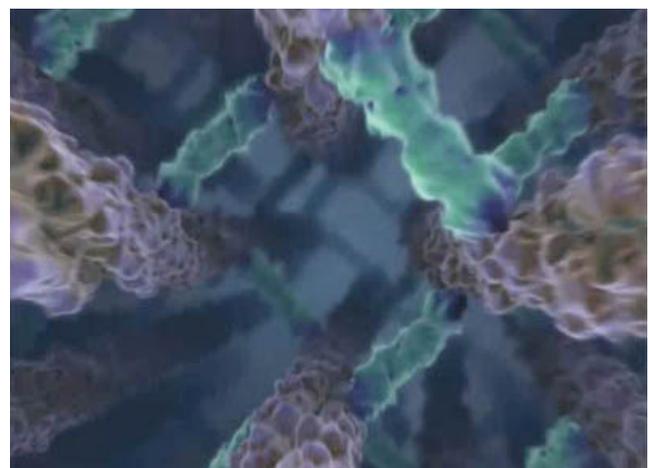


Image 4.
Character: Actin Filaments
Analysis: Actin Filaments are like the skeloton of the cell. Actins and filaments become a united whole.

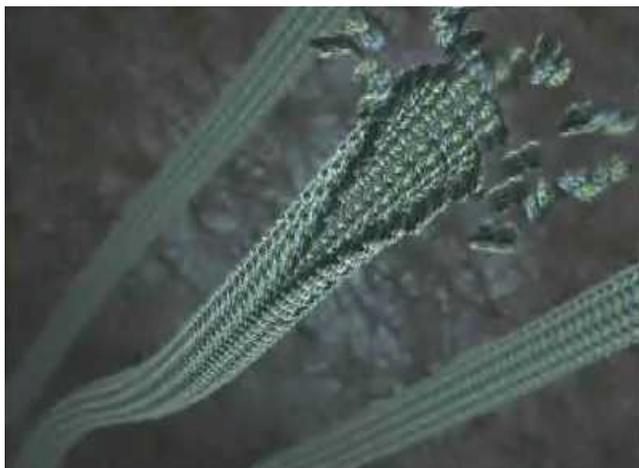


Image 7.
Characters: Microtubules
Analysis: Microtubules sustain the cell integration like a railway or a highway on which cell movements come true.

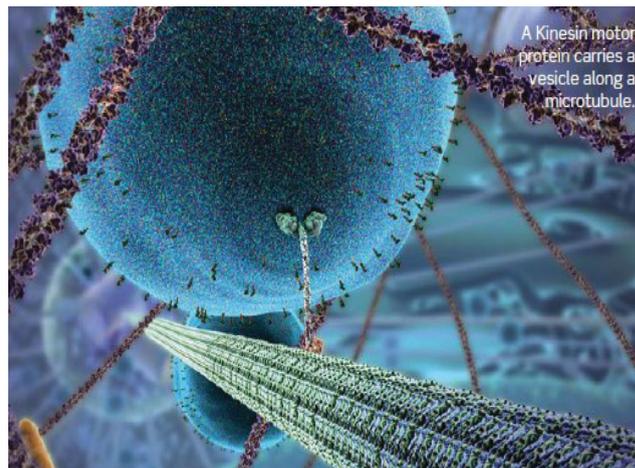


Image 8.
Character: Vesicle and motor protein
Analysis: Motor protein carries the vesicle which consists of materials. This vesicle is a kind of burden for motor protein. It walks on the microtubules and carries the vesicle.

