

## **AC 2008-920: NEW YORK NANO-BIO-MOLECULAR INFORMATION TECHNOLOGY ( NYNBIT ) INCUBATOR**

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# **New York Nano-Bio-Molecular Information Technology (NYNBIT) Incubator**

## **Abstract**

This paper presents the outcome of an effort made by a consortium of six universities in the State of New York to develop a Center for Advanced Technology (CAT) in the emerging field of Nano Bio-Molecular Information Technology. The effort consists of activities such as organization of the NYNBIT incubator, collaborative research projects, development of courses, an educational program for high schools, and commercial start-up programs.

## **Introduction**

Six New York Universities met in the Fall of 2004 at a workshop held at the SUNY Institute of Technology (SUNYIT), Utica, NY, and explored the possibility of establishing a Center for Advanced Technology (CAT) in the emerging field of Nano and Bio Information Technology. All the participants agreed that in order to achieve this goal an initial organization would have to be formed for a period of two years, which would be located at SUNYIT, Utica, NY, and named “New York Nano-Bio-Molecular Information Technology (NYNBIT) Incubator”.

The mission and purpose of this organization is to set up a plan to establish a Center for Advanced Technology (CAT) focused on fostering an environment of research, development and education and creating a new industrial base in New York State in this unique technology area.

The collaborating Institutions are:

1. SUNYIT
2. SUNY- Geneseo
3. SUNY-Binghamton
4. SUNY-Oneonta
5. Rochester Institute of Technology (RIT)
6. New York University (NYU)

The activities of the NYNBIT incubator are as follows:

1. Organization of the NYNBIT Incubator
2. Collaborative Research Projects
3. Development of course work
4. High School Educational Program
5. Commercial start-up program.

These are briefly described in the following sections:

## **Organization of the NYNBIT Incubator**

The participating institutions selected a Director for the NYNBIT Incubator, who was given the charge of setting up the organization and exploring possible sources of funding. This involved the following tasks leading to the current structure of the organization:

- a) Select a proper location for the office of the NYNBIT incubator at SUNYIT.
- b) Procure office furniture and computers, printers and other peripherals.
- c) Set up the furniture and the computers and its peripherals in the office and establish the net work connections.
- d) Identify and select the members for an Executive Advisory Board. Initially the board was constituted with four members selected from the federal government, local industries and the small business development center (SBDC). One of the members acted as the chairman of the board. The board advised the director of the NYNBIT incubator in all aspects of the project.
- e) A Research and Development Advisory Committee was formed with representative from all the participating Institutions. The committee advised the director in various aspects of the research and development projects.
- f) An Industrial Liaison officer was hired to identify possible commercial partners for the incubator and also to help the Director in the various aspects of the daily operations of the NYNBIT office.
- g) An organizational consultant was hired to advise the Director in various aspects of the organization.
- h) A work study student assistant was hired to assist in the daily operations of the NYNBIT office.

The fund raising efforts of the organization were spread over approximately two years. The NYNBIT project is now funded by the US Department of Energy for an amount at three quarter of a million dollars for a period of two years.

## **Collaborative Research Projects**

One of the major objectives of the NYNBIT Incubator has been to develop collaborative research projects amongst the participating institutions and explore the possibility of commercial start- ups. In the first year of the operation of NYNBIT, all six institutions have participated in this collaboration; each project has been led by a principal investigator from the respective campus and there has been active participation by other faculty members and graduate students. However, senior undergraduate students have also been strongly encouraged to participate in these research projects. The titles of the projects and the participating institutions are shown below:

- a) SUNYIT, Utica, “Designing a Web-based P System Simulator with Query Facilities.”
- b) SUNY- Geneseo, “Bio-molecular Computing Technologies.”
- c) SUNY-Binghamton. “New technologies to measure cancer and human pathogen proteins.”

- d) SUNY- Oneonta, “Molecular Quantum-Dot Cellular Automata and Nano-wires: Nano-scale charge transfer characterization for information processing”.
- e) Rochester Institute of Technology, Rochester, “Nanobiocomputing Architectures and Molecular Electronics.”
- f) New York University, New York, “GRIN: Technology combining Genomics, Robotics, Informatics and Nanotechnology for Single Molecule Analysis.”
- g) New York University, New York, “Self-Assembled DNA Arrays and Devices for Diverse Structural Patterning.”

