

Quantum Monte Carlo and the CASINO program

Cambridge University International Summer School
Sun 30th July - Sun 6th August 2006
The Towler Institute, Vallico Sotto, Tuscany

www.tcm.phy.cam.ac.uk/~mdt26/tti/tti.html

August 15, 2006

This is the final programme for the first international quantum Monte Carlo Summer School to be held at the Towler Institute. The event will be organized and run by the TCM Group from Cambridge University's Cavendish Laboratory. The purpose of the school is to provide the student with a thorough working knowledge of the quantum Monte Carlo electronic structure method as currently used in quantum chemistry and condensed matter physics, and to show him or her how to use the Cambridge CASINO QMC program for serious scientific research. The course will consist of around 20 hours of lectures by recognized experts in the field and a series of practical exercises in using the CASINO program led by its authors. No previous background other than a basic knowledge of quantum mechanics is assumed. Knowledge of density functional theory and similar methods is useful, as is an ability to work within a Unix/Linux environment.

As with all events at the Institute, *Quantum Monte Carlo and the CASINO program* will provide ample time for the participants to relax. Formal lectures are restricted to the mornings, and participants are given the freedom and space to think and to contemplate and discuss the issues at hand. Healthy recreational activities will be organized in the afternoons, and it is hoped that by following this strict regime, together with breathing clean mountain air and by preparing and sampling fine Tuscan cuisine, the participant will be able to return home mentally and physically refreshed as well as better informed.

1 LIST OF PARTICIPANTS

Luca Bellarosa	Imperial College, London	l.bellarosa at imperial.ac.uk
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Paul Jouanna	Montpellier, France	jouanna at msem.univ-montp2.fr
Thomas D. Kühne	ETH, Zurich	tkuehne at phys.chem.ethz.ch
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Jan Lundell	University of Helsinki	jan.lundell at helsinki.fi
Chul-Hong Park	Pusan University, Korea	cpark at pusan.ac.kr
Eli Rezabal	University of the Basque Country	pobrease at sq.ehu.es
Jan Ruzs	Charles University, Prague	rusz at mag.mff.cuni.cz
Leandro da Silva	Santa Maria University, Brazil	lb.silva at mail.ufsm.br
Jan Steckel	National Energy Tech Lab, Pittsburgh	steckelj at pitt.edu
Simone Taioli	University College, London	s.taioli at ucl.ac.uk
Ching-Ming Wei	Academica Sinica, Taiwan	cmw at phys.sinica.edu.tw

Arlette Jouanna
Jin Jung and Jonas Park

2 FLIGHTS AND TRANSPORT

This section gives details on how to get to the Institute for people flying into Galileo Galilei Airport, Pisa. Further details about transport, including how to drive to the Institute, are given on the TTI web site. If you are flying into some airport other than Pisa, you will need to find your own way by train to Barga-Gallicano.

If possible you should aim to arrive at Pisa airport on Sunday 30th July. If this is not possible (e.g. if flights from your country are irregular) then we recommend having a brief holiday in Florence or similar before coming to TTI. Early arrivals cannot be accommodated at the Institute because of the International QMC workshop taking place the previous week which finishes on Saturday 29th July i.e. the day before the Summer School starts. Late departures should be possible if necessary - please contact us beforehand to organize this.

Upon arrival in Pisa you should get a train from Pisa Centrale station via Lucca to Barga-Gallicano station. From the airport you can get to Pisa Centrale station either by taxi in 5 minutes or by a short train ride from Pisa Aeroporto station (which you get to by walking out of the left-hand side of the airport as you face outwards). There are some direct trains, but it is likely you will have to change at Lucca to get the train north into the mountains up the valley of the river Serchio towards Barga. Don't forget that in Italy you need to validate your train ticket by getting it stamped in the yellow machines on the platform or you may have to pay a fine.