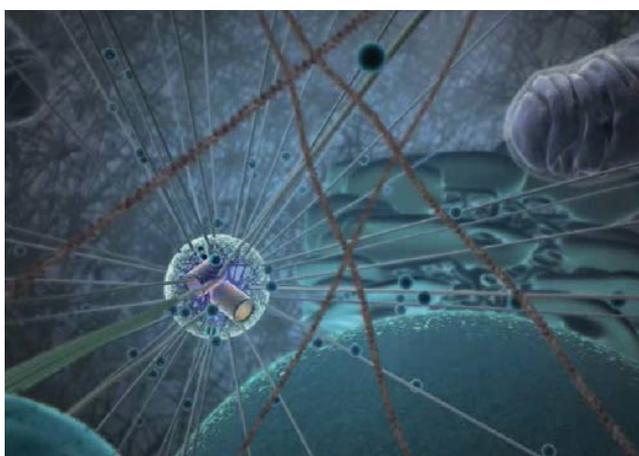


Image 9.
Characters: Centrosome
Analysis: Centrosome is the centre of the cell and is like a brain of it.

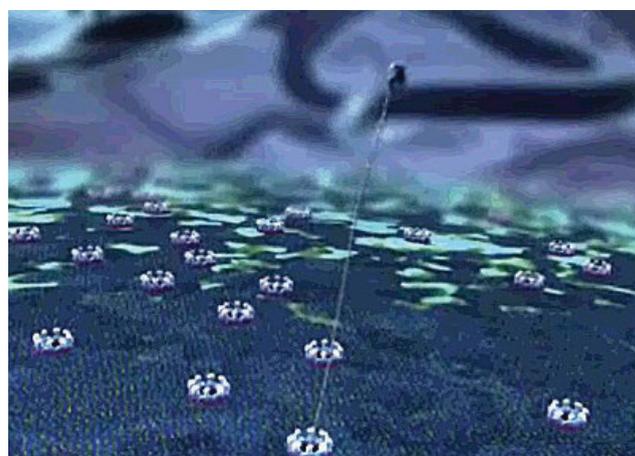


Image 10.
Character: Pores, RNA, Ribosome
Analysis: RNA comes from Pores and makes a circle. Afterwards Ribosome comes and sticks on the circle and it begins to read the Nucleotide letters which have different combinations. These system is like the computer which reads a CD in CD reader.

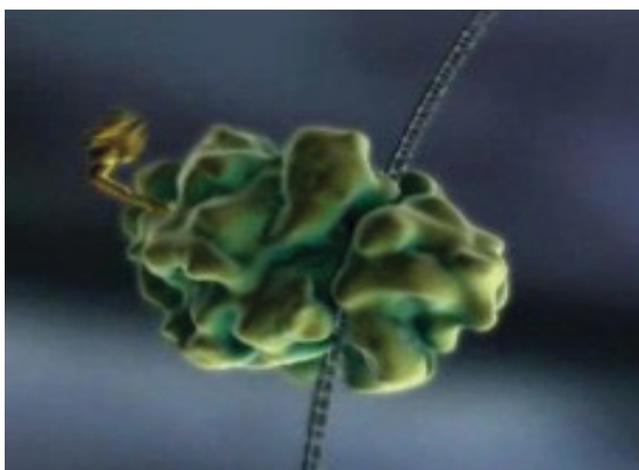


Image 11.
Characters: Ribosome and Protein
Analysis: Ribosome is producing the protein on the circle.



Image 12.
Character: Mitochondria and Protein
Analysis: The protein which is produced by Ribosome, sticks to the molecule and they go to mitochondria together.

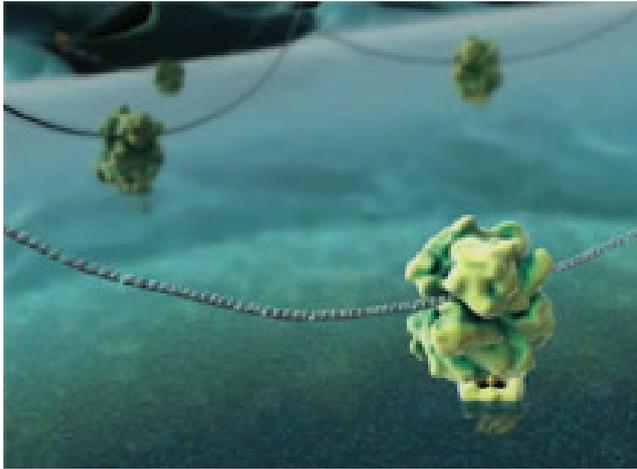


Image 13.
Characters: Ribosome and Translocator
Analysis: Ribosome is sticking on to the translocator while it is producing the protein.

