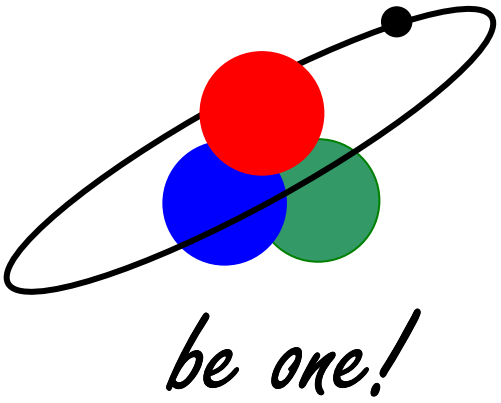

SA Physics Olympiad 2005

Full Report

on the

First South African Physics Olympiad

Prepared by

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for the

Department of Science and Technology

as part of their contribution to the

International Year of Physics

2005

Report on the First SA Physics Olympiad

1 Background

For some years attempts have been made to establish the SA Physics Olympiad, SAPhO. It was always hoped that this could become the 'final' round of the then SA National Youth Science Olympiad, SANYSO, run originally by the Foundation for Education Science and Technology, FEST, and later by the SA Association for Science and Technology Advancement , SAASTA. By the middle to late 1990s a second round was added to the then SANYSO, but a third round, focusing on Physics, unfortunately never materialized. Later, this second round was abandoned and was seen by many as a retrogressive step.

In 2002 FEST sponsored an observer, Case Rijsdijk, to visit the 2002 International Physics Olympiad, IPhO, held in Bali, Indonesia. This was the first time that SA had the opportunity to get at least some understanding what the IPhO was and what was required for SA to compete. This was a most useful visit and a full report was submitted to FEST and the SAIP and is available on the homepage of the SA Institute of Physics, SAIP, (www.saip.org.za). It was clear that SA would not be competitive for some time and that a strategy would need to be developed that would enable SA to compete in the future. To this end several proposals were submitted, see Appendix 1.

2 Introduction

With 2005 being the International Year of Physics, IYP, it appeared an opportune time to try and establish the SAPhO. A Steering Committee was set up to oversee and manage SA's contribution the IYP. This committee invited its members, and others, to submit proposals for activities during the year. One of these was a proposal to hold the first SAPhO as a part of the IYP. This proposal was accepted by the Steering Committee and the funding made available.

The submitted proposal was intended to be a draft programme giving some indication as to the costs of running SAPhO. A properly constructed budget was not presented as the draft proposal was accepted and as such did not include administration and staff costs: an issue that was addressed during IYP, but needs finalization.

2.1 Proposal Submitted

A detailed proposal paper is available, (see App. 1) but for the budgetary purposes of this proposal it is hoped that the following outline will suffice.

It is intended to use the existing SA National Youth Science Olympiad, SANYSO, as a first round for identifying and **selecting** 250 candidates for participating in a second round: this being the first round of the SA Physics Olympiad, SAPhO. From this, 10 candidates will be **selected** and invited to attend a physics camp to be held during the July vacation at Bishops in Cape Town: a school that has the capacity and resources to host such an event. In addition it is close to the University of Cape Town. Both these institutions have indicated a willingness to participate in this programme.

During the Physics Camp the ten final candidates will undergo intensive training and coaching in both practical and theoretical Physics culmination in two three hour exams: one theoretical and the other practical. It is envisaged it run from Sunday evening to the following Sunday morning.

Sunday	Arrive in the evening
Monday	All day training
Tuesday	All day training
Wednesday	All day training
Thursday	AM Exam PM Practical
Friday	Visit to Sutherland
Saturday	Return from Sutherland and awards dinner in the evening
Sunday	Return home.

Awards will consist of two gold, three silver and five bronze certificates with a once off contribution to their tertiary education: it is expected that these candidates will be able to access funding elsewhere on their first year results. The idea here is to make it clear that by attending the camp, achievement is recognized – all attendees being winners.

2.2 Budget

Preparing, setting and distributing SAPhO 1st round papers			R 2 500
Travel costs (averaged) for the ten finalists @ R2 000 each			R 20 000
Local travel costs			R 2 000
Accommodation for camp @ R1 000 pp			R 10 000
Accommodation for two local teachers (male/female as chaperons)			R 2 000
Use of facilities			R 2 500
Resources for practicals: purchase or hire			R 2 500
Consumables, printing etc.			R 1 000
Awards dinner (30 people @ R100 pp)			R 3 000
Prizes:			
	2 x Gold @ R 7 500	R 15 000	
	3 x Silver @ R 5 000	R 15 000	
	5 x Bronze @ R 2 500	R 12 500	R 42 500
Alternative prizes:			
	2 x Gold @ R 5 000	*R 10 000*	
	3 x Silver @ R 2 500	*R 7 500*	
	5 x Bronze @ 1 500	*R 7 500*	
		R 25 000	
Honoraria for presenters/teachers/examiners			R 10 000
		R 90 500	**R108 000**

The finalists prize money is to be paid directly to the tertiary institution that they register in.

