Parallel session 7: PCST as a performance: looking for new audiences

S & T COMMUNICATION THROUGH PUPPETRY - A CASE STUDY (INDIA)

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Abstract

The social milieu of India is such that the folk dances, folk songs and folk dramas are part and parcel of our live. It has also been observed that it is possible to accelerate the pace of science communication if folk media are employed effectively in regional languages. A nation wide programme was conceived and implemented by National Council For Science & Technology Communication (NCSTC), Govt. of India, on "Science & Technology Communication Through Puppetry".

The paper highlights and analyzes the efforts undertaken by NCSTC in the past decade with special reference to script writing and other experiments.

Key Words: Science Communication, Science Popularization

Text

India's manifold diversity-cultural, social, religious, linguistic and regional is unparallel in the world. In addition, nearly 70% of population are rural and about one third are still living below poverty and not literate. The reach of mass media, except radio, is still limited. These ground realities present a formidable challenge to a science communicator. In such a scenario, any centrally planned strategy employing modern means of communications does not stand much chances of success. Any strategy to be effective should be "participatory and in the local language through the familiar channels of communication".

The first major effort on the above premise was “Bharat Jan Vigyan Jatha (1987), a massive S&T communication programme, which established the efficacy of the folk arts as a powerful mode of science communication.

Puppetry, being a traditional mean of entertainment, confined generally to semi-urban areas and villages. A characteristic of this medium is its flexibility to suit regional variations and prevailing mood of the audience. It can involve the audience in active dialogue. Illiterates and neo-literate groups can be addressed by a puppet show. It is a cost effective medium and is being used by NCSTC to communicate science.

The efforts undertaken can be divided into phases-pre and post 1996. Analysis of pre-1996 efforts revealed that all forms of puppets may not be employed and science communicators can also accomplish the task of puppet making and developing scripts. However, some issues, do call for attention were, namely:

- Scriptwriters must be expert in the subject and format of the medium to produce interesting scripts.
- Communicators must accompany every team of traditional puppeteers.
- Traditional puppeteers require training and familiarization with the scientific issues and facts

NCSTC’S Intervention

Since 1996 a much-focused programme “S&T Communication through Puppetry” is being implemented throughout the country. A 7-day training module (content and methodology wise) has been standardized with three distinguished feature as:

- Development of puppetry as interactive medium.
- Development of script on scientific themes, and
- Using this medium in combination with other techniques of communications

In each workshop the participants are provided with all necessary inputs to show their best creativity with the help of audio-visual aids, lectures and necessary background material for increasing the understanding of puppet as a medium for science communication.

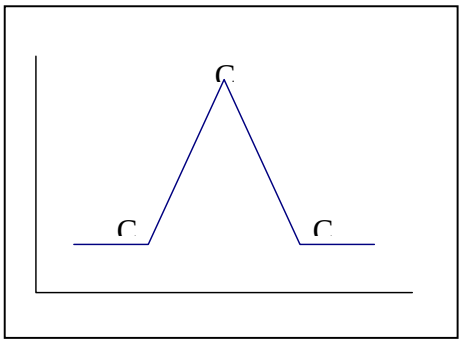
Script Writing Technique

- The basic purpose of a script is to communicate science and scientific methods. The script should be target specific and aimed at bringing science close to people by taking examples from the everyday life to the extent possible.

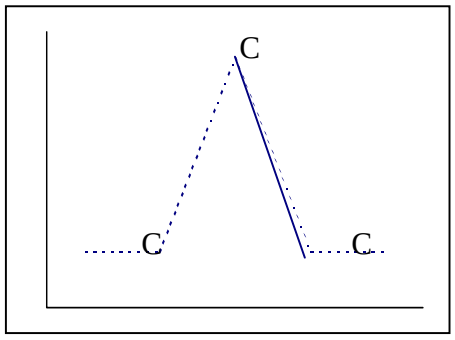
- The basic framework around which the script is woven must necessarily follow the scientific method and should bring out through dialogues or the situations relevant to the theme the basic elements of scientific methods.

- Scripts can be divided into two categories, (I) that emphasize the scientific method and the scientific values, and (ii) that familiarize the audience with a new scientific information/ discovery/technology etc.

- **A puppet drama is** like any science drama having three main features viz; (a) ability to crate curiosity in the beginning, (b) satisfy the curiosity at the end; and (c) ability to express the up and downs of emotions through the dialogues. The difference between a script for puppet and other drama can be represented graphically as follows: -



The Curiosity graph in street Drama indicates the time and scope available to script writer (C_1, C_2, C_3)



The Curiosity graph in Puppet Drama indicates the time and scope available to script writer (C_2, C_3 only)

In Graphs, C1 is building point of curiosity and C2 is the peak of the curiosity and C3 is the end of the curiosity.

(The puppet scripts, which were written on the above pattern, have proved to be very crispy and effective in catching the attention of the audience in the beginning of the play itself.)

Integration of Puppetry with other Media to improve effectiveness:

- Integration of human characters for acts and movements not possible through puppets.

- Use of other visual aids in puppetry to assure accuracy of diagrams.

- Theme Exhibition and Puppet Shows.

- Puppets in Classroom to initiate Discussion

Findings of National Convention on Puppetry (May 28-June 1 2002): About 1600 trained resource persons with scientific background.

- The medium has been used more for spreading the scientific messages on subjects like pollutions, Health & Hygiene and anti-superstitions.