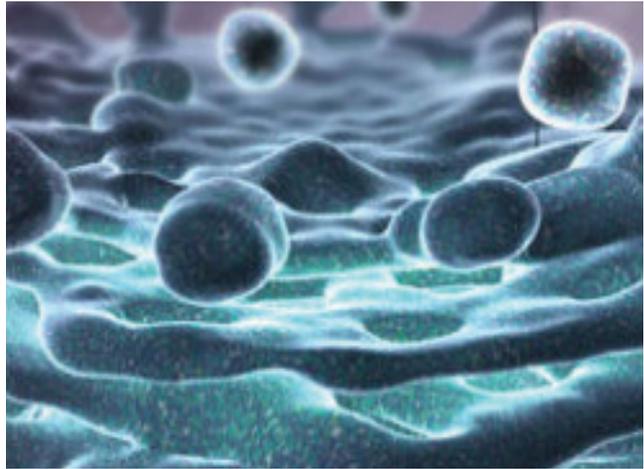


Image 14.
Character: Golgi Apparatus
Analysis: Vesicles are moving (dancing) on the scene golgi apparatus.



Image 15.
Characters: Plasma Membrane
Analysis: Protein and other materials go out from plasma membrane which looks like a volcano.

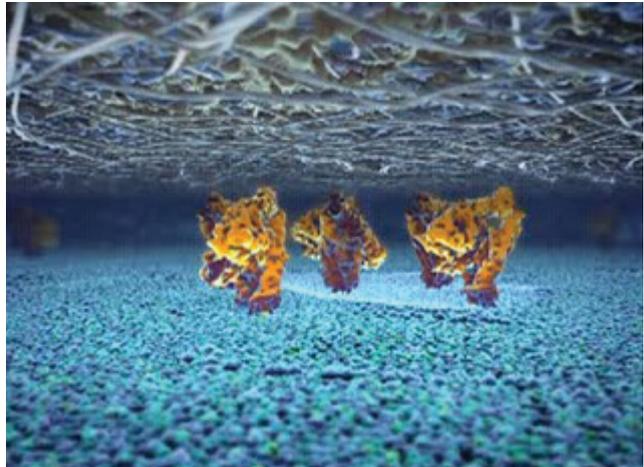


Image 16.
Character: Integrin and I cam
Analysis: Integrins and I cams look like sunflowers and they sustain the cell movement.

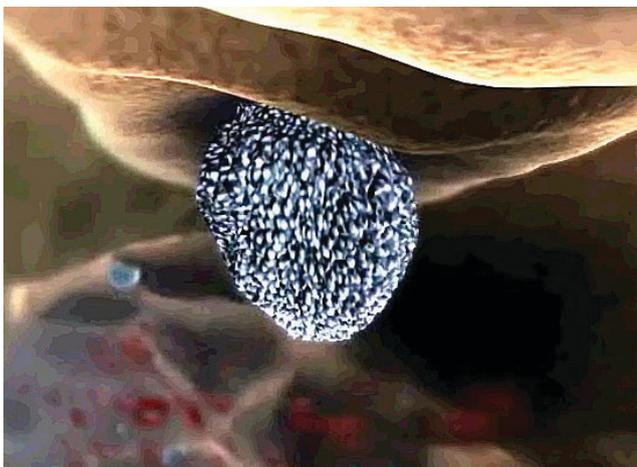


Image 5.
Characters: The cell
Analysis: The cell goes out from vessel, finishes it's mission and reaches to the end of it's journey.

