

## **THE DEVELOPMENT OF EXHIBITION THEMES AND THE DISPLAY TECHNIQUES OF CUTTING EDGE SCIENCE AND TECHNOLOGY; “NT, MEMS, AND BT”**

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### **Abstract**

The rationale for this research is to develop exhibition themes and presentation techniques with respect to exhibitions on rapidly expanding field of cutting-edge technology and its applications; in an attempt to contribute to the proliferation of a scientific culture of appreciation, understanding and interaction for the museum's patrons.

We have planned a total of three stages of research (duration of two years for each stage). Currently, the first stage of research has been completed in the first year encompassing ten items in the field of cutting-edge technology. In the second stage, twelve items are planned on the combined application of cutting-edge technologies in medical diagnostic and treatment; five items are already installed as exhibitions at our museum.

Consequently, this research is the first and only of its kind to be attempted in Korea in the area of developing exhibition themes and presentation techniques of cutting-edge technology exhibitions, and in the future we hope this research will be positively applied to disseminate the awareness of cutting-edge technology.

**Keywords:** Cutting edge science exhibition, Nanotechnology, Biotechnology, MEMS, Science exhibition

### **1. Introduction**

Museums presenting futuristic disciplines of science and technology should objectively present the current level of development through visual aids, exhibitions and scientific programs for the enjoyment and interest of its patrons.

Taking into account that the general public should be educated in scientific principles and applications through the experience, the exhibitions must incorporate the characteristics of the cutting-edge technology of the period and the positive humanistic characters so that they are able to exist coherently. Museums should accentuate the positive aspects of the development of the technology through the massive support network, which will then allow the development of the technologies as well as allowing the re-examination of the current direction of the development of cutting-edge technology to check that the direction was the desired direction. It will only then allow the current understanding of cutting-edge technology to become the foundation for the future developments and experiments based on the subject matters of the exhibition.

The current exhibition design techniques are to display the techniques behind the technology or to make the display on an interactive medium development. The development of the current design techniques will affect the layout and the configuration or the exhibitions. Any sudden changes will have to correspond to cutting-edge technology and serve as the background to new exhibition subjects where the development will require the understanding and the knowledge- spreading.

Looking at the worldwide trend of the future exhibition display techniques, there is a tendency to move from being “hands-on”? to “minds-on” experience, thus allowing the experience to be enjoyable, which then in turn, draw interest to the theories behind the exhibit. The experience gained and/or the development of cutting edge based exhibits will build rapport with the viewers.

The main focus is to develop a medium or display method so that people of all ages are able to understand, experience and explore the technologies such as Nanotechnology, Biotechnology, MEMS(Micro-Electro Mechanical System), and its applications.

## **2. Research Domain and Method**

### **2.1 Research Domain**

The National Science Museum of Korea is an organization with the focus being on developing a space where people of all ages, especially the young to develop a “science orientated mind”. We research on the different display techniques and training methods not the actual technologies itself (NT, MEMS, BT). The knowledge gained about the actual technologies are received from field experts and what we have done is to explore various ways of displaying the technology so that it is practical for the general public to comprehend and to enjoy the exploration.

The research and development overview is as below;

#### Content Overview

1. Understanding the basic concepts by experiencing the cutting edge technology through the exhibitions
2. Applying the current display techniques to develop new display techniques
3. Creation of new display techniques by incorporating the existing display techniques for Nanotechnology, Biotechnology, MEMS(Micro Electro Mechanical System), Information technology, and its applications along with the display techniques for cutting edge technology
4. To convey enjoyable and effective theory about cutting edge technology through the exhibits
5. Giving “hands-on” experience to allow understanding of the basic theory, practicality and its application
6. Raise the competitiveness in the of exhibit display field so that it progressively makes an improvement

There are 3 phases whereby each phase is 2 years. The current exhibition is displaying the findings from the first phase. The display technique was developed with the focus that by exploring and the understanding the displayed exhibits, this in turn will allow the understanding of the nano-technology, MEMS technology (micro-sensor, micro- actuator and other energy transmitting miniature equipment) and bio-technology (cloning).

### **2.2 Research Method**

The research scope was to develop the exhibition design technique which will enhance the understanding of the NT, MEMS, BT and fusion technology. This is to create a scientific culture that is unique to the exhibition that will allow the development of the display methods. The material required to develop the exhibits were gained from specialized research groups from universities, research institutes and industry leaders.

### **2.3 Trends domestic and foreign Exhibition**

Currently Korea’s science museum display method has reached a high level of standard. However, in regards to the technique of displaying exhibits for cutting edge technology, there are boundaries where by even the researchers of the technology themselves are well aware of the faults and the errors within their own research. In case of Korea, the principles are understood through the physical/artificial models displayed in ‘panel, screen and search’ mediums.