- The tool of puppetry has proved to be quite handy and helpful for science communication.

- The agencies with their formal networks have quite effectively passed on the skill to other communicators.

Looking Ahead

NCSTC is now standardizing the methodologies and approaches in usage of various performing arts for science communication. An attempt is being made to standardize the training modules in terms of contents, reach, selection of participants and resource material. Tools are being developed to assess the impact of various folk Medias used for science communication.

Notes

The first author of the paper is a trained puppeteer and has done many new experiments with this medium to make it more effective for science communication. The paper is based on the experiences of the various national/ state level workshops and field performances.

References

- Patairiya Manoj, Hindi, Vigyan Patrakaria, 1990, Taxshila Prakashan, New Delhi

- Tyagi B.K. S & T Through Folk Media: Writing a Script, *NCSTC Communications11 (3) pp2-3*, February 1993

- Tyagi B. K, Science Communication Through Puppetry, *NCSTC Communications 4(9), pp2-3* July 1997)

Parallel session 7: PCST as a performance: looking for a new audience?

USE OF COMEDY TO TRIGGER DISCUSSION OF HOT SCIENCE TOPICS

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Abstract

Science communicators in the UK are making increasing use of drama to promote engagement with issues raised by science and technology for society. This project used a comedy sketch based on a reality TV show to promote discussion amongst 16-19 year olds of the issues raised for them by advances in genetic screening. The results showed that the event succeeded in raising awareness of key issues but also raised questions about how to ensure that discussion is effectively facilitated and the most effective means of disseminating the project.

Key Words: Comedy, Genetics, Discussion

Context

The science communication community in the UK has been urged to move from one way communication to two way dialogue models, and project funders like the Wellcome Trust and the Research Councils now expect that projects submitted to them be designed to promote public engagement with science and technology, rather than simply understanding of it.

A consequence of this shift in emphasis has been an upsurge in the use of drama by science communicators since it is seen as having considerable potential to trigger responses from an audience. Also scripts can include explanatory elements as well as sections designed to provoke discussion.

Ground breaking work in this area was produced by Y Touring who, in 1996, were commissioned by the Wellcome Trust to create plays aimed at young adults that used hard hitting methods to generate debate. Amongst the issues chosen were stem cell therapy [*Learning to love the grey*], genetic selection [*The Gift*] and mental illness [*Cracked*]. The approach was to commission a script from a professional playwright and have it performed by a group of five professional young actors. An innovation was that the play which ran for about 40 minutes was followed by a facilitated discussion during which the

actors remained in character and the audience was drawn in to expressing opinions on key issues raised by the drama.

This approach proved very effective in stimulating discussion but was vulnerable to the criticism that it was top down, and did not allow young people to devise and perform plays that raised issues of greatest importance to them. This latter approach was the starting point for *Science Centrestage* once again the Wellcome Trust in 2001/2002 in which the science and drama teachers within secondary schools across the UK were encouraged to work with their students to devise dramas scripted and acted by them[i].

Both these initiatives were evaluated, although not all the evaluations have been placed in the public domain.

An independent evaluation carried out on "Cracked" concluded:

> "The play had a demonstrable and significant impact on student attitudes to mental health. The index scores for students who have seen the play are 28% higher for an index based on knowledge and understanding of mental illness"[ii]

Objective

To build on previous initiatives by devising a low cost, easy to mount and disseminate event that used a comedy sketch to promote debate about how individual's genetic information should be used.

Method

The Graphic Science Unit devised a performance that used elements of theatre and television to draw the target audiences into engagement with the issues raised by advances in gene technology. The event called "Meet the Mighty Gene Machine" was originally devised for Czech Science Week with funding from the British Council and was first performed in Czech at the Czech Academy of Sciences in November 2003. The event began with a 12 minute comic mini-drama set in the future when a reality TV show has been based on live disclosure of individuals' genetic profiles and their implications. It then became an opportunity for the audience to discuss their attitudes to the use of their own genetic information in a number of contexts including, diagnosis of disease susceptibility, solving crimes and buying insurance. This discussion was facilitated by the performers one of whom invented the machine and the other who has just been embarrassed by its disclosures on his own TV show.

Results

In Prague, the event was targeted at 16-19 year olds and the discussion, which was prompted by questions posed by the facilitators, continued for over 30 minutes at every performance. Subsequent evaluation using questionnaires showed that reactions of the target audience were positive with 62% of the participants reporting that the event had stimulated them to think abut the issues raised by the human genome project and genetic screening. A full

evaluation is available from http://www.uwe.ac.uk/fas/graphicscience/projects/evalgene_machine.htm . However, some of the scientists who attended the event felt that it should have focused more on explaining the science behind the technology.

Conclusions

Comedy can be used as a way of drawing young adults into discussing issues raised by science and technology within society and the stimulus piece of theatre can be short and simple to stage and perform. Discussion following the stimulus is extended by the use of two facilitators, who mix with the audience, and use a series of prompt questions to initiate discussion. Further issues that now need to be addressed are who are the ideal performers in such an event and how to construct an effective dissemination strategy.

Notes

[i] The Wellcome Trust (2002, September) Retrieved May 5,2004 from http://www.wellcome.ac.uk/en/scs/home.html

[ii] Evaluation Associates (2001, June) Retrieved May 6 2004 from http://www.evaluation.co.uk/library/c&c/cracked.htm

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SCIENCE AND THEATRE: A MULTIFACETED RELATIONSHIP BETWEEN PEDAGOGICAL PURPOSE AND ARTISTIC EXPRESSION

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Abstract

This paper offers an analysis of the relationship between science and theatre. Such a connection can be twofold: either theatre is used primarily as a means for conveying scientific concepts and ideas, or it borrows its contents from science while maintaining its own features as an artistic expression.