2.3 Additional comments

Bishops and some UCT staff have been approached and are supportive of the SAPhO. Bishops itself has indicated that it is prepared to reduce costs as a contribution to the establishment of the SAPhO. There is also a close liaison between myself and Dr John Webb of the Maths Olympiad, since we will be drawing from the same pool of learners.

It is appreciated that the cost of this project is high, but it is anticipated that it will set a standard and trend that will attract outside sponsors in future. It should therefore be noted that this project should be seen as "seeding" or a kick-start for future SAPhOs.

In addition, SAPhO, in line with the recommendations of *Shaping the Future of Physics in South Africa. Report of the International Panel, April 2004* should be seen as a short term introduction to a longer and more permanent attempt at promoting Physics in SA. It is hoped that the success of the SAPhO will inspire the formation of a Science Olympiad in Gr 9 level, see Appendix 2, to identify competent learners early and so start a longer term process of maintaining a science (Physics) pipeline to increase SA's capacity in the sciences.

3 Implementation of the first SAPhO.

Once approval was obtained a notice advertising the SAPhO was inserted into the application forms of the SANYSO, now sponsored by MITTAL. This indicated that there would be a Physics Olympiad following the MITTAL Science Olympiad. After this had been written the results of the Physics section were sent down to Cape Town from SAASTA.

3.1 Selection process

The Physics results of the MITTAL Science Olympiad were examined and it was hoped to select 250 students to write the first round of SAPhO. On receipt of the results it became clear that it would not be possible to select 250, as the results after about 200 odd of the 600+ students on the list were not really worth considering as they were scoring 12 or less out of 50. In the end the top 50 or so were selected purely on merit after which the selection was made on gender and race. This process finally led to 193 students being selected, see Appendix 3, and invited to write the first round of SAPhO, and 189 accepted this invitation.

The first round paper, see Appendix 14, a multiple choice exam, was set, moderated and sent up to SAASTA in Pretoria, who kindly distributed it the relevant schools accompanied by a letter to school principals, and a congratulatory letter to the students, see Appendix 4. The exam was written on May 18, 2005 and the results were received a week or so later and marked. These results were again carefully examined and the final 10 students selected, see Appendix 5 & 6. The process followed was similar to that done before: the top 5 were selected and then as before gender and race were given priority. These students were then sent an invitation to attend the Physics Camp, see Appendix 7 and on acceptance were sent a letter confirming their arrangements for coming to Cape Town, see Appendix 8. These included letters are typical of those sent to all students.

As was to be expected there would be problems with this process. Ideally one would simply want to select purely on merit, but that is some way off in SA. The compromise reached was arguably the best – but one mistake was made! In selecting the top 5/10 for the Physics Camp, only the names were considered, the schools column was omitted and this led to 3 students coming from one school. Consideration was given to choosing only the top one from that school and two others 'next-in-line' from other schools. This wasn't done as it was thought that this could lead to further complications. Whilst the original choice didn't lead to any problems during the camp itself, it did mean there was a small "clique" within the camp. Should this happen in future then only the top individual from a school will be invited to attend the camp should more than one candidate from any one school qualify. For feedback from the students see under "Comments".

3.2 The Programme

The programme as outlined above was only a draft. When the actual camp was planned in greater detail, it was found that there was a need to revise and streamline the programme considerably. One of the main reasons was that it was felt that there really was not enough time to go to Sutherland and visit SALT, and so the programme was modified, see Appendix 9.

At the first meeting of all those attending the camp, held on the Sunday night in the Founders House recreation room, Bishops, some additional features of the camp programme were outlined:

- how they all got there was explained, as was the reason for them being there,
- every night they would all be given a Tutorial Problem to solve, see Appendix 10, for a summary of the problems,
- research problems, see Appendix 11
- visits to various places were discussed, including SAAO (Cape Town), iThemba LABS,
- lecture and practical venues,
- exams, and
- of course the expectations that the tutor (Kevin Govender NECSA) and the organizers had of the students.

