INTRODUCTION

The National Science Talent Search (NSTS) is an annual award that accords recognition to students who have excelled in research in Science and Technology. Modelled after the Westinghouse Science Talent Search, it targets and identifies students, between the age of 15 and 18 years, who have a strong aptitude for S & T, and the potential to pursue R & D careers.

The Singapore Science and Engineering Fair (SSEF) is a national fair that is affiliated to the INTEL International Science and Engineering Fair (ISEF) to be held in Phoenix, Arizona, from 8 to 14 May 2005. It is open to all secondary school and pre-university students between the age of 15 and 21 as of 1 May 2005. It is intended for students who have conducted research over the past year to showcase their findings. Winners of SSEF will be invited to represent Singapore and participate in ISEF in the US.

This year is the fifth year of SSEF and it is held in conjunction with the NSTS. Students who participate in the NSTS will be required to showcase their research projects at SSEF to be held in March 2005. Students can also participate in SSEF without having to participate in NSTS. Withdrawal from SSEF requires the permission of the school teacher-in-charge.

RULES AND REGULATIONS

The deadline for submission of entry forms and projects with the relevant documentation is Saturday, 22 January 2005. However, students are strongly advised to complete and submit the entry form as early as possible.

1. NSTS is open to secondary school and pre-university students, who are Singaporeans or Singapore Permanent Residents (PRs), between the age of 15 and 18 years as at 31 Dec 2004.

2. SSEF is open to ALL (Singaporeans, PRs and foreigners) secondary school and pre-university students studying in Singapore and who are between the age of 15 and 21 years as of 1 May 2005. However, winners of SSEF who are chosen to represent Singapore in the INTEL International Science and Engineering Fair (ISEF) 2005 in Phoenix, Arizona, USA, from 8 to 14 May 2005, must be Singaporeans or PRs.

3. ALL participants of NSTS are required to participate in SSEF. In this case, applicants need to submit the National Science Talent Search Entry Form and register their projects online by 1 December 2004 at the following URL:

   http://www.science.edu.sg/ssc/ssefnsts/index.htm

4. Applicants may also choose to enter for SSEF only. In this case, applicants need to submit the Singapore Science and Engineering Fair Entry Form and register their projects online by 1 December 2004 at the abovementioned URL in para 3.

5. All project entries must be accompanied by the Checklist for Adult Sponsor/Safety Assessment Form (1), Research Plan (1A), and Approval Form (1B) and may require Regulated Research Institutional/Industrial Setting Form (1C). In addition, the following areas require review and approval by the Scientific Review Committee (SRC) or Institutional Review Board (IRB) prior to experimentation: Human Subjects, Vertebrate Animals, Pathogenic and Potentially Pathogenic Agents, Controlled Substances and Recombinant DNA (rDNA). The
following areas require approval by a Designated Supervisor (an adult directly responsible for overseeing student experimentation) prior to experimentation: Human and Vertebrate Animal Tissue and/or Hazardous Substances or Devices.

6. There is an Individual Category and a Team Category for SSEF. Each SSEF team must comprise at least TWO members and not exceed THREE members. A team project may NOT be converted to an individual project or vice versa. However, there is NO team category for NSTS. Only individual applicants (even if done as a group project) will be considered for the NSTS.

7. Research projects that are submitted for NSTS or SSEF should be projects that have been conducted between the period of 1 January 2004 and 31 December 2004.

8. Shortlisted applicants will participate in SSEF 2005. The exhibition of projects constitutes part of the total score of the students’ projects. The judging criteria can be found on page 5 of this document.

9. The judges' decisions are final and no correspondence will be entertained.

10. All reports submitted will be kept by the organisers and will not be returned. Each applicant should keep a copy of his or her report for personal use. The applicant is not required to send in his project data book(s) but he should have it available for the exhibition and interviews (NSTS).

Please read the Intel ISEF Display and Safety Regulations instructions at the URL: http://www.sciserv.org/isef/students/rules/safdisp.asp to have a better idea of what should/should not be included in exhibits. The SSEF requirements are the same as those of ISEF. In fact, applicants are strongly encouraged to visit the official ISEF web site - http://www.sciserv.org/isef/ - to view past projects and obtain other information that may be pertinent to SSEF.

APPLICATION REQUIREMENTS

The following items must be submitted with each application:

1. A research paper, which should include an abstract of no more than 250 words, in hard- and soft-copies. (Please read para A to I of the SUPPLEMENTARY INFORMATION FOR APPLICANTS on page 4, for information on the format of the research paper submission.)

2. A 100-word description, in hard- and soft-copies, of the applicant's project written in an easily comprehensible manner, using non-technical terms for general readers. This will be used for publicity purposes. Please read the SUPPLEMENTARY INFORMATION FOR APPLICANTS on page 4, para J, on where to place this 100-word description in your submission.