I will focus on the second form of "scientific theatre", i.e. when theatre preserves its artistic and aesthetic characteristics, thus enhancing the scientific imagination for the public.

Key words: science theatre, science communication, artistic expression

Text

Introduction

It is quite a evidence that, in the last few years, science has been winning more and more space on the stage. Even if the results are not always the best, this facts stimulate a reflection on the possible contact points between science and theatre. Since we deal with a problematic relationship, it would seem difficult to build a structured theory. Rather, thinking of ways in which the pair "science-theatre" might be analyzed would seem more appropriate[1].

Starting from the assumption that theatre is, first of all, an encounter between the audience and the actors[2], I would propose the following classification for performances combining science and theatre:

1. theatre as a set of performing techniques to support didactics
2. theatre deriving from the "scientific conferences" tradition
3. theatre posing ethical questions on the responsibility of science and scientists towards the society
4. theatre pointing to existential reflection
5. theatre staging either biographies of scientists or episodes from the history of science
6. theatre using certain sciences (such as neurobiology, anthropology, anatomy, cognitive sciences) as a support for the artistic creation

There is quite a marked difference between theatre used merely to communicate science (1. and 2.), and theatre maintaining its characteristic of an artistic expression, drawing elements from the scientific universe to create drama (3. to 6.).

Going through the proposed classification, I can summarize the following:

Theatre with pedagogical purpose

When theatre is used as a means of supporting didactics, the performing elements (the acting area, lights, sound, images, the "dramatic vocabulary" of movement, the body and verbal language), help to lower the barriers between an inexperienced public and scientific contents through the main strengths of theatre: emotional and sensory communication[3]. Thus, the pedagogical activity is reconciled with the entertainment, the aim being to excite curiosity towards the scientific world. This practice is often applied in the museums or scientific institutions[4].

In the same context can be placed some performances deriving from the tradition of the "scientific conferences"[5], which started in the XVII Century, coinciding with the origin of the first scientific Academies, and widely spread for the next two centuries, mostly emphasizing the facet of the "marvellous" in science and being warmly appreciated by the audience. The roots of the contemporary "science shows", frequently put on in the science centres[6], may be found in this tradition.

Theatre drawing up motif of inspiration from science

A different scenario comes when dramatic creation is inspired by science without any specific purpose of communicating its contents.

Within this framework, I propose the following classification: plays dealing with ethical issues generated by the scientific discoveries; plays portraying episodes of famous scientists' lives; theatrical activities drawing on scientific ideas to support the creation of dramas.

Referring to the first class, the greatest example is "Galileo's life" by Bertolt Brecht. Its first revision, after the atomic bomb was dropped, was strongly centred on the responsibility of scientists towards the humanity. This theme was amply debated in the German circles, and many plays, during the 50's and the 60's, were addressed to it[7]. Most of them are not staged anymore, but worth mentioning are "The physicist" by F. Dürrenmatt and "On the matter of Julius R. Oppenheimer", by H. Kipphardt. Another theme posing ethical problems is pertaining to the creation of artificial beings similar to humans[8] (artificial intelligence and cloning are clearly evoked). In this sense RUR Rossum's Universal Robots by K. Čapek (1920) is an example.

Another class is the portrayals, mainly based on a psychological introspection and historical reconstruction of facts (e.g. Copenhagen by Michael Frayn).

In the third class all the activities that take inspiration from some sciences (such as neurophisiology, psicology, cognitive sciences, anthropology, anatomy) to improve the actor's technique[9] are included. Peter Brook, whose research is close to that area, created two performances where the "brain's sciences" are the nucleus of the drama: "Je suis un phénomène" and "L'homme qui…".

Conclusions

Having briefly summarized different facets on how theatre relates to science, I would emphasize my interest, from the point of view of a theoretical reflection on science communication, in the second form of "scientific theatre", i.e. when theatre maintaining its artistic and aesthetic characteristics enhances an image of science as a human activity, an integral part of a culture in general.

Notes

[1] For more details see: Silvana Barbacci, *Un caledoscopio magico: la scienza a teatro*, Dissertation of Master in Science Communication, 2001, Sissa-Isas, Trieste.

[2] See also: Peter Brook, *The empty space*, Mc Gibbon &Kee, London, 1968.

[3] Among others, *L'Oracle de Delphi* on Dirac's scientific adventure, by the "Mimescope", staged for the first time at Cern, Genève (1999), is a nice exemple that effectively applies body's techniques, musics and images.

[4] Catherine Hughes, *Museum Theatre: Communicating with visitors through drama*, Heineman, Porthsmouth, 1998.

[5] See also Daniel Raichvarg *Science et Spectacle. Figures d'une rencontre* Z'Editions, Nice, 1993

[6] The *Klara Soppteater* in Stockholm gives contemporary examples, which can be linked to that tradition., having produced many plays where a scientist is on the stage with the actors.

[7] See also M.A. Orthofer, *The scientist on the stage: a survey*, in *Interdisciplinary science reviews*, v. 27, n. 3, Autumn 2002, Maney, London.

