

Quantum Monte Carlo and the CASINO program II

Cambridge University International Summer School

Sun 29th July - Sun 5th August 2007

The Towler Institute, Vallico Sotto, Tuscany, Italy

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

August 8, 2007

This is the programme for the second 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. In addition to hands-on exercises, a programme of 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 REGISTERED PARTICIPANTS

Hamad Alyahyaei	California State University, U.S.A.	yahyaei99 at yahoo.com
Ching Cheng	National Cheng Kung University, Taiwan	ccheng at phys.ncku.edu.tw
Hsien-Yao Chang	National Dong Hwa University, Taiwan	u8914071 at msg.ndhu.edu.tw
Matus Dubecky	Slovak University of Technology, Bratislava, Slovakia	matusdubecky at yahoo.com
Dan Fors	Chalmers University, Göteborg, Sweden	forsdan at chalmers.se
Colin Glass	ETH Zurich, Switzerland	coglass at mat.ethz.ch
Ching-liang Huang	Academia Sinica Taipei, Taiwan	chinglh at gmail.com
Mikhail Kibalchenko	University of Cambridge, U.K.	mk531 at cam.ac.uk
Wendy Lampart	University of Pittsburgh, U.S.A.	wmlst3+ at pitt.edu
I-Chun Lin	Swiss Federal Institute of Technology, Lausanne	ichun.lin at epfl.ch
Ru-Fen Liu	National Cheng Kung University, Taiwan	12890110 at phys.ncku.edu.tw
Yun Liu (NO VISA)	Chinese Academy of Sciences	lyun2003 at yahoo.com
Emmanuel Baribefe Naziga	Università La Sapienza, Roma, Italy	baribefe at gmail.com
Cono di Paola	Università dell'Insubria, Italy	cono.dipaola at uninsubria.it
Alvaro Rodriguez	University of the Basque Country, 'Spain'	alvaro at wm.lc.ehu.es
Flavia Rolim	University of Coimbra, Portugal	fl.almeida at ci.uc.pt
Amit Raj Sharma	IPP Greifswald, Germany	Amit.Raj.Sharma at ipp.mpg.de
Maja Stojkovic	University of Belgrade	maja.stojkovic at vin.bg.ac.yu
Haibin Su	Nanyang Technological University, Singapore	HBSu at ntu.edu.sg
Aleksandra Vojvodic	Chalmers University, Göteborg, Sweden	alevoj at fy.chalmers.se

Tang Mao Liu (NO VISA)

Jonas Hartwig

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 - though we will help to arrange your timetable on request.

If possible you should aim to arrive at Pisa airport on Sunday 29th 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 28th July i.e. the day before the Summer School starts. Late departures should be possible if necessary - please contact us beforehand to organize this.

How to get to the TTI from Pisa airport on Sunday 29th July:

Go to Pisa Centrale train station - either by taxi in 5 minutes from the airport 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 the car park). You then need to get a train to Barga-Gallicano. This is an isolated station north of the city of Lucca somewhere along a branch line going up the valley of the river Serchio into the mountains (see the map on the TTI web site). Depending on the train time, you may need to change at Lucca to get the train north - the train will usually be flagged as going to "Aulla" or "Minucciano". 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. Other than that, Italian trains are absurdly cheap by international standards.

At Barga-Gallicano station you should find a TTI representative who will meet each Saturday train as required and take new arrivals to the Institute (driving either a minibus or a maroon Fiat Multipla). If no-one is there you can wait in the excellent station café 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, but I have listed the relevant journey times in the next section. Note that the last train from Pisa is at 19:50 so it would be a good idea to arrive earlier in the day if possible.

In emergencies it is possible to get a taxi to Vallico Sotto from Barga-Gallicano 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 stazione di Barga?" or similar down a phone at him - the trip should cost 30 Euro. Note that "I don't speak Italian" is "Non parlo italiano".

In case of problems contact Mike on his mobile phone - 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 Pisa to Barga-Gallicano Train Timetable (29/7/2007)

Pisa Centrale dep 05:30		Barga-Gallicano arr 06:54
Pisa Centrale dep 07:50		Barga-Gallicano arr 09:13
Pisa Centrale dep 08:50	Lucca arr 09:15 dep 10:02	Barga-Gallicano arr 10:51
Pisa Centrale	Viareggio	Barga-Gallicano

dep 08:51	arr 09:09	dep 09:28	arr 10:51
Pisa Centrale	Viareggio		Barga-Gallicano
dep 09:02	arr 09:17	dep 09:28	arr 10:51
Pisa Centrale	Lucca		Barga-Gallicano
dep 09:50	arr 10:15	dep 11:30	arr 12.13
Pisa Centrale			Barga-Gallicano
dep 13:43			arr 14:50
Pisa Centrale	Lucca		Barga-Gallicano
dep 15:50	arr 16:15	dep 16:20	arr 17:02
Pisa Centrale			Barga