Once at Barga-Gallicano, you should be met by a TTI representative (in either a minibus or a maroon Fiat Multipla) who will take you to the Institute in the mountain village of Vallico Sotto. Each Sunday train will be met as required. If for some reason no-one is there to meet your train, you might like to wait in the café-bar next to the station car park until he arrives - do call if you have to wait more than five or ten minutes. Clearly it would be helpful if participants could state in advance the time of the train on which they intend to arrive. The timetable is linked from the TTI web site - don't worry about the fact that this is the German Railways timetable - it's just better than the Italian equivalent. Currently it suggests that train arrivals at Barga from the direction of Lucca on Sunday 30th July are at 6:54, 9:13, 10:51, 12:13, 14:50, 17:02, 18:57, 19:59, 21:34 (corresponding to departures from Lucca at 6:12, 8:25, 10:02, 11:30, 14:10, 16:20, 18:17, 19:13, 20:46). As you can see it is a bit of a branch line and services are fairly irregular so careful planning is required. Dinner will be served in the Institute on the Sunday evening about 8.30pm so you are encouraged to arrive by then if at all possible.

In emergencies it is possible to get a taxi to Vallico Sotto from the station but in general this needs to be pre-booked - see the instructions on the web site (Barga Taxi : taxibarga@libero.it Tel. 340 1669279 or 348 8106112). If you are a non-Italian speaker who hasn't pre-booked and need to talk to the guy on the phone you will find he doesn't speak English so just say (phonetic) "Taxi a Vallico Sotto da la stazioni di Barga? Inglayzi. Non parlo italiano." or similar down a phone at him - the trip should cost 30 Euro.

In case of problems contact Mike on his mobile phone - 3478077359. Additional assistance is available from Samantha Keil on 3478077418. The TTI has a direct phone line (0583 761706) but this should be used as a last resort as people generally need this for internet use.

3 FINAL TRAVEL ARRANGEMENTS

Luca Bellarosa

ARRIVAL Pisa Centrale 17.06 Sun 30th, Arr. Barga-Gallicano 18:57 (maybe 19.59)
DEPART ~2pm, Pisa Centrale, Sunday 6th August

Richard Christie

ARRIVE Pisa airport 11.35 Sun 30th, Arr. Barga-Gallicano 14.50
DEPART Stay Sunday night in Pisa, Flight out 09.55 Mon 7th.

Paul Jouanna + WIFE

ARRIVAL his own car
DEPART his own car

Thomas D. Kuehne

ARRIVAL Possibly Arr. Barga-Gallicano 21.34
DEPART ???

Olli Lehtonen

ARRIVE Pisa airport Fri 28th (spend 2 days in Pisa), Arr. Barga-Gallicano 14.50
LEAVE Pisa airport Tue 8th (stay for 2 extra nights)

Jan Lundell

ARRIVAL Pisa airport 17.30 Sun 30th, Arr. Barga-Gallicano 19.59
DEPART Train from Barga-Gallicano 7.56, Pisa airport 12.00 Sun 6th
Mobile : +358-40-7053493

Chul-Hong Park (+ WIFE + SON)

ARRIVAL Rome Fri 28th, Train to Pisa Jul 30th ~4pm, arrive BG station 21.34
DEPART Mon August 7th (stay 1 extra night)

Eli Rezabal

ARRIVAL Pisa airport Sat 29th (1 night in Pisa), Barga-Gallicano 18.57
DEPART Barga-Gallicano station 6:30 (train at 6:43, or 8:41)

Jan Ruzs

ARRIVAL Bologna airport Sun 30th, 13.05, 15.20 train from Bologna Centrale -
arr. Barga-Gallicano 18.57
DEPART Bologna airport Sun 6th, 13.45, Train from BG ~08.00

Leandro da Silva

ARRIVAL Pisa airport Sun 30th 11.35, Arrive Barga 14.50
DEPART Depart Pisa Sunday 6th 17.30

Jan Steckel

ARRIVAL Pisa airport Sun July 30, 11:35 AM, arr. Barga-Gallicano 14.50
DEPART Leave Saturday August 5th afternoon, 12:00, 14:02, or 15:14 train from
BG to Lucca, 1 night in Lucca, 1 night in Pisa, Depart Pisa airport,
Monday 7am

Simone Taioli

ARRIVAL Pisa airport, Sun July 30th, 11.45 a.m. - Pick up school car - drive
to Institute.
DEPART Sunday 6th August, early morning

Ching-Ming Wei

ARRIVAL Pisa airport, Sun July 30th 15.10, arrive Barga-Gallicano 18.57
DEPART ???