[8] Silvana Barbacci, *From the Golem to Artificial Intelligence: science in the theatre*, Jekyll.comm n.3, September 2002, http://jekyll.comm.sissa.it/articoli/art03_04_eng.htm

[9] See Eugenio Barba– Nicola Savaese, *The secret art of the performer*, 1990, Centre for Performance Research, Cardiff, UK, and Jean Marie Pradier, *Ethnoscenology*, http://www.artweb.univ-paris8.fr/theatre/ethnoscenology/ethnoscenology.htm

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1905-2005: A CELEBRATION OF ALBERT EINSTEIN'S "ANNUS MIRABILIS".

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Abstract

Teaching science should be considered as science communication and the History of Science as a right tool for it. History of Science allows us to interpret, to identify and to know which events are responsible for the main accepted theories, the obstacles that troubled their appearance and development or which facts contributed to them. History also permits the identification of the concepts which permitted the transformation of a science, the construction of a new theory or the use of new methods and new conceptual instruments and the social context in which their development took place. Using the History of Science in the Secondary School may allow both, the educators to communicate science contextualizing the scientific issues, and the pupils to understand that science is not "one man's work" and that the production of scientific knowledge is inserted in a social dynamics.

Keywords: History of Science, Communication, Education

Text

Science is an inseparable part of nowadays culture. Today, the vision of the world of men and women is, in great measure, conditioned by scientific knowledge and their technological applications. But, in the other hand, the image of science has been simplified and distorted because their historical and philosophical aspects had not been under consideration. Science has never been so obscure, but, at the same time, had never appealed such a great public interest. In past times, science was only one more piece in human culture, with no direct implications in everyday life. Today, science is present in the social life and has become a collective enterprise that moves great amounts of funding. It is important to stress the social function of science communication, so to say, the need to transmit this knowledge, the processes and the technologies available to reach it. In this frame, success depends, in great measure, on the abilities of the science communicator to settle bridges between pre-established knowledge and audiences' expectations, to elaborate discourses which allow to adequate the context to every new situation, for

example, the teaching of science, considered as a form of scientific communication.

Following a previous educational experience on the celebration of Watson & Crick's Double Helix Model, we present a new attempt to communicate science at secondary School level using Einstein's relativity papers celebration in 2005, emphasizing the historical and the scientific context. Within the context of a scientific meeting, and considering that our audience knows the basic features of twentieth century Physics at a very basic level, our aim is to situate Einstein's publications in the frame of the first two decades of the 20th Century, between Max Planck's hypothesis and Niels Bohr's model of the atom. On the other hand, and related to the social context, we must not forget Einstein as a social icon, a public image that, sometimes, hides the scientist, but shows a scientific communicator and a committed man.

We justify this celebration for two reasons. The first one, trying to contextualize some scientific facts which are in our educational programs. The second one, our previous experience on DNA, which was well accepted by our pupils and also in the first meeting on History of Science and Teaching, celebrated in Barcelona during November, 2003.

Material

1.- "Einstein seen as scientific communicator", by Xavier Roqué, published in *Quark*, 26.

2.- Book review from "Einstein 1905: un año milagroso", published by one the authors in *Quark*, 31.

3.- Einstein's paper "My Theory", from *The Times*, 28 November 1919, Spanish version.

4.- Einstein's letter to Sigmund Freud, "Por qué la guerra", 1932, published in Spanish by Editorial Minúscula.

5.- Einstein's letters to Franklin D. Roosevelt.

These materials should be delivered to our audience one week before the meeting.

Programme:

00.00: Presentation of the activity.

00.10: The 1905 papers : a scientific communication perspective.

00.25: Albert Einstein: a man and his time.

00.40: Any other business.

00.50: "coffee end".

Evaluation of the experience:

A brief questionnaire will be presented to our audience in order to evaluate:

1.- The whole experience from 0 to 10.

2.- Possibilities to extend this kind of activity to other teaching areas.

3.- Suggestions about future experiences.

Conclusions

Before the delivery of this paper to the PCST organization, one of the authors essayed it with pupils at the secondary School level, with little knowledge of physics and history of science. The aim of this trial was to evaluate their possibilities and the convenience of the materials. We must point out the special difficulties in understanding the issues related to relativity. But, on the other hand, the historical approach was well understood.

Acknowledgments

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References

1. Calvó, X., Catena, F, Pérez, N., (2003): "Una experiència didàctica al voltant del 50è aniversari de l'estructura de l'ADN". I Jornada d'Història de la Ciència I Ensenyament, Barcelona, (forthcoming).

2. Calvó, X (2002), "Einstein 1905: un año milagroso". Book review, *Quark*, 31, January-March.

3. Einstein, A., (1980), *Mi visión del Mundo*, Barcelona, Tusquets.

4. Einstein, A., Freud, S., (2001), *¿Por qué la guerra?*, Barcelona, Editorial Minúscula.

5. Einstein, A., "Letters to President Franklin Delano Roosevelt", from **http://hypertextbook.com/eworld/einstein.shtml**

6. Roqué, X., (2002), "Einstein como divulgador científico", *Quark*, 26, October-December, 2002.

Parallel session 7: PCST as a performance: looking for new audiences

SCIENCE ON STAGE!

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Abstract

Reflection on the notion of science often used to be either an unpleasant, boring or very demanding task, but nowadays this has changed for the better. Evermore resources are available to bring it closer to an ever-increasing public. Our activities involve theatre as the main vehicle in the transmission of scientific concepts, in what one might call the "staging of science." These staged science-related situations are devised to create a direct and live contact with scientific processes so that museum visitors acquire scientific knowledge implicitly through their identification with the stage character or characters.

