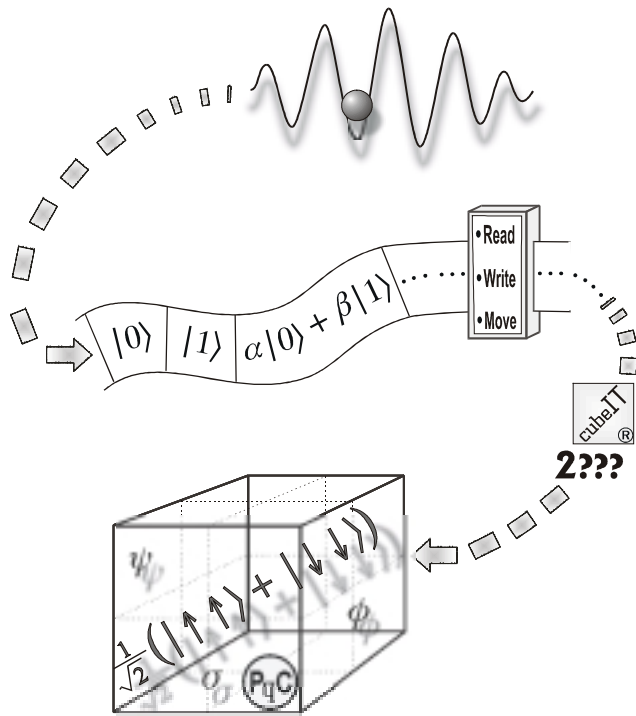


Thirteenth Chris Engelbrecht Summer School
in Theoretical Physics



QUANTUM COMPUTING,
COMMUNICATION
AND DECOHERENCE

24 January to 2 February 2001

Devon Valley Hotel, Stellenbosch, South Africa

The Thirteenth Chris Engelbrecht Summer School in Theoretical Physics is sponsored by the South African National Research Foundation (NRF) and is supported by the South African Institute of Physics (SAIP) and the Organisation of Theoretical Physicists (OTP).

TIME AND VENUE

The school will take place from Wednesday, 24 January to Friday, 2 February 2001 at the Devon Valley Protea Hotel situated 6 km outside Stellenbosch, Western Cape, South Africa.

THEME

QUANTUM COMPUTING, COMMUNICATION AND DECOHERENCE

COURSE LECTURERS AND TOPICS

- I Cirac** University of Innsbruck, Austria
Optical implementation for quantum computing; quantum error correction
- A Ekert** University of Oxford, UK
Quantum algorithms and logical gates; universality; cryptography
- A Leggett** University of Illinois, USA
Entanglement; decoherence and various models of environment
- D Loss** University of Basel, Switzerland
Devices for quantum computing and communication (semiconductors, quantum dots); spin qubits
- A Zeilinger** University of Vienna, Austria
Introduction to fundamentals: superposition, qubits, entanglement and non-locality; quantum teleportation
- W Zurek** Theory Group, Los Alamos, USA
Information transfer(measurement, entanglement); decoherence, chaos and entropy production; classical / quantum correspondence; Maxwell's demon

FORMAT

About 40 one-hour lectures will be presented in English.

PARTICIPATION

The course is a graduate school aimed primarily at theoretical physicists and postgraduate students interested in broadening their knowledge of the field. The fields of quantum computing and communication have, apart from providing a deeper understanding of Quantum Mechanics and its consequences, recently stimulated interest and research in the general fields of information technology, computer science, mathematics and electronic engineering. In contrast to some previous schools in this series the present school therefore has a more interdisciplinary character. Participants from fields outside of physics are most welcome and encouraged to participate. We do, however, expect all participants to have a suitable background in the natural sciences or engineering, typically at least an honours degree and basic knowledge of quantum mechanics.

STUDENTS

Students are normally expected to find support from their home institution and/or thesis advisor to participate in the school. Funds are, however, available to support a number of *bona fide, full-time local students*. It is envisaged that the successful candidates will be subsidized up to 60% of their total accommodation costs. **Interested students are encouraged to apply as soon as possible.** Applications for a subsidy should provide a summary of personal details and include a letter of recommendation from the Head of Department or thesis advisor. Complete applications should be sent to Prof. FG Scholtz at the secretariat address below. Only in cases of particular need will increased support be considered for well motivated and meritorious applications. It is unfortunately not possible to subsidize any travelling costs.

Applicants will be informed by 15 November 2000 if they had been successful. After that date all applications will be subject to available funding.

ACCOMMODATION

The Devon Valley Protea Hotel is a three star hotel, surrounded by 8 hectares of its own vineyards, situated 6 km outside the historic town of Stellenbosch. Situated within a 20 minute drive to Cape Town International Airport

and 35 minutes to central Cape Town and the Waterfront, it offers a beautiful view over the Cape Winelands and the Helderberg Mountains. The hotel has a swimming pool and jacuzzi and offers the opportunity to play Petanque (the ancient French game played with metal balls) as well as golf at the nearby Devon Vale Golf Course. Furthermore, wine tasting and musical performances can be arranged. There are also several hiking trails in the Stellenbosch environment. Rooms have private bathrooms, telephones, radios and satellite TV.