The main aim was to have the students continually involved in physics and for them to get used to discussing physics, problems and problem solving techniques as much as possible. The programme was very intensive and kept them all busy for 18+ hours per day.

A normal day (Kevin Govender's report App. 18) would start in the evening with their Tutorial Problem. They were free to discuss this amongst themselves, but each had to submit a written solution first thing the following morning at the start of the first lecture which was where these problems were discussed in detail. These results formed part of their overall assessment. This would be followed by formal lectures and problem solving techniques. In the afternoon they were taken up to UCT to do their practical's under the guidance of Dr Andy Buffler, UCT staff member.

One morning was devoted to their research problem. Two were given and they had to decide which one they wanted to do. They all chose the same one and some additional material was given to them as a sort of "hint", see Appendix 11. Arrangements had been made for these students to have access to the UCT Jagger Library where they spent several hours to complete their research. These projects were then written up and submitted as part of their total assessment.

On the Friday morning, July 15, they all wrote the three hour theoretical paper and in the afternoon they wrote the three hour practical exam – after which there was much celebration! Kevin Govender took them all off to a film to unwind whilst the marking of the papers was started.

The next day they visited the Waterfront, Kirstenbosch and generally relaxed whilst marking was completed and in the evening there was the awards dinner, held in the Founders House Dining room at Bishops. The food was excellent, see menu Appendix 12, and all seemed to have a good time. At the end of the dinner the Gold, Silver and Bronze Certificates, see Appendix 13, were handed out by Prof. Phil Charles, director SAAO. Accompanying the certificates was a letter explaining that their prize money would be paid to the university at which they registered, on receipt of their registration numbers. This ensured that the prize money went towards their education rather than clothes and cell-phones! The only real disappointment here was that very few people of standing bothered to reply or were willing to attend – in sharp contrast to the experience of the IPhO, see under "Comments".

3.3 The Exams

The first round consisted of 50 multiple choice questions with 5 alternatives each. The paper was set by Case Rijsdijk and moderated by Dr Andy Buffler, UCT, see Appendix 14. Questions covered some curriculum work at an advanced level as well as other problems on work students were likely to have done at some stage during their school lives.

The second paper focussed entirely on work relating to that which was covered during the training camp and work that students had done leading up to this. Because there was little time available the work covered in the lectures consisted of:

- more difficult electricity problems,
- Kirchoff's Laws of electric circuits,
- advanced topics in linear mechanics, the equations of motion (constant a) and
- rotational motion, and
- there was also one lecture of Special Relativity: it was after all Einstein's Year! But not for exam purposes.

It was felt that these topics were possible for the limited time available as well as being of use to them when they started there first year at university. As can be seen from the actual paper, students had ample opportunity to show of their skills, which they did!

After the papers were written they were marked, see memorandum Appendix 15, and moderated and the results added to create their final mark, see Appendix 16.

Dr Andy Buffler, UCT, ran the practicals training and exams and the work covered is attached as Appendix 17.

3.4 Accommodation, Venues and Resources

All the students and their tutor, Kevin Govender, stayed in the new matric wing in Founders House, Bishops. The accommodation was excellent and extremely convenient as the students could simply walk across to their lectures in Room S7 of the Bishops Science Block. This has excellent facilities and is fully equipped with an internal computer network, whiteboard, screen and OHP. Meals in Founders House were good and special diets for those who needed them were arranged.

The original programme had envisioned getting copies of the relevant material compiled: a set of lectures notes which would need to be written up/copied etc. This proved to be a very time consuming process and in the end a better option proved to be the purchase a good 1st year textbook. A price with a local bookseller was negotiated and ***"Physics" by Cutnell and Johnson***, sixth edition was purchased. The other advantage of this was that it gave the students the opportunity to use a good textbook in preparing for their studies during the break between school and university.

3.5 Transport

An 8-seater Kombi was hired for the duration of the camp, and this was licensed to be driven by Case Rijsdijk and Kevin Govender: the latter usually used it as Case Rijsdijk's car made up the rest of the transport when visiting or going out. The Kombi proved more than adequate in collecting people form the Airport! The cost of this was somewhat more than budgeted, but in retrospect was essential!

4 Expenditure

4.1	Air tickets	R 24,730.16
4.2	Local transport/van hire	R 5,730.61
4.3	Bishops: venue hire = R1 000, accommodation = R13 200, awards dinner for 21 people = R1 829	R 16 028.82
4.4	Honoraria	R 9 800.00
4.5	Books	R 3 497.45
4.6	Promotional material	R 1 830.00
4.7	Prizes	R 42 500.00
4.8	Reports	R 1 000.00
	Total Expenditure	**R 105 117.04**

4.8 Notes

4.8.1 This is within budget. Whilst there was over expenditure on some items:

- local transport,
- learning materials
- air tickets

there was under expenditure on others:

- awards Dinner,
- exam setting,
- use of facilities,

but on the whole the goals set to achieve the first SAPhO were achieved within budget.

