

Extramural Round Problems

VII International Natural Sciences Tournament

October 10-16, 2016 | Novosibirsk State University, Novosibirsk, Russia

1. A Song of Water and Fire

One of Russian Academy of Science libraries burned down in 2015. About 5 million books were destroyed; most of them had not been digitized. All the knowledge contained in those books was lost forever.

Current fire detectors either have low sensitivity or are very expensive. A possible solution of the problem might be book impregnation, with a special compound featuring release of a specific gas upon smoldering. In that case, the gas could be easily detected with an inexpensive gas detection system. The compound should not compromise quality of books, and such books should be safe to handle, even after a long-term storage. Propose such a compound.

2. Osmotic eel

In the *Star Trek: Enterprise* series (2000, season 1, ep.1-2), a so-called “osmotic eel” – a small aquatic lifeform — was used to heal a starship captain leg wound he got from a laser rifle fire-fight. Propose a concept of a device or biological object that would autonomously promote healing of burns, deep cuts, and stab or gunshot wounds. The device/object should stop bleeding and promote healing in a timely manner. Would it be possible to use your device/object for internal organs healing as well?

3. Hot water

Solar energy use is one of innovative areas in renewable energy industry, where thermal or electrical energy is produced from sun irradiation. Solar collector systems are a promising technology, widely used for water heating and space heating.

However, these systems are usually bulky and heavy; require a sophisticated manufacturing technology and laborious transportation; need an additional energy source as a backup. These features, together with a high cost, render a solar collector system unattractive for outdoorsmen, campers, and other consumers who prefer outdoor activities.

Propose an alternative design of an affordable solar collector system (or its components) for water heating with the following features: lightweight, portability, ease of installation, independent operation mode, and high thermal efficiency.

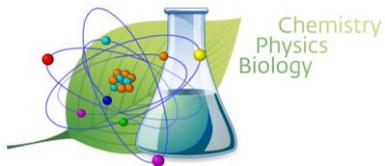
The Tournament consists of extramural and intramural rounds. To participate in the intramural round the team should send clear and outstanding solutions to all the intramural round problems before **May 31, 2016**. The solution consists of:

1. presentation (*.ppt, *.pdf);
2. extended solution (*.doc) – 5 pages or less.

The solutions should be sent before the deadline via account on the website www.scitourn.com/account.

If you have any questions in regard to the presented information, please, do not hesitate to contact us again by: e-mail: participants@scitourn.com;

International Natural Sciences Tournament



International Natural Sciences Tournament, 2010-2016

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Please, remember the following notes:

- participation in the extramural round is free of charge;
- participation fee for the intramural round is 500 US Dollars. This will provide a team of 5 members and its coach accommodation for the intramural round days of the Tournament; the fee does not include meals;

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