3. Checklist for Adult Sponsor/Safety Assessment Form (1), Research Plan (1A), and Approval Form (1B). The Regulated Research Institutional/Industrial Setting Form (1C) will be required only if work was conducted in an institutional or industrial setting at any time during the current ISEF project year.

4. The ENTRY FORM
   - The National Science Talent Search Entry Form for applicants of NSTS. These applications will automatically be admitted to SSEF.
   - The Singapore Science and Engineering Fair Entry Form for applicants who want to enter for SSEF only. If the project is done individually, the applicant must fill up Part A and B of the form. If the project is done as a team, Parts A and C are to be completed.
5. **Digital Photographs**

- A softcopy of the individual applicant or all members of the team if it is a team application should be stored on the floppy disk/CD-R containing the softcopy of the research paper.
- The file-size of each colour photograph in JPEG format should be less than 100 kb with a dimension of 125 by 150 pixels.

*Students are to ensure that the relevant sections of the Entry Form are completed. Incomplete submissions may be rejected.*

Applications are to be sent to the below address:

The Singapore Science Centre  
c/o  
Fair Director (SSEF 2005)  
15 Science Centre Road  
Singapore 609081
SUPPLEMENTARY INFORMATION FOR APPLICANTS

THE RESEARCH PAPER

Each student **must provide** a report on his or her research project. The research paper is an evidence of the student's research ability. It should describe actual laboratory, field or theoretical research (not library research) done by you. It should involve ideas and, preferably, data generated by you. If ideas or data mentioned in your report are not your own, it should be clearly stated, with credit given to the appropriate source and reference.

Please ensure that your research paper:

A. has a minimum of 5 pages and a maximum of 20 pages in length. The research paper, including all appendices, tables, figures, etc., **should not** exceed 20 pages. The judges may disqualify reports that exceed the 20-page limit.

B. is submitted in hardcopy (4 copies), bound using staples only.

C. is submitted in neatly-labelled floppy diskettes or CD-R (please specify the software used for the tables, graphs, diagrams and other graphics).

D. is typed using double-spacing on white A4 paper and printed on one side only. 12-point Times New Roman font or a similar one should be used.

E. has your full name printed on the upper right-hand corner of each sheet.

F. has a cover page that includes a specific title of no more than 3 lines, your name and school. Heavy covers and fancy designs should be avoided.

G. has an abstract of no more than 250 words.

H. has a short introduction describing
   - the **background** and **purpose** of the research area
   - the **hypothesis** of your research
   - an experimental section including **methods** and **results**
   - a short **conclusion** that includes discussing the results and their **implications** or **possible future research**.
   - Include a **bibliography** of your references. You should consult journals of scientific research in your field to see how research is reported.

I. contains details illustrating your methods and results in the forms of tables, figures, charts, photographs or drawings wherever possible. Do **NOT** include equipment or videotapes.

J. has a summary (not more than 100 words) of the project in a manner that can be understood by non-scientists. This summary should be placed immediately after the cover page of your research paper. In the event that your project is one of the winning entries, this summary will be used in preparing press releases to convey information about your project to the general public.
The guidelines below apply to both NSTS and SSEF. However, selected candidates of NSTS will undergo additional interviews with a different set of judging criteria.

Scoring

I. Creative Ability (Individual - 30 points, Team - 25 points)
1) Does the project show creative ability and originality in the questions asked?
   - the approach to solving the problem?
   - the analysis of the data?
   - the interpretation of the data?
   - the construction or design of new equipment?
2) Creative research should support an investigation and help answer a question in an original way.
3) A creative contribution promotes an efficient and reliable method for solving a problem. When evaluating projects, it is important to distinguish between gadgeteering and ingenuity.

II. (a) Scientific Thought (Individual - 30 points, Team 25 - points)
(for an engineering project, the more appropriate questions are those found in II (b).)
1) Is the problem stated clearly and unambiguously?
2) Was the problem sufficiently limited to allow plausible attack? Good scientists can identify important problems capable of solutions.
3) Was there a procedural plan for obtaining a solution?
4) Are the variables clearly recognised and defined?
5) If controls were necessary, did the student recognise their need and were they correctly used?
6) Are there adequate data to support the conclusions?
7) Does the student/team recognise the data's limitations?
8) Does the student/team understand the project's ties to related research?
9) Does the student/team have an idea of what further research is warranted?
10) Did the student/team cite scientific literature, or only popular literature (i.e. local newspapers, Reader's Digest)?

II. (b) Engineering Goals (Individual - 30 points, Team - 25 points)
1) Does the project have a clear objective?
2) Is the objective relevant to the potential user's needs?
3) Is the solution workable, acceptable to the potential user or economically feasible?
4) Could the solution be utilised successfully in design or construction of an end product?
5) Is the solution a significant improvement over previous alternatives?
6) Has the solution been tested for performance under the conditions of use?