4.8.2 All financial matters were handled by the finance division of the SAAO in accordance with their normal operating procedures. They have retained all receipts for auditing purposes as agreed to by the SAASTA accountant. In addition it was agreed that the account would be signed off at SAAO and the audited account forward to SAASTA and DST.

5 Comments

5.1 Feedback form the students was very positive. One student questioned the selection process: the feeling was that maybe there were others who should have come. This issue was discussed at length with the student concerned and the group as a whole and the matter was resolved entirely satisfactorily.

5.2 Kevin Govender, then from Nuclear Energy Corporation of South Africa, now SALT Foundation manager at SAAO, wrote a thorough report and is included in Appendix 18.

5.3 Awards Dinner. It was hoped that this would be a high profile affair with significant dignitaries attending. Invitations (see Appendix 18 for a typical example) were sent out to the Minister of Education, the MEC for education in the WC, the Principal of Bishops, CEO of SAASTA and the directors of iThemba LABS and SAAO as well as other ranking officials from the DoE and DST. It was extremely disappointing that none of the education officials even acknowledged the invitation, despite frequent e-mail and phone calls. Perfectly acceptable declines came from Bishops and SAASTA, the latter sent a representative from HMO. Should the SAPhO

become a sustained effort, then this is an issue that needs addressing – it is of outmost importance that academic pursuits are seen as being just as important as sporting ones, (see IPhO report). More publicity needs to be sought.

5.4 There were problems of course. One of which is the inability of people to follow simple instructions. This is human nature but frustrating and very time consuming – getting ID numbers from students was a typical example, see Appendix 18! This is mentioned as in future some sort of administrative assistance would be a great help and facilitate the smooth running of the camp, leaving the convenor and tutor time to concentrate on the academic aspects of the camp.

5.5 The logo. This is in part a derivation of the 2002 IPhO whose by-line was “Be one of the Proud Few”. It was felt that “Be One” was ubiquitous enough to cover all that and the actual logo is a hydrogen atom, with the nucleus showing the three quarks that make up the proton.

6 Acknowledgements

6.1 First and foremost the Department of Science and Technology for providing the funding for SAPhO. In particular to Tshepo Seekoe for managing the IYP Steering committee and to Byren Mitchel Archary for his support.
6.2 SAASTA for their assistance with the initial stages of SAPhO, in particular Elize van Staden and Humphrey Netshifhefhe for their efforts in getting the first round papers to the selected students.
6.3 Profs. Harm Moraal and Edmund Zingu for their support as well as the SAIP Council.
6.4 Ginny Stone at iThemba LABS for her help in printing certificates, posters and other odds and ends.
6.5 Glenda Snowball, accountant at SAAO for all her hard work, support and sorting out all those “mysterious” financial matters!
6.6 Bishops staff for making their excellent facilities so readily available and their most helpful and considerate staff.
6.7 Dr Andy Buffler, Physics department, UCT, who willingly gave up so much of his vacation time to make a significant contribution to SAPhO by running the practicals.
6.8 UCT Library staff for their willingness to let these young students loose in a great library and for all the assistance they provided.
6.9 SAAO for making their facilities so freely available to the SAPhO convenor
6.10 Mrs S Rijsdijk, for her support and acting as “mother” to the students and thinking of those little things like coffee making stuff for the students.
6.11 Prof John Webb for his advice and experience with the IMO.
6.12 Finally and **not** least, Kevin Govender, without whom it would never have been possible. His total commitment to the concept of SAPhO and its execution were indispensable. He was the ideal tutor: an excellent knowledge of physics, enthusiastic and young enough to understand these bright young minds. His was a truly magnificent contribution.

7 Conclusion

There is little doubt that the 2005 SAPhO was a success. It also proved that it can be done, and that such problems that did exist can be addressed in future Olympiads. It is hoped that now that the first SAPhO has completed that funding will be made available to sustain it.

Case Rijsdijk March 08, 2006
SAPhO Convenor

Some images of SAPhO 2005

Welcome to the 10 finalists on Day 1

First lesson

First practical in UCT labs

Visit to the SAAO

Visit to iThembaLABS

Theory exam

Practical exam

Awards dinner

Gold Medallists Heidi Berg and Michael Mahale