Key words: theatre, science, emotion.

Text

Science enters our daily lives through the means of communication, our leisure time, our habits of consumption and so on.

Our work centres on the transmission of science in leisure time situations, using the arts. We transmit scientific concepts by drawing on the emotions that art provokes, and by means of theatrical characters and/or situations this access to science is enhanced. We therefore work with educational and instructive resources which foreground the senses and feelings, such as music, theatre, dance, taste and even smell. Our objectives would not be met, however, without the prime target of providing the visitor with a pleasurable and memorable approximation to science.

TIC Teatro Interactivo Científico (Interactive Scientific Workshop)

L'Aquàrium de Barcelona (Barcelona Aquarium)

The TIC Interactive Science Theatre is especially designed for the 3 to 10-year age group. The main goal of the activity is to immerse children into the world of science, enabling them to understand simple scientific processes without apparent effort.

So as to achieve this objective the visit was divided into two stages: the first consists of a visit to the aquaria which focuses on a series of practical demonstrations, with or without the use of gadgets, turning it into a playful and entertaining experience; and the second consists of a theatre play with the sea as its theme, which aims to consolidate the learning process.

Here, theatre is used as the instructive device that, drawing on its inherent playfulness, becomes the vehicle towards the learning of scientific concepts related to the sea. It is through their experience with different characters and

plots that youngsters are provided with an easy understanding of the mechanisms that rule nature.

Image 1: “1910, un paseo por la fábrica” (“1910, a stroll through a factory”). Museu de la Ciència y la Tècnica de Catalunya (The Catalan Museum of Science and Technique)

In this particular case Technology is our focus of attention: the process of the transformation of sheep wool to fabric inside a textile factory in turn-of-the-20th-century Catalonia. The activity is designed for an adult public, but also adapted for children from 6 to 18 years.

Our proposal recreates this specific moment in Catalan history through the experiences of a group of characters –a male and female factory hand, a sales representative and the factory owner. The visit incorporates the visitors as new factory workers, and by means of various theatrical skits not only do they come to understand the technological process underlying textile production but also the social tissue that forms part of the labour history of early-industrial Catalonia.

This activity explores scientific concepts and the intimate relationship between science and society at large, as exemplified in history, economy and all sorts of social situations.

Image 2: “Todo es Química / All is Chemistry”. Itinerant Exhibition, Museu de la Ciència y la Tècnica de Catalunya (The Catalan Museum of Science and Technique)

The aim of this exhibition was to show the importance of chemistry in our daily lives, its applications and its history. Due to the successful museum exhibition policy and the demand for this kind of exhibitions, it attracted a significant number of visitors from an educational and general background.

It was specifically designed with instructive activities as an integral part, which complemented it by enabling dealing with those aspects of chemistry less easily integrated into a conventional exhibition, such as experiments, historical data and anecdotes. Moreover, the difficulty of some of the scientific concepts on display required the design of a series of accompanying explanatory activities that would be adaptable to any kind of public.

The methodology used to achieve the goals above was the incorporation of chemistry workshops as theatrical skits where chemistry was directly linked to our daily live into the staging of historical encounters between chemists of great historical importance, such as Mendeleev and Mme. Curie.

Image 3.

Conclusion

When scientific concepts come to us through several senses simultaneously, they tend to leave a much stronger and broader imprint on our memories than in a strictly cognoscitive way. Leaving conceptual achievements apart, we firmly believe that intense moments of magic, amusement, solidarity and union are extremely valuable to the senses and feelings, stimulating ongoing visits to any science museum and boosting the museum visitor's will to appreciate, take care of and protect the natural environment. Therefore, when trying to make science accessible to the larger public, one should always rigorously focus on their needs, interests and individual realities, as this will boost their curiosity for unknown aspects of science. As science forms an integral part of our daily lives, we only need to establish the bridge that allows us to understand and appreciate it fully.

Parallel session 7: PCST as a performance: looking for new audiences

SCIENCE AS PERFORMANCE:

A PROACTIVE STRATEGY TO COMMUNICATE AND EDUCATE THROUGH THEATER, MUSIC AND DANCE

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Abstract

Science as Performance is designed to communicate science to the general public. We present the concept of a *Center on Science and the Arts* consisting of public performances, program dissemination, and outreach to schools, professional societies and laboratories. We put forward a strategy for exporting productions to other venues, spreading public engagement in science issues. As an example of international outreach, two of the authors (BS+LM) are producing a musical play, based on the acclaimed novel *Einstein's Dreams* by Alan Lightman, which will have its European premiere in Lisbon next year.

Key Words: Science, Performing Arts, Theater, Science and the Arts

Text

Science as performance

Context: It is a challenge to convey to the public the exciting developments in science, technology, engineering and mathematics (STEM). (In what follows we use the word science to represent all the STEM disciplines.) Theater, music, dance, the literary and the visual arts can convey the joys and controversies of science. Over the past few years there have been major successes in communicating science to the public through the arts. This is especially evident in theater and film with such recent plays as *Copenhagen* and the Oscar winning film *A Beautiful Mind* [Ref. 1-2].