III. Thoroughness (Individual - 15 points, Team - 12 points)
1) Was the purpose carried out to completion within the scope of the original intent?
2) How completely was the problem covered?
3) Are the conclusions based on a single experiment or replication?
4) How complete are the project notes?
5) Is the student/team aware of other approaches or theories?
6) How much time did the student or team spend on the project?
7) Is the student/team familiar with scientific literature in the studied field?

IV. Skill (Individual - 15 points, Team - 12 points)
1) Does the student/team have the required laboratory, computation, observational and design skills to obtain supporting data?
2) Where was the project performed? (i.e. home, school laboratory, cluster centre, tertiary institution laboratory.) Did the student/team receive assistance from parents, teachers, scientists or engineers?
3) Was the project completed under adult supervision, or did the student/team work largely alone?
4) Where did the equipment come from? Was it built independently by the student/team? Was it obtained on load? Was it part of a laboratory where the student/team worked?

V. Clarity (Individual - 10 points, Team - 10 points)
1) How clearly does the student discuss his/her project and explain the purpose, procedure and conclusions? Watch out for memorised speeches that reflect little understanding of principles.
2) Does the written material reflect the student's/team's understanding of the research?
3) Are the important phases of the project presented in an orderly manner?
4) How clearly are the data presented?
5) How clearly are the results presented?
6) How well does the project display explain the project?
7) Was the presentation done in a forthright manner without tricks or gadgets?
8) Did the student/team perform all the project work, or did someone help?
VI. Teamwork (Team - 16 points) – applicable to SSEF only

1) Are the tasks and contributions of each team member clearly outlined?
2) Was each team member fully involved with the project, and is each member familiar with all aspects?
3) Does the final work reflect the coordinated efforts of all team members?

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Individual Projects</th>
<th>Team * Projects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Creative Ability</td>
<td>30 points</td>
<td>25 points</td>
</tr>
<tr>
<td>Scientific Thought / Engineering Goals</td>
<td>30 points</td>
<td>25 points</td>
</tr>
<tr>
<td>Thoroughness</td>
<td>15 points</td>
<td>12 points</td>
</tr>
<tr>
<td>Skill</td>
<td>15 points</td>
<td>12 points</td>
</tr>
<tr>
<td>Clarity</td>
<td>10 points</td>
<td>10 points</td>
</tr>
<tr>
<td>Teamwork</td>
<td>--</td>
<td>16 points</td>
</tr>
</tbody>
</table>

TOTAL POSSIBLE SCORE 100 points 100 points

* There is no Team Category in NSTS.

We strongly recommend that students write their names on every piece of paper submitted. Only complete entries can be judged fairly. Please do not send incomplete entries.

Should you have any questions regarding your application, please do not hesitate to contact any of the following:

<table>
<thead>
<tr>
<th>NAME</th>
<th>EMAIL ADDRESS</th>
<th>TELEPHONE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ms Tng Lay <a href="mailto:Pengp_tng@science.edu.sg">Pengp_tng@science.edu.sg</a></td>
<td>6425 2594</td>
<td></td>
</tr>
<tr>
<td>Mr Ow Mun Hoe</td>
<td><a href="mailto:ow_mun_hoe@moe.gov.sg">ow_mun_hoe@moe.gov.sg</a></td>
<td>6879 6642</td>
</tr>
</tbody>
</table>
SOME ADVICE FOR NSTS APPLICANTS

Originality of work

The judges realise that students may not have the appropriate apparatus or sufficient training to conduct research that is entirely original. However, try your best to be creative and innovative. For example, if you construct a machine or equipment, indicate the parts you designed yourself. If you followed up on the plans or ideas of others, show additional work that was done yourself.

Help on the project

Consult books, magazines, scientific journals, the Internet and people wherever possible. Remember to acknowledge and give the names, addresses, and phone numbers of those who have helped you.

Types of project

The project should be in a field of science that interests you and for which you have adequate equipment. Try not to go out of your way to source for expensive equipment as these do not necessarily lead to good projects. Remember that some of the best projects in history have been conducted using recycled or unwanted material. For engineering, a clear distinction should be made between gadgetry and a genuine invention. A “Rube Goldberg” device may be ingenious, but if it is inefficient, unacceptable to the potential user, or unreliable in function, it cannot really be considered a valuable creation.

Autobiography

Do not go into lengthy autobiographical detail about the development of your interest in science. This personal history, while interesting, does not prove anything about your present ability as a scientist.

History and the report

Consult literature pertaining to your research area, but do not use the literature as your report. It merely serves as a background for your own work. A report devoted to a complete history of cancer research, for instance, is not very suitable for this competition as it is too broad and well-studied, leaving you little opportunity to express original ideas. Try to be more focused in choosing your research topic.