In the Japanese museums, they have field experts in the exhibitions who encourage the audience to be involved and/or to explore each exhibit to aid the understanding process as well as providing extensive explanation. In 2003, the LA county Arts Museum when they held the Nano special exhibition which displayed from the physical space to the nano space, where the cutting edge technology was applied throughout so that the patrons are able to enjoy their experience. Also, the display technique that Berkley University's Laurence Hall's Cutting Edge Department used are either graphic panels or the latest audio-visual equipments so that the experience was “hands-on” as well as being interactive.

The difference is that in case of Japan and USA, they use technique which are more approachable. This aides the understanding of the exhibits which in turn fastens the absorption of the theory behind the display.

## **3. Research Results**

The display subject developments are the micro-environment using NT, MEMS and BT with the main focus on the Nano-biotechnology. The display methods used are so that the base technologies can be understood by first hand experience by the patrons.

1<sup>st</sup> year (2003) exhibit emphasized on the future direction for cutting edge technology, where upon NT, BT and MEMS became the focus for the development.

Table 1 - Stage 1 Exhibition Themes (Total of 11 items)

Theme	Exhibition	Description
NANO	What is Nanotechnology?	Introduction to nanotechnology; general facts, important points and application.
	Exploring the World of Nanotechnology	Experience the amazing and astonishing world of microphysics (nanotechnology).
	What are nanites compared to?	Observe and appreciate the size of nanites and the concept of “scale” on this level.
	The usage of applied nanotechnology	Observe and experience the building blocks of nanotechnology and a fabricated model of nanites.
MEMS	Rewriting “Gulliver's Travels”	Understand the world of MEMS using a narrative of Gulliver's Travels.
	MEMS Technology	Understanding optics using an array of micro reflectors for DLP Projection.
	Exploring MEMS	Understanding MEMS by using a nozzle of the head of all Inkjet Printer.
	Attempts at future-orientated biotechnology.	The true meaning of biotechnology and its effect on our future.
BIO	Focus on Biotechnology! DNA	Understand the importance of genes and the function of DNA through fabricated models.
	Transmitting the Code of Life	Understand the trigger effects of DNA on living organisms through animated exhibitions.
	Normality and Mutation	Understand the effect of mutation on living organisms though animated exhibitions.



Figure 1. Images of “Nano” themed exhibitions



Figure 2. Images of “MEMS” themed exhibitions



Figure 3. Images of “Bio” themed exhibitions

2<sup>nd</sup> year (2004) exhibit emphasized on drawing and triggering interest to explore and experience the 3 technology, with the focus on the introduction and the examination of Nano-biotechnology.

Table 2 - Stage 2 Exhibition Themes (Total of 12 items)

Theme	Exhibition	Description
	Invitation to a micro world	To invoke curiosity and an understanding in cutting-edge technology (NT, MEMS, BT) using visual aids.
Diagnostics	DNA Chip	Understand and appreciate cutting-edge technology by using visual aids.
	Biosensors	Understand and experience the principles of nano-biotechnology diagnostics; the glucose level biosensor.
	Cell Counter	Understand and experience the principles and usage of cell counters.
Treatment	Artificial Retina	Understand and experience nanotechnology treatment equipment; the artificial retina.
	Artificial Middle Ear	Understand the usage and principles of sound transfer using the “Artificial Middle Ear”.
	“Smart” nanites administering drugs	Understand the basic principles and enjoyably learn about “Targeted Drug Delivery”.
	Ionized administering drugs	Understand and experience the administration of drugs without needles by using ionized delivery systems.
Materials	Nano-coating	Experience the comparison between normal and nano-coated materials with film, paint and other items.
	Dirt-resistant nano-material	Experiment and explore the adhesive property water; using the leaf of a lily flower.
	Iris scanning	Experience biometrics recognition through iris scanning
	Meet the experts	Gather information by engaging in the experts in the theory and current developments of nanotechnology.



Figure 4. Images of “Nano-Bio Diagnostics” themed exhibitions



Figure 5. Images of “Nano-Bio Treatment” themed exhibitions



Figure 6. Images of “Nano-Bio Materials” themed exhibitions

The research results focused on the display techniques being suited for the average level of intelligence of year 4~9. The exhibits were to be explored and experienced so that the new exhibits are able to give understanding of the theory to the patrons. Of the 23 level 1 exhibits, 5 items are already installed in the museum.



Figure 7. Installed “Fabricated model of nantes” exhibition



Figure 8. Installed “MEMS technology” exhibition



Figure 9. Installed “Normality and Mutation” exhibition



Figure 10. Installed “Nano-coating” exhibition



Figure 11. Installed “Dirt-resistant nano-materials” exhibition



#### 4. Conclusion

There are many patrons who have no or little knowledge and understanding of the NT, MEMS and BT themed cutting edge technology. The research focuses on display techniques that allow the patrons to gain a greater understanding of the theory through the exhibits. We believe that the research will be beneficial in that it will raise the standards of the exhibition methods as well as to the organizations specializing exhibition displays. The techniques are currently being applied in 95 different organizations domestically.

In order to be able to improve the understanding of the theories and to gain more interest from the patrons, more research must be done to the display techniques.

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