The performance series *Science and the Arts* has been developed and tested at the Graduate Center of the City University of New York (CUNY) in mid-Manhattan for more than three years [Ref. 3]. The response to the series has shown that the arts can make the sciences accessible, relevant, and exciting to diverse audiences in ways that provide both scientific content and significant artistic and entertainment values.

Objectives: The overall objective is to disseminate widely the concept of *Science as Performance,* by using three strategies:

1- Presenting high-quality performances in our *Science and the Arts* series.

2- Helping other institutions develop their own *Science and the Arts* series.

3- Presenting performances at the meetings of science societies, and as part of the educational outreach programs of national and private laboratories**.**

Methods: The *Science and the Arts* series at the Graduate Center has been an incubator for the development of programming. The authors have identified performers who use science content in their work and others who wish to develop such work. This has been accomplished by attending many art and theatre events; a task made possible because we are located in New York City, the cultural center of the U.S. After presenting an event on our stage, we judge its suitability for performance at other venues. We have often supplemented performances with discussions with the audience about the science ideas conveyed in the script.

A strategy for replicating the *Science and the Arts* program on another campus is to make use of the talents of faculty and staff in the science and the arts departments, and the infrastructure of performance and meeting spaces at the institution. We are researching those institutions which will be good candidates for collaboration, with promising talent, facilities, and a philosophy that encourages interdisciplinary thought.

Currently, many US government agencies such as the National Science Foundation, the Department of Energy, the Department of Education, and the National Aeronautics and Space Administration support educational programs for public school teachers and students. We work with the developers of these programs to bring to their projects appropriate performances in *Science and the Arts*.

In an example of international outreach, Brian Schwartz and Linda Merman are producing a musical play based on physicist Alan Lightman's book *Einstein's Dreams* (Ref. 4-5), which is scheduled to have its European premiere in Lisbon in January 2005.

Results to Date: The authors have collected a wealth of professional contacts and documentary materials. For example, the authors have a listing with annotations (and a personal library) of over 100 science-related plays including dramas, histories, biographies, comedies and musicals [Ref. 6-7 and personal collection]. In addition, over the years we have developed working relationships with actors, playwrights, dancers, choreographers, musicians, composers, artists and scientists who work at the intersection of science and the arts. In the conference presentation we will illustrate many of our collaborations in theater, dance, music and art.

The presentation of *Science and the Arts* programming at the professional meetings of teachers and scientists has proven to be a particularly popular strategy. A successful symposium on *Copenhagen* [Ref 8] and the *Science and the*

Arts programs at the Graduate Center have been well covered by the national print and electronic media [Ref. 9-10]

Conclusions: We observe that there is a non-professional public with a strong interest in all aspects of science. We attempt to satisfy this interest with quality performances that impart some information about science and the lives of scientists. Our productions are well attended and we are drawing the attention of other institutions that would like to replicate our success. In time, we will package many of the science/arts series productions so that they may be duplicated. We hope to expand our project into a *Center on Science and the Arts*, including residencies and opportunities for artists to develop new work in dialogue with scientists. To this end, the *Science and the Arts* program is currently establishing a Board of Advisors.

References

1- Michael Frayn, *Copenhagen*, Anchor Press, (2000).

2- Sylvia Nasar, *A Beautiful Mind: The Life of Mathematical Genius and Nobel Laureate John Nash*, Simon & Schuster (1999).

3- See the website http://web.gc.cuny.edu/sciart

4- Alan Lightman, *Einstein's Dreams*, Warner Books, (1994).

5- Joanne Sydney Lessner and Joshua Rosenblum, *Einstein's Dreams*, see http://web.gc.cuny.edu/sciart/0203/amnh.htm

6- Harry Lustig and Karen Shepherd-Barr, *Science as Theater*, American Scientist, Vol. 40**,** 550, (2002).

7- Judy Kupferman, *Science in Theater*, see http://www.jewish-theatre.com/visitor/article_display.aspx?articleID=485&pagenumber=3

8- Harry Lustig and Brian Schwartz, *Copenhagen in New York*, Forum on Physics and Society Newsletter, 29 no.4, (Oct. 2000); See http://web.gc.cuny.edu/sciart/copenhagen/copenhagen.html

9- James Glanz, *Of Physics, Friendship and the Atomic Bomb*, The New York Times, D1, (March 21, 2000); Dennis Overbye, *Lab Coat Chic: The Arts Embrace Science*, The New York Times, B1, (January 28, 2003); Sarah Boxer, *The Art of the Code, Or, at Play With DNA*, The New York Times, C1, (March 14, 2003).

10- Ira Flatow, *Science on Stage*, Science Friday, (Jan, 23, 2004), see http://www.sciencefriday.com/pages/2004/Jan/hour1_012304.html

Parallel session 7: PCST as a performance: looking for new audiences

CHILDREN 3D WORKSHOP: NEW TECHNOLOGIES AND ICONOGRAPHY LANGUAGE IN THE CREATIVITY PROCESS.

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Abstract

The Centre de Création en Realité Virtuel (CCRV) and Institut Image propose the application of new technologies to the development of a children's workshop based on the work of graphic artist Warja Lavater.

The goal of this project is to develop a learning tool based on iconographic language supported with computers which would allow children to create and tell stories as a group. Researching the development of an application for an intuitive learning tool adapted for children is a key part of the project.

In general, we highlight the potential of this activity as a learning tool suitable for children's knowledge development.

Key Words: children, creativity, new technologies

Text

Context

The 3D workshop emerges from the combined efforts of the CCRV and Institut Image. Both institutions work together in premises where art and new technologies go hand in hand. CCRV provides the concept of interactive art while the Institut Image provides technical and human means.