SUMMARY

ARRANGED PICKUPS FROM BG STATION

14.50 Christie, Lehtonen, Da Silva, Steckel

18.57 Bellarosa, Rezabal, Ruzs, Wei

19.59 Lundell

21.34 Kuehne(?), Park (x3),

DRIVING Jouanna(x2), Taioli

4 THINGS TO BRING WITH YOU

Whatever you like, plus :

- Paper and pens.
- Your wireless-enabled laptop, if you want - see note in next section.
- Summer hiking gear such as boots, socks, mini-rucsacs etc.
- Italian plug converters if you want to plug anything in (we have some spare but probably not for all countries). Our sockets mostly have two round pins (with an optional third one between them).
- A towel.
- Some Euros for spending in restaurants and shops. Please note that there is no easily accessible cash machine near the Institute, and although we might pass them from time to time on our afternoon trips, large numbers of people getting money out can cause considerable delays. There is a cash machine in Pisa airport to your right as you emerge into the arrivals hall, and we very strongly recommended you fill your wallet there.
- People who intend to participate in the wetter activities (e.g. visits to caves) should bring some clothes that you don't mind getting wet and a torch.
- Sunscreen (it is likely to be quite hot in the first week of August).

We generally find that squishy luggage is easier to fit into multiply occupied cars than giant hard-shelled suitcases..

5 SUMMER SCHOOL SCHEDULE

Here is the proposed schedule for the Summer School. It is of course, quite elastic. The instructors are Prof. Richard Needs, Dr. Mike Towler, Dr. Neil Drummond, Dr. Pablo Lopez Rios, and Dr. Alexander Badinski. One or two of the students also have a little experience with QMC: if that is the case, you are warmly encouraged to give a little ten-minute presentation of what you have done so far - contact us to arrange this.

Sunday 30th July

ARRIVALS

~8pm : Buffet dinner in the Institute garden.

Monday 31st July

8.30am : Mike Towler - "Quantum Monte Carlo : the basics. Overview of everything. Why QMC? Basic MC integration/VMC/DMC theory. Many-electron wave functions - aperiodic and periodic. Basic solid-state ideas - reciprocal space, k points etc. Idea of wave function optimization Representation of orbitals. Basis sets. Spin. Excited states. Total energy." (2.5 hours)

11am : BREAK

11.30am : Mike Towler - "An introduction to the CASINO program" (1 hour)

1pm LUNCH

PRACTICAL SESSION -

2pm-3.30pm Distribution, setup and compilation of the CASINO program (MDT)

3.45pm EXCURSION

- Trip to Alta Matanna. See the entire Versilia coast, and even Elba and Corsica from the easily accessible summit of one of the more spectacular mountains in the Apuan Alps. Bring one of the Institute's telescopes. Followed by drinks and dinner in 19th Century hunting lodge. There might also be a slight detour to find the site of the ancient balloon cableway that led up here from the beach (see Local History Projects on the web site).