Conclusion

When the messages of the film are read related to shot analysis there is a neverending communication between the cells similar to the communication between people in societies. Human body has chemicals which match to every single emotional situations. Peptides send messages to cell from the world and these messages change the cell and the human consciousness. Cells are alive, they know where and in which situation they are. They are aware of what they produce and their futures. Cells are innercopies of the consciousness in Human body. The innerlife and the inneractions of human like a voyage to undefined and unknown universe. Nowadays, box office films are observed as artifacts which have inspiration of human consciousness, and non linear editing related to kuantum style life experiences. The scenerios has been evolving to destroy the time and space unity. The different realities and possibilities are considered. The changings in science, metapsychic, human mental and communication between the people in imaginary world shows that the most complex and deep cosmos is human consciousness.

References

- W. E. Loechel, (14 September 2009), The History of Medical Illustration, Available: <http://www.pubmedcentral.nih.gov/pagerender.fcgi?artid=200463&pageindex=1>
- O. Gürel, Doğa Bilimleri Tarihi, İstanbul, İmge Kitabevi, 2001, p.p.81-85
- C. Sagan, The Dragons of Eden: Speculations on the Evolution of Human Intelligence (Turkish edition; Cenetin Ejderleri, İnsan Zekasının Evrimi Üzerine Düşünceler), Tr. transl. Kayhan Çetin, İstanbul, E Yayinevi, 1986, p.35
- C. Wills, The Wisdom Of The Genes, New Pathways In Evolution (Turkish edition; Genlerin Bilgeliği), Tr. transl. Feryal Halatçı, İstanbul, Sarmal Yayinevi, 1997, p.33
- R. Westfall, The Construction Of The Modern Science, (Turkish edition; Modern Bilimin Oluşumu) Tr. transl. İsmail Hakkı Duru, Tubitak, Ankara, 1994, p.32
- E. Keller, The Century Of The Gene, (Turkish edition; Genin Yüzyılı), Tr. transl. Haluk Barışcan, İstanbul, Metis Yayınları, 2004, p.18
- C. Junqueira, J. Carneiro, R. Kelley, Basic Histology (Turkish edition; Temel Histoloji), Tr. transl. Prof. Dr. Yener Aytekin, Tr. Transl. Edit. Asist. Uz. Dr. Seyhun Solakoğlu, Uz. Dr. Bülent Ahısali, İstanbul, Barış Kitabevi, 1998, p.1
- M. Yıldırım, İnsan Anatomisi, İstanbul, Nobel Tıp Kitabevi, 2000, p. 8 ibid, p.p:1-2
- J. Rifkin, Harnessing The Gene and Remarking The World-The Biotech Century, (Turkish edition; Biyoteknoloji Yüzyılı-Evrime), Tr. transl. Celal Kaplan, İstanbul Evrim Yayinevi, 1998, p.205-207 ibid, p.201
- E Hodges, The Guild Handbook Of The Scientific Illustration, New Jersey, John Wiley and Sons Inc, 2003, p. 248

P. Ratner., "Mastering 3D Animation", Allworth Press, New York, 2004, p. 126

P. Wood, "Scientific Illustration: A Guide To Biological, Zoological And Medical", Canada, John Wille and Sons Inc., 1994, p. 140

http://www.jochenenglish.de/vocab/film_analysis.pdf(10-12-2013)

<http://www.wabashcenter.wabash.edu/syllabi/w/weisenfeld/rel160/filmterm.html> (09-12-2013)

Biographical Notes

Yasemin Kılınçarslan is a Lecturer of Film Studies. She is now with the Department of Radio-Television-Cinema, Usak University. Her animated films are; "Metamorphosis" 2D cut-out/stop motion, "Meadow Love" 2D paste-stop motion and "Sun City" 2D computer generated cartoon. Her Phd thesis on propagandist animated cinema.