The 3D workshop, aside from having a creative and technological approach, opens up an educational dimension that represents an introduction of interactive art to children of early ages.

The founder of this project, Louis Fléri, launched the 3D workshop with the help of the institutions mentioned above. His new challenge consisted in developing a software to create and recreate fairy tales trough Warja Lavater's iconographic language adapted to children.

This project was made possible by the collaborative work of qualified professionals from different fields, among them there are artists, teachers, pedagogues and computer engineers. The project was supported by the European Union and the local authorities of Burgundy, France.

The graphic universe of Warja Lavater.

In the early sixties, at the Museum of Modern Art (MOMA) of New York, Lavater launched a book-object consisting of folded pages like an accordion, where The Little Red Riding Hood tale was narrated in an alternative way: with colour images and without words. The colour images were not figurative drawings but symbols. In this case little red riding hood was represented by a red circle and the wolf by a black circle.

"Imageries" is the name given to a series of Perrault's fairy tales using iconographic language, where the artist's goal is "to make written language into images and images into written language".

In 1965, Warja Lavater presented her first book at the Georges Pompidou Children's Workshop (Paris, France) and in 1994, the artist herself helped with the audio-visual adaptation and the production of synthesis images. The same year, the film was awarded the first Prize Pixel INA Art category at Imagina Festival.

Technical-pedagogical dialogue.

Dialogue between educational objectives and technical tools is the base which supports the development of this project. From a pedagogical point of view, the goal is to stimulate a different approach into traditional fairy tales, where the reader interprets the story conditioned by his/her social and cultural background and in accordance with his/her knowledge development.

Another objective of the workshop is to make it easier for children to develop group work creativity, as well as narrative and listening skills through the use of advanced technologies. In a certain way this initiative tries to put children in touch with new technologies.

The computer screen doesn't stimulate cooperative work, it encapsulates individuals into a virtual world. Children go through a learning process by using computer interfaces, keyboard and mouse. Softwares are full of abstract metaphors that are difficult to understand for the very young ones. These facts are confronted with its learning objectives.

In order to overcome the obstacles of using new technologies, we created, in the first place, an adapted ergonomic design to work in teams (tactile screens set on table surfaces not needing the use of keyboard and mouse). On the other hand, the workshop developed an info-graphic software without artificial devices (cut, paste, etc.) by which interaction is guided intuitively, "pointing a circle on the screen, giving it colour, making it bigger, moving it and changing page".

To make the most of the software, it was set up in two different working places. On one hand, low tables with tactile screens called "Magic Palettes" and, on the other hand, a wide working surface called "Magic Table", were children could climb and make their compositions with images using an e-pen.

The 3D Workshop.

Three schools were chosen to try out the project with a total of 45 students from four to eight years of age. Later, during the Nicephore Days (an image, art and new technologies festival), we opened the experience for all publics, from 0 to 99 years old.

The 3D workshop was divided into three phases:

1. Projection of video "Imageries". An introduction of Warja Lavater iconographic language and traditional fairy tales.

2. Working with the Magic Palettes

    - Making up tale's characters using images, making up or recreation of fairy tales and info-graphic making of stories in small groups (4 or 5 children).

    - Fairy tale teller. Projection and narration of stories with all groups together and with parents in the open sessions.

3. Making of an accordion-like book with images made by the children at home or in the school.

4. Playing with Magic Table. An open area to show how the software worked.

The feed back among students, schoolteachers and the 3D workshop team members was vital for the pedagogical and technical adaptation of the project and to open the workshop to other publics.

Conclusions

Through the experience, we realised the potential of the activity as a pedagogical tool adequate to learning processes of reading and writing skills, narrating fictional or real facts, creative expression and artistic language. Additionally, we would like to emphasise the utility of the activity the makes new technologies accessible from an early to late age in an intuitive way.

The 3D workshop allows working in teams with different fields at the same time, such as language, literature, art expression, math, new technologies and education of values. It's also possible to work with groups of different ages mixed together because each child has his/her own role. With no doubt, this is a useful tool for the development of children's knowledge. To conclude, it has to be mentioned that this experience opens up many challenging questions for the research of psychopedagogy.

Parallel session 7: PCST as a performance: looking for new audiences?

SCIENCE CONSULTANTS, FICTIONAL FILMS, AND THE "WAR GAMES EFFECT"

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Abstract

Scientists often consult on Hollywood films because they believe that fictional films will heighten awareness of their research areas. Fictional films are very persuasive promotional tools because scientists and filmmakers create representations with the purpose of convincing audiences that these images accurately reflect the "natural world." In addition, these representations are embedded in a narrative framework designed to encourage this belief and further the impression that the scientific scenarios are plausible. Fictional film's ability to create images of "scientific possibilities," both positive and negative, convinces scientists that "realistic" depictions will enhance funding opportunities and promote research agendas.

Key words: Film, Scientific Promotion, Representation

Many scholars have demonstrated that scientific popularization often functions as a promotional activity. Scientists who consult on fictional films are engaged in a mode of popularization that has a unique capacity as propaganda. By helping craft scientific images in high profile Hollywood films, scientific organizations and individual science consultants are able to focus the public's attention on a particular scientific issue or area. Many consultants perceive the intensely popular medium of Hollywood films as a great way to promote their science and draw the public eye to their research. By helping to construct more "realistic" depictions scientists increase the rhetorical power of a film's message.