A provisional booking of single and double rooms has been made and rooms will be allocated on a 'first paid, first serve' basis. Should the need arise, the hotel management has undertaken to arrange additional comparable accommodation at the school rates in nearby guest houses in the Devon Valley, to and from which the hotel will provide a shuttle service.

Students who are unable to obtain the financial support (including subsidy from the school) to stay at the hotel, may be accommodated elsewhere if the organizing committee is notified well in advance, although we would like to limit this option to the minimum for logistical reasons. Other participants who prefer not to stay at the hotel, are requested to make their own reservations. Unfortunately the secretariat of the school cannot accept responsibility for individual reservations at other guesthouses or hotels. More information on Stellenbosch, the surroundings, and a list of some guesthouses and hotels can be found at (<http://www.stellenboschvillage.com>). For a greater variety of options the tourist information office can be contacted at:

Telephone: 27-21-883-9633/3584
Telefax: 27-21-8838017
e-mail: eikestad@iafrica.com

TRANSPORT

A shuttle service from Cape Town International Airport and Cape Town Railway Station will be provided on arrival and departure. Please indicate requirements in this regard on the registration form.

Devon Valley Hotel offers a daily shuttle service to Stellenbosch at a minimal cost.

REGISTRATION

Interested persons should pre-register by completing the first part of the online registration form. A personal reference number will then be assigned which can be used to update and finalise the registration at a later stage. Registration can only be finalised upon payment of the registration fee **by or before 15 December 2000**.

COSTS

Registration fee:

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|----------------------|---|
| Regular participants | R350 (US\$100 for participants from outside Africa) |
| Students | R175 (US\$50 for students from outside Africa) |

All course documentation is included in the registration fee.

ACCOMMODATION

A special school package is offered to participants at the following rates:

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|-------------------------------|-------------------------|
| Single | R405 per person per day |
| Sharing (in a double room) | R295 per person per day |

The accommodation package includes three meals per day at the Devon Valley Hotel, as well as refreshments during tea-breaks and use of the conference facilities. Rooms are available from the afternoon of Tuesday 23 Jan and must be evacuated by Friday morning, 2 Feb. The package **does not include** lunch and dinner on Sat 27 and Sun 28 Jan. as many participants prefer to explore Stellenbosch and the Cape Peninsula over the weekend. Dinner on Tue 23 Jan is **included**, as well as breakfast and lunch on Fri 2 Feb.

DAILY CONFERENCE RATE

The following daily rate is payable by participants who prefer to arrange their own accommodation. This rate includes use of the conference facilities, refreshments during tea breaks and lunch at the hotel.

Daily rate: R75 per person per day

DEPOSIT FOR ACCOMMODATION

The following deposits are required to secure accommodation at the hotel:

| | |
|-------------------------------|--|
| Single | R1700 (US\$280 for participants from outside Africa) |
| Sharing (in a double room) | R1100 (US\$180 for participants from outside Africa) |

The closing date for registration and payment of an accommodation deposit is 15 December 2000. The balance of accommodation costs is payable by Friday 26 January 2001.

PAYMENT

Participants resident in South Africa can pay by personal cheque. Foreign participants can pay by bank draft or bank transfer (in US dollars). All cheques and bank drafts should be made payable to '**Theoretical Physics Summer School**'. For bank transfers refer to the following information:

| | |
|------------------------|---------------------------------|
| Bank: | ABSA Bank Stellenbosch |
| Street Address: | Plein Street, Stellenbosch |
| Postal Address: | P.O. Box 138, 7602 Stellenbosch |
| Bank Code: | 63-04-10-45 |
| Swift Code: | ABSAZAJJ |
| Account Number: | 4046528525 |

If payment is made by bank transfer, a copy of the transfer instruction should be faxed to the secretariat (+27-21-8083385).

ORGANISING COMMITTEE

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|----------------------|---------------------------------|
| W D Heiss (Chairman) | University of the Witwatersrand |
| H B Geyer | University of Stellenbosch |
| F G Scholtz | University of Stellenbosch |
| W-H Steeb | Rand Afrikaans University |

SECRETARIAT

Theoretical Physics Summer School 2001,
c/o Mrs. J A de Waal, Department of Physics,
University of Stellenbosch, Private Bag X1, 7602 Matieland,
South Africa

| | |
|-------------------|-----------------|
| Telephone: | +27-21-808 3380 |
| Telefax: | +27-21-808 3385 |

e-mail: fqs@maties.sun.ac.za or jadw@maties.sun.ac.za

Participants are requested to use the online registration facility at <http://www.sun.ac.za/summerschool/2001.htm> to register and check updated information, including the preliminary program.