The research experience level of the participating principal investigators (PI) is in the range of ten to thirty years. All PIs have published extensively and two of them are endowed full professors.

All the projects mentioned above were funded by the NYNBIT incubator and are close to a successful completion and several papers are being prepared for publication. Some of the recent publications<sup>1, 2, 3</sup> by the participating faculty and student investigators are shown in the bibliography.

### **Development of course work**

One of the important objectives of the NYNBIT has been the development of educational packages for the work force in the field of Nano-Bio-Information Technology. In the first year of the operation of the NYNBIT incubator, eight courses were developed at the baccalaureate (B.S.) level on various aspects of Nano-Bio-Information Technology. These courses will be used toward a concentration in nano-technology within the B.S. degree program in Mechanical Engineering Technology at SUNYIT. The courses will also be available, on-line, as electives for students in the collaborating institutions. The names of the courses are shown below:

- i) Introduction to Nano-Bio-Molecular information technology: 3 Cr.
- ii) Material Science Aspects of the Nanotechnology: 3 Cr.
- iii) Nano-Micro-Electromechanical Systems (NEMS/MEMS): 3 Cr.
- iv) Carbon Nanotube Technology: 3 Cr.
- v) Molecular Biology of the Cell: 3 Cr.
- vi) DNA Computing: 3 Cr.
- vii) Membrane Computing: 3 Cr.
- viii) DNA Laboratory: 3 Cr.

Several faculty members from the participating institutions with five to twenty years of teaching and research experience in these fields were actively involved in the development of these under-graduate level courses.

Two labs were developed to support the courses mentioned above. These labs are located at the SUNY Oneonta Campus. The names of the labs are:

- 1) Thin Film Lab

## 2) DNA Lab.

Another federal grant in the amount of a quarter of a million dollars was awarded to equip the DNA lab with the state of the art lab equipments.

### **High School Educational Program**

A high school level educational package was developed based on the courses mentioned in the previous section. The intended audience for this package is high school students in the sophomore, junior and senior grades. All the faculty members involved in the development of college level courses, shown in the previous section, were actively involved in the development of this package.

The educational package was presented to a selected audience in two summer camps in the summer of 2007 at the SUNYIT campus. Field trips were organized for the participants to visit the Thin film lab and DNA lab at SUNY-Oneonta campus. A total of twenty high school students and ten high school Math, Science and Technology teachers attended the summer camps. The student's participation in the summer camps was free and the participating teachers were awarded appropriate stipends to attend the summer camps.

### **Commercial start-up program.**

One of the major objective of the NYNBIT incubator project was to transfer the know how of this emerging technology to the interested local industries of the New York state. The activities to achieve this goal are indicated below:

- a) An Industrial Liaison Officer (ILO) was hired and his responsibility was to take all the actions necessary to establish a link between the local industries and the NYNBIT incubator under the supervision of the director. The ILO was also responsible for helping the director in the daily operation of the incubator office.
- b) A data base of the local industries (initially Mohawk Valley region) was created with the help of the Small Business Development Center (SBDC, currently located at the SUNYIT campus).
- c) In the first year of the operation of the incubator about ten local industries were identified for possible commercial collaboration with the incubator.
- d) Currently plans and discussions are in progress to identify possible application projects and exploratory attempts are being made to identify sources of funds such as SBIR grants.

### **Plans for the future and concluding remarks.**

The main objective of the NYNBIT incubator project was to establish a Center for Advanced Technology (CAT) in the emerging field of Nano & Bio Information Technology. The activities described in the previous sections were all focused on achieving that goal. The outcome of the activities in the first year of operation of the

NYNBIT incubator has been positive and very encouraging. In the second year of the NYNBIT project, plans are in progress for creation of a CAT and possibility of acquiring funding from state sources are being explored. It is anticipated that the CAT will be located at the SUNYIT campus in the next couple of years.

### **Acknowledgement**

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