It is fictional film's ability to create an image of "scientific possibilities" in the audience's mind that leads scientists to believe that "realistic" depiction can lead to higher funding levels. In a previous article (Kirby 2003), I explore how film acts as a "virtual witnessing technology." Fictional cinema is particularly useful as a virtual witnessing technology because scientific representations in film are embedded in a narrative framework designed to highlight the representation's "reality" and to make opaque its construction. Joel Black (2001) highlights fictional film's ability to make people believe they have witnessed "reality," saying that it is film's nature to "make things explicit – to reveal or display the world in an evidentiary sense that is beyond the capability of traditional representational or art media" (8, italics in original). Film, then, can work as a powerful virtual witnessing technology because of this evidentiary element.

Often, consultants will proclaim that the film on which they are working highlights an issue that requires more funding. Near-Earth-Objects (NEOs) permeated the scientific and cultural climate in 1997, the year two asteroid/comet impact films, Deep Impact (1998) and Armageddon (1998), went into production. These films provided an opportunity for science consultants, all of whom had a stake in the NEO debate, to promote the hypothetical dangers of NEOs. Joshua Colwell, for example, believed that his consulting work on Deep Impact would help inform the public about the dangers of comet impacts, "The fact that the movie made an effort to portray all this realistically helps convey this message to the public and raise awareness of a real issue" (quoted in Bradley 2001). Colwell believed that realistic film depictions of disaster scenarios would raise public awareness and could provide a means for preventing these disasters. Joel Black refers to this belief as the "War Games effect" after the 1983 film. Black claims that filmmakers are "playing (or banking) on the notion that by presenting these doomsday scenarios in a fictional form, they are preventing them from happening (24, italics in original)." Like Colwell, many consultants see their role as enhancing the War Games effect. They believe that the more realistically a subject is visualized in a fictional world, the more motivated the public will be to fund scientific research in order to prevent the event from occurring in the real world. Consultants working on the disaster film Twister (1995) stress the importance of creating realistic scenarios in heightening public awareness about the dangers of tornados. From the scientists' perspective, the only way to avert this danger, of course, is to learn more about tornados and that requires more research support for meteorologists and storm chasers. For Deep Impact this promotional strategy worked as the publicity surrounding these two films, and their impact on public opinion, played a major role in the development of a U.S. NEO agency (for example see Anonymous 1998).

While the concept behind the War Games effect is to create highly plausible depictions of disasters in order to arouse fear in the audience, scientists can also create realistic filmic images of "scientific possibilities" with the intention of stimulating desire in audiences to see these events become realities. Consultants on Contact (1997), for example, believed that realistic depictions of the SETI program promoted positive visions about the search for extraterrestrials. Consultants felt that if this vision could excite the public about SETI they would be more willing to fund this controversial endeavor. I refer to film's ability to inspire as the Destination Moon effect after the 1950 film whose authentic depictions convinced people that space travel was a real possibility and not just the cartoonish fantasies seen in Buck Rogers. NASA, for example, is well aware of the Destination Moon effect and views fictional consulting on films such as Apollo 13 (1995), Mission to Mars (2000) and Space Cowboys (2000) as an excellent vehicle to promote its agency's mission and scientific projects. Although the War Games effect is about creating anxiety and the Destination Moon effect is about creating desire, they are actually two sides of the same coin. The realistic presentation of scientific scenarios within a cinematic framework can convince the public of the validity of scientific ideas and foster public excitement about research agendas.

References

Anonymous (1998) “At Least There Will be a Warning,” Denver Rocky Mountain News (18 Jul.): 56A.

Black, J. (2002) The Reality Effect (New York: Routledge).

Bradley, D. (2001) “’It’s the Dilithium Crystals Captain!’ Science on the Screen,” HMS Beagle (14 Sep.): <news.bmn.com/hmsbeagle/110/notes/adapt>.

Kirby, D. (2003) “Science Consultants, Fictional Films and Scientific Practice,” Social Studies of Science, 33(2): 231-268.

Parallel session 7: PCST as a performance: looking for new audiences

A CREATIVE APPROACH TO SCIENCE COMMUNICATION AND EDUCATION

Steve Mesure

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Abstract

A Creative Approach to Science Communication and Education: (How Science Theatre And Creativity Has Influenced A Variety Of Projects In Science Education And Engagement.)

Steve Mesure has been writing creative science communication and developing a variety of techniques and applications for 17 years. Recent work, which emphasises the importance of encouraging the presenter to become more creative, can be applied equally to science education and public communication.

The emergence of creative science engagement can be seen through the use of science theatre and theatrical techniques. The presentation will cover the development of Floating Point Science Theatre over the last 16 years, how it continues to promote and teach science to over 1½ million children and 7,000 schools. Steve will then look at some of the other new creative applications of science theatre which have arisen from this work and a range of other, more recent initiatives that focus on developing creativity in science education and public awareness.

He will look at the benefits of using the visual arts, (physical theatre in particular), story telling, characterisation, emotions, crossing disciplines and above all, creativity. Exploitation of these intelligences can make science accessible to those who were turned off by it, and be inspirational to many who haven't seen it's opportunities.

Specifically Steve will talk about the pilot 'Creative Science Teaching Lab' and its outcomes, and some forum theatre work arising from a project at the University of Liverpool.

The success of these projects suggests that science communication as a whole can benefit from creative thinking.