



Global Networks on Nanotechnology Education

Zsolt Illyefalvi-Vitéz

*Department of Electronics Technology, Budapest University of Technology and Economics
Budapest, Hungary*

Abstract: An important objective of the EuroTraining project (GA No.: 316526 – Funded by the European Union) is to promote networking and international cooperation activities in the field of university level education of nanoelectronics and micro-/nano-systems. An Internet search was carried out to identify and categorize the highest level global networks in this field. The contribution summarizes the results, presents some examples, and provides the links how to search for and access the identified and qualified networks.

Key words: nanoelectronics, micro-/nano-systems, education, networking.

1. MOTIVATION AND DESCRIPTION OF WORK

The Internet provides a unique knowledge source for education of a wide range of topics and on every level. Through resource sharing, providing course materials and helping teaching as well as student preparation, the education oriented portals and networks contributes to creating and sustaining economically viable education across the Globe.

The aim of the EuroTraining project is to increase European knowledge and skills at the frontier of nanoelectronics technology and miniaturized electronic systems, to enable European partnerships for further world-wide collaborations by the promotion of networking and international cooperation activities in the field.

An Internet search was made by the EuroTraining team to identify and categorize the highest level global educational networks in the field of nanotechnology and micro-/nano-systems. It was found that the number of universities and institutions, which have advanced worldwide accessible Internet based multimedia courses, has extremely increased during the last couple of years and the content of these courses has also become much richer. The content of the multimedia courses are usually accessible on the websites of network-like associations, which were formed by a group of universities and institutions. In most cases joining a network and using its services need only a few formalities, the application for membership to join the network is very simple. Some of the networks or the member-institutions can also be followed on social networking services, like Facebook, Twitter or LinkedIn.

2. RESULTS AND CONCLUSIONS

Different types of nanotechnology networks have been identified, as follows:

- university based networks for the promotion of education on all levels;
- research networks for cooperation within a consortium with some external links;
- database type networks;
- networks for knowledge dissemination.

Some characteristic features of the networks could have been identified according to their locations, whether they are in the USA, in the Far-East or in Europe.

In general, the USA networks are based on universities, supported by NSF (the National Science Foundation) through long term projects. Their aim is to teach nanotechnology for all levels and ages, including kids, teachers of secondary schools, undergraduate and graduate students, and even retired seniors. They usually form large consortiums. A selection of USA networks of the highest impact and popularity are listed below:

- Nanotechnology Applications and Career Knowledge (NACK) Network (USA); <http://nano4me.org>; Ms.Lisa Daub, E-mail: ldaub@enr.psu.edu
- nanoHUB -online simulation and more for nanotechnology (USA); <https://nanohub.org/>; Gerhard Klimeck, E-mail: gekco@purdue.edu
- NANOWERK LLC (USA); <http://nanowerk.com/>;
- MATEC NETWORKS (USA); <http://www.matecnetworks.org/>; Michael Lesiecki, E-mail: michael.lesiecki@domail.maricopa.edu
- University of Washington - Molecular Engineering & Sciences Institute (USA); <http://www.moles.washington.edu/>; Jill Aronson Pfaendtner, E-mail: jmap@uw.edu
- Nano-Link: Nanotechnology Resources for Educators (USA); <http://www.nano-link.org/>; Deb Newberry, E-mail: dmnewberry2001@yahoo.com
- Nano-Education (Nano-Ed) (USA); <http://nano-ed.org/>; Kurt Winkelmann, E-mail: kwinkel@fit.edu

The best examples are the nano4me.org website of the NACK network (Figure 1) and the nanohub.org portal (Figure 2).

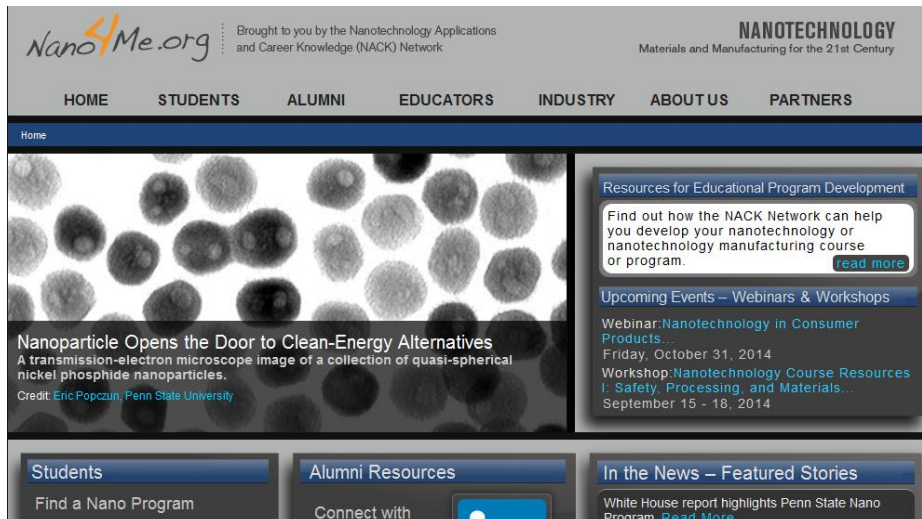


Fig. 1. The nano4me.org portal of the Nanotechnology Applications and Career Knowledge (NACK) network.