7.30PM DINNER - Alta Matanna hotel

Tuesday 1st August

8.30am : Pablo Lopez Rios - "Statistical analysis of VMC results. Basic DMC - how to run a calculation. How to extract and analyze DMC results. Serial correlation. Timestep optimization. Correlation time. Reblocking. Use of graphit program. Other statistical issues."
(1 hour)
9.30am : Richard Needs/Alexander Badinski - "Pseudopotentials for quantum Monte Carlo" (1 hour)
10.30am : BREAK
11am : Richard Needs - "Solid state calculations. Interactions and finite size effects" (2 hours)

1pm LUNCH

2pm PRACTICAL SESSION -
Basic use of CASINO program - simple VMC, DMC calculations (MDT/PLR)

EXCURSION/ACTIVITY

8.30pm DINNER - Da Sandra

Wednesday 2nd August

8.30am : Neil Drummond - "Jastrow factors and wave function optimization"
(2 hours)
10.30am : BREAK
11am : Pablo Lopez Rios - "Orbital optimization, multideterminants and backflow, with numerical results" (2 hours)

1pm LUNCH

2pm PRACTICAL SESSION
- Wave function optimization with CASINO (NDD)

EXCURSION/ACTIVITY

8.30pm DINNER - Al Laghetto

Thursday 3rd August

11.00am : Neil Drummond - "Advanced diffusion Monte Carlo. Timestep errors.

Green's function modifications. Fixed-node approximation. Wave function nodes. Fermion sign problem (release node and fermion Monte Carlo, optimizing the nodes). Expectation values in DMC. Future walking etc. Population explosions." (2 hours)

10.30am : BREAK

11.00am : Mike Towler - "Scaling with system size. Localized orbitals and localized basis sets (Gaussians/blips). All-electron calculations. Heavy atoms - timestep errors. Forces and derivatives. (2 hours)

1pm LUNCH

PRACTICAL SESSION

- Advanced use of the CASINO program (PLR)

EXCURSION/ACTIVITY

8.30pm DINNER - Mulino

Friday 4th August

8.30am : Mike Towler - "Expectation values other than the total energy computable with CASINO" (1 hour)

9.30am : Pablo Lopez Rios - "Applications : electron-only systems (fluid phase, Wigner crystals etc.) Electron-hole systems. (1 hour)

10.30am : BREAK

11.00am : Neil Drummond - "Applications : systems with atoms" (1.5 hour)

12.30pm LUNCH

EXCURSION/ACTIVITY

PRACTICAL SESSION

- Trial wave function generation with other programs (CRYSTAL/PWSCF/CASTEP etc.)
- General CASINO applications.

8.30pm DINNER - Canapale, Vallico Sopra

Saturday 5th August

MORNING - Exercises with CASINO and QMC exam (with prizes)

AFTERNOON/DINNER - Long distance excursion e.g. to Cinque Terre

Sunday 6th August

DEPARTURES

6 EXCURSIONS AND ACTIVITIES

Here is the list of excursions and activities offered to the International Workshop participants the week before the School. Clearly with the Summer School we have less time in the afternoons because of the need to run CASINO practical sessions so many of these excursions will no longer be feasible. Nevertheless we shall try to get through some of them, according to time available and the tastes and interests of the students.

The various activities are divided into categories according to the physical effort involved. As there will be around 20 people at the Summer School, it is envisaged the group may split into two, with the hot young muscular virile people doing the strenuous excursions, and the lazy, the corpulent, and those deficient in the requisite number of limbs doing the more relaxed activities. What to do can be debated in the morning each day.

6.1 Very strenuous activities

- Reach the high peak of Pania della Croce from Piglionico (described as ‘The finest peak in the whole of Italy’ in *Below the Snow Line* - one of the 19th century books in the TTI Antiquarian Library).
- Find the spectacular natural rock bridge of Monte Forato (under which someone once flew a bi-plane). This disgracefully eluded the Cambridge student team during last year’s Workshop, probably on account of the city boys’ inept map reading.
- *Orrido di Botri* guided canyon walk. The Orrido is a giant canyon created by the Pelago river in the Apennines (about an hour’s drive from the Institute) with deep steep walls as high as 200 metres and in some places only a few metres apart. Apparently this is a geologists’ and naturalists’ paradise. It can only be visited on a guided walk with helmets and suitable clothing you don’t mind getting wet. Let Mike know in advance if you want to do this since it needs to be booked.
- Alexander’s morning workout. Run from the Institute with Mr. Badinski each morning at 6am to the spectacular summit of Monte Palodina in order to tone up your thigh muscles and pep yourself up in preparation for the morning’s talks.
- There are of course any number of spectacular high mountain expeditions in the Apuan Alps and the Institute has a library of guidebooks which you can browse through. Let me know if you want to try anything else (that will fit in the clearly limited amount of time). There is also the TTI Antiquarian library (Mountaineering section) to inspire you.

6.2 Quite strenuous activities

- Take part in the second expedition to the ancient cave known as the *Tana di Cascaltendine* which is the subject of Pietro Magri’s 1880 book *An expedition to Mount Gragno and the Cave of Cascaltendine* as translated by MDT and available on the TTI web site (click the Local History Projects link). This time the aim will be to find and photograph the following things that were missed last summer : The Palace of Ismeno, the Cave of Extreme Fear, the House of Vampires, the Column of Hercules and the bat. The main aim is to photograph the result of the following quote : ‘*Before coming down from the cavern we used a chisel to inscribe our initials and the year 1880 on both walls of the passage near the entrance.*’. This was done in the Palace of Ismeno whose entrance is a 6 foot hole about thirty feet up a cliff - a picture of which is on the web site. Anyone with rock climbing expertise? Otherwise we will have to somehow get a ladder up there.. To be followed by cold beers and refreshments in the lovely village of Cardoso.
- Explore the Vallico Sotto mule trail and the spectacular forgotten waterfall of Cascata Pendolina - one of the highest in Italy. Vallico was only connected by road to the outside world in the 1960s - before then people went up and down the *mule trail*. This has now been forgotten and is a little overgrown (though less so following TTI clearing activities) but is still very beautiful. Once we reach the bottom of the valley we will head over the river to the site of the Cascata Pendolina where will take lunch. On the way back the bravest people will try to ascend the *Crystal Canyon* (you will get wet!).

- Five a side-football (a new fenced pitch has been constructed in Vallico since last year) or regular football (on the local full-sized pitch).
- Rock climbing or low-level bouldering - the Institute should have ropes and climbing equipment by the summer.
- Pietro Magri in his 1880 book mentioned above states that there are two other caves in Monte Gragno. Today no-one seems to know where they are. Can you find them? Base camp might be at Santa Luigi ten minutes drive above Vallico Sotto.
- Traverse from Santa Luigi via Mote Palodina and the spectacular cliffs of Monte Gragno past the giant karst depression of Pian di Lago to the spectacular Rocca Estense fortress of Trassilico.
- Explore the *Tana che urla* (the Cave that Screams!) - first explored and scientifically described by Vallisneri in 1726 - off the footpath to Foce di Petrosciano from Fornoalasco. This isn't a tourist cave for wusses - so bring some appropriate clothes and torches. By the summer the Institute should have some proper speleological equipment to hand round. If you can read Italian, have a look at www.buffardello.it/Documenti/alcunegrotte3b.htm.

6.3 Relaxed activities

- Spend the afternoon bathing in the outdoor hot pool at the ancient thermal baths of Bagni di Lucca (one of the most fashionable spots in Europe in Lord Byron's time - the Switzerland of Tuscany!). Followed by shopping, sightseeing and coffee in the town centre.
- Samantha has two other favourite open-air pools at Galliciano and Barga. These are like little beach resorts where one lazes about on deckchairs and has the occasional dip.
- Visit the ancient city of Barga (www.barganews.com) for an afternoon's relaxed sightseeing, shopping and culture.
- Visit the beautiful city of Lucca for the same reason.
- Drive to the next valley along from ours over a spectacular high mountain road where the eagles live. Visit the Grotta del Vento - the Cave of the Winds (www.grottadelvento.com). This is the most famous cave system in Tuscany and the visitor will enjoy a spectacular and bizarre landscape of caverns and lakes. Take a pullover as the temperature is a reliable 10 degrees the whole year round. Then head down the valley to visit the *Eremo di Calomini* - an ancient monastery built into a high steep cliff.
- Table football and drinking in Fabbriche di Vallico.
- Horse riding at La Fornace.
- Various mild short walks around the Institute.
- Digging the Institute garden and doing little DIY things like restoring the church (I say this merely in hope..).

6.4 Very relaxed activities

- Spend all day in the TTI garden relaxing in one of the Institute's three hammocks, drinking wine, snoozing or reading one of the books from the TTI library.
- The Institute has a variety of games and jigsaws..
- Debate physics with the help of the Institute blackboards.
- Listen to Mike's lecture "Richard Burton and the Source of the Nile" (Burton the Victorian explorer and polymath, not the one out of *Where Eagles Dare*..) which he didn't have time to give last year, followed by a screening of the "Mountains of the Moon" movie.
- Spa treatments in the Bagni di Lucca "Thermal resort".

6.5 General

- The Institute has a wildlife photography notice board. Prizes for the best entries, particularly if you can take a picture of one of the eagles that regular soar above Vallico or of the elusive *marmite*. Currently there are seven entries, all taken by enterprising student Andrea Ma.
- The Towler Institute Exploration Society also has a photographic competition running - see the web site for details.

7 TTI TECHNICAL EQUIPMENT

There should be seven modern laptop computers in the Institute available for use during the summer. Most run both Suse Linux 9.3 and Windows XP, but the CASINO practical sessions will be run under Linux. However, it is recommended you bring your own laptops if at all possible (since there are clearly not enough public laptops for every student). It would help if you could set up a fortran90 compiler on it before arriving at the school (we recommend Intel's free ifort compiler- available for download on their website).

All connections are made through a WiFi wireless network (802.11b or 802.11g). If you wish to bring your own laptop then it therefore needs to be wireless-enabled if you wish to log into the network. Three spare wireless network cards that you can plug into your laptop PC card slot are available - but note this can be tedious to set up on some machines so clearly it is better to wireless-enable it before you come. The Institute SSID is 'titi' and the network is completely unencrypted due to the total absence of hackers, or indeed computers, in remote mountain villages.

I'm afraid that for the moment the Institute is still on dialup (the wireless network plugs straight into the telephone through a Wiflyer router). Large files should thus be brought with you on your laptop rather than downloaded when you get there. The connection is certainly fast enough for multiple people to do remote logins and terminal-based email. Viewing graphical internet pages is OK when only one person is doing it so try to do this sparingly. Finally, please turn off things like Microsoft's Automatic Update feature - downloading Gb of files to patch all the security holes in your machine while other people are trying to work is not a good idea.

The TTI management is very sorry about the slow connection but would like to stress how difficult it is to get a decent broadband connection in rural Italy. Italian fast connections are almost all ADSL and this is never going to get to such a remote area. Satellite equipment is available but prohibitively expensive, and a bit flakey.. We seem to be only a year or two from having appropriate technology to wire the Institute properly with the outside world - such as Wimax or floating giant airships sailing over Europe and so on.

Apart from computers and networking devices, we also have the following equipment available for Summer School participants to use:

- Canon Pixma ip4000 colour inkjet printer (on a wireless print server, so one can print from anywhere in the Institute)
- Hi-Ti Transphotable photo printer for instant printing of your photographs (you can plug in your camera directly - no need to go through a laptop - accepts all memory card formats that I am aware of).
- Epson Perfection 4990 scanner
- A3 laminator
- Guillotine.
- Finepix F455 digital camera
- Two memory sticks

- Driver disks for most of the above.
- A supply of writeable CD-Rs, CD-RWs and DVD-Rs.
- The usual stationery and staples etc..

A technical guide to the TTI computer systems will be available. There is also a reasonable selection of scientific reference books.

8 PRESENTATION EQUIPMENT

The church is equipped with a state-of-the-art NEC MT1075 projector, a giant 16' by 12' main screen, a 7'8 x 5'9 electric auxiliary screen, an Avervision document camera, a dual projection stand, a laptop, a DVD player with decent speakers, and various wireless control devices. There is a giant blackboard in the church and a smaller one in the main corridor stolen from the TCM Seminar room in the Cavendish.

The projector is wireless capable, so presentations can be beamed from your laptop straight to it from anywhere in the room, as well as with old-fashioned direct connection (technical specs on the TTI website). The projector also allows PCMCIA card Mobile disks to be plugged into it. The Institute laptops - equipped with Suse Linux 9.3 and Windows XP - will of course also take CDs and have the usual software such as Acroread and Powerpoint.

The Institute has an Avervision document camera instead of an overhead projector. This will display any printed document, photo, slides, X-ray film or 3D object straight through the NEC projector, so basically you can dissect a frog live on the wall. There is a Victorian microscope with an attachment that allows it to be connected to the Avervision, so biological people can project the microworld onto the big screen. Although we have a table with a white square painted on it, non-electronic talks are probably better on white pieces of paper rather than on transparencies..

Speakers can of course ignore all the technology and use the blackboard.

9 DINNER

In general breakfast and lunch will be taken in the Institute. Basic food staples will be provided which participants should feel free to pillage, but if you want a bit more variety you might like to buy your own food in the village shop. The lovely and friendly Adelina will be happy to help you (she doesn't speak English, so learning some basic Italian food words before you come will help : *pane* = bread, *formaggio* = cheese, *prosciutto* = ham, *pomodori*=tomatoes, *birra* = beer, *vino* = wine, *caffè* = coffee, *latte* = milk, *grazie!* = thank you!). There are other shops in Fabbriche di Vallico - 5 minutes drive downhill, and a giant Leclerc supermarket in Gallicano (20 minutes drive).

You are of course welcome to make use of the Institute's cooking facilities whenever you want. There is a huge downstairs kitchen with a total of 10 rings formerly run by a proper cook, and a small upstairs kitchen. The Institute even has its very own *Il Collegio Cookbook* written and published by former owner Leonie Whitton whose recipes you are very much encouraged to try.

On the first evening a special buffet dinner will be provided. Later in the week the Institute's 15th Century pizza oven will be pressed into service. The rest of the time we will make use of the excellent local restaurants - these are mostly incredibly cheap. Given the large number of people staying at the Institute, people are encouraged to break up into at least two groups, although most local restaurants are large enough to handle everyone. Ask Mike to make reservations for you if you don't speak Italian.

LIST OF LOCAL RESTAURANTS

- Da Sandra (0583 761289 on the road between Fabbriche di Vallico and Vallico Sotto).
- Il Canapale (0583 761829, Vallico Sopra)

- Al Laghetto (near the lake at the entrance to the Turrtecava valley)
- La Rondine (0583 761751 Fabbriche di Vallico, open Fri evening, plus all day Sat/Sun)
- Alta Matanna (0584 776005)
- Mulino Biologico (Fabbriche di Vallico)

RESTAURANTS SLIGHTLY FURTHER AFIELD

- Circolo dei Forestieri, Bagni di Lucca
- Antica Trattoria dell'Eremita, Vergemoli
- MANY MORE

10 CINEMA VALLICO

The requirements of modern science presentations means the Institute church is also the only cinema in the whole of the Apuan Alps - a fact that local people very much enjoy (since the opening presentation of *Cinema Paradiso* in August 2005). Starting in June 2006 there will be a weekly film to which the whole valley will be invited (providing we can buy more chairs before then). During the conference you are welcome to use the projectors and it is expected that movies will be shown most nights. The Institute has an extensive DVD library which you are welcome to browse. Feel free also to bring your own movies that you think we might enjoy.

11 CONFERENCE SCHEDULE

The Summer School will be preceded by an International Quantum Monte Carlo workshop. For reference, here is the schedule.

`\begin{verbatim}`

Saturday 22nd July

ARRIVALS

~8.30pm : Welcome buffet dinner and drinks in the Institute garden.

Sunday 23rd July

8.30am : Mike Towler (5 minutes)

- "Welcome to Tuscany"

8.35am : Lubos Mitas (50 minutes)

- "Topology of fermion nodes and Pfaffian pairing wavefunctions"

9.30am : Neil Drummond (50 minutes)

- "Ab initio study of positron annihilation in a homogeneous electron gas"

11.30am : Idoia de Gurtubay (30 minutes)

- "QMC dissociation energy of the water dimer: Time-step errors and backflow calculations"

12.30am : CHURCH (your only chance to see the gorgeous Chiesa di San Giacomo in Vallico Sotto - only open during mass on Sundays!).

1.30pm : Trip to Alta Matanna.

6.30pm : Discussion

8.30pm : Dinner - Da Sandra

Late : Cinema Vallico

Monday 24th July

-
- 8.30am : Richard Hennig (50 minutes)
 - "Accuracy of the pseudopotential and fixed-node approximations for first and second-row dimers."
 - 9.30am : Pablo Lopez Rios (50 minutes)
 - "Inhomogeneous backflow transformations in quantum Monte Carlo"
 - 10.30am : Zoltan Radnai (50 minutes)
 - "Non-collinear spins in QMC: application to spiral spin density waves"

REGULAR AFTERNOON/EVENING SCHEDULE

Tuesday 25th July

-
- 8.30am : Nick Hine (50 minutes)
 - "The surface energy of the electron gas: resolving a long-standing contradiction"
 - 9.30am : Dario Bressanini (50 minutes)
 - "Is QMC delivering its early promises? (with some reflections on nodes and wave functions)"
 - 10.30am : Neil Drummond (15 minutes)
 - "Some QMC puzzles"

REGULAR AFTERNOON/EVENING SCHEDULE - WITH LONG EXCURSION

Wednesday 26th July

-
- 8.30am : Matthew Foulkes (50 minutes)
 - "Finite-size corrections: structure factor or MPC or both?"
 - 9.30am : Ali Alavi (50 minutes)
 - "Quantum Monte Carlo based on the idea of sampling graphs"
 - 10.30am : Alexander Badinski (50 minutes)
 - "Accurate forces from ab initio pseudopotentials within QMC"
 - 11.30am : Andrea Ma (30 minutes)
 - "The equation of state of diamond"

REGULAR AFTERNOON/EVENING SCHEDULE

Thursday 27th July

-
- 8.30am : Richard Needs (50 minutes)
 - "Where are the atoms?"
 - 9.30am : John Trail (50 minutes)
 - "QMC : what are the odds of that?"
 - 11.30am : Graham Spink (30 minutes)
 - "Remaining Problems in the homogeneous electron gas"

REGULAR AFTERNOON/EVENING SCHEDULE

Friday 28th July

-
- 8.30am : Ian Snook (50 minutes)
 - "QMC and weak physical interactions"

9.30am : Ryo Maezono (50 minutes)
- "The fragment method in QMC"
10.30am : Ainsley Gibson (30 minutes)
- "My researach"
11am : Senior Person (30 minutes)
- "Summary of the conference"
11.30 am : GENERAL DISCUSSION

REGULAR AFTERNOON/EVENING SCHEDULE

Saturday 29th July

DEPARTURES

The REGULAR AFTERNOON/EVENING SCHEDULE would usually consist of the following:

- * Excursion/activity (see later)
- * Discussion (optional, around 6.30pm)
- * Dinner (see later)
- * Cinema Vallico (see later)

12 FINALLY

Please address all queries to Mike Towler whose email address is mdt26 at cam.ac.uk.

HAVE FUN AT THE TOWLER INSTITUTE!