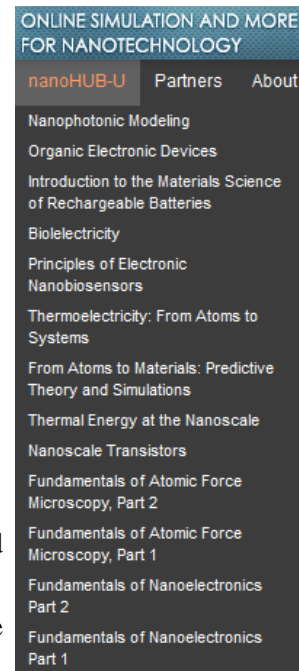


Fig. 2. Courses accessible on the nanohub.org website

Interesting courses have been identified from the nanoHUB-U list (see in Figure 2.) for MSc Students to join. Two examples are listed in the following:

- Professor Muhammad Ashraful Alam: "Principles of Electronic Nanobiosensors" The self paced version of the course is available at: <http://nanohub.org/courses/PEN/>
- Purdue Assistant Professor Peter Bermel: "Nanophotonic Modeling" The free instructor-paced course accessible at: <https://nanohub.org/courses/NPM>

An MSc student of the Budapest University of Technology and Economics (BME) took part in the Principles of Electronic Nanobiosensors course; his opinion about the technical content, structure and teaching methodology would be reported on the EuroTraining website.

The Far East networks are usually focused on cooperation in research. The only Australian network distributes equipment for nanotechnology. A few examples are listed below:

- Shinshu University, Research Center for Exotic NanoCarbons (ENCs) (Far East – Japan); <http://www.shinshu-u.ac.jp/project/encs/english/>; Yoshimasa Miura, E-mail: shinhp@shinshu-u.ac.jp
- National Institute for Materials Science (NIMS) (Far East – Japan) <http://www.nims.go.jp/eng/>; E-mail: info@nims.go.jp
- Suzhou Institute of Nano-Tech and Nano-Bionics (SINANO) (Far East – China) <http://english.sinano.cas.cn/au/bi/>; E-mail: administrator@sinano.ac.cn

European networks are mostly for research, and they have some connections to the similar institutions in the USA and/or Far-East. Their scope is wide; it includes database, information source, academic training, university education, PhD school, etc. A selection of European networks of the highest impact and popularity are listed below:

- Institute of Nanotechnology (IoN) (Europe); <http://www.nano.org.uk/>; Steve Mulligan, Email: steve.mulligan@nano.org.uk
- IMEC Headquarters at KU Leuven (Catholic University of Leuven) (Europe); http://www2.imec.be/be_en/; Email: info@imec.be
- MATTER Materials Teaching Project at the University of Liverpool (Europe); <http://www.matter.org.uk/>; Email: matter@liv.ac.uk
- Dissemination of IT for the Promotion of Materials Science (DoITPoMS) (Europe); <http://www.doitpoms.ac.uk/>; Email: doitpoms@msm.cam.ac.uk
- NANOWERK (Europe & USA); www.nanowerk.com;

A good example is the www.nanothinking.com interactive portal, where a map (Figure 3) helps the visitors to find clients, partners and suppliers, as well as, to promote their companies and products.



Fig. 3. Interactive map on the portal of the NanoThinking network with the number of local resources.



3. CONCLUSIONS

The abstracts and links of nearly forty international networks were identified by the Internet search and evaluation activity of the EuroTraining team.

Different types of nanotechnology networks have been categorized, as follows:

- university based networks for the promotion of education on all levels;
- research networks for cooperation;
- database type networks;
- networks for knowledge dissemination.

To share the accessibility and the knowledge of these networks and universities with the EuroTraining community a web page on the eurotraining.net website is to be created, where the visitor could easily search for and get access to these portals.

Interesting courses have been identified for MSc Students to join. An MSc student of BME already took part in the Principles of Electronic Nanobiosensors course; his opinion about the technical content, structure and teaching methodology would be reported on the EuroTraining website.

4. ACKNOWLEDGEMENTS

This work was supported by the EuroTraining project, funded by the European Union.

5. REFERENCES

1. www.eurotraining.net
2. www.ett.bme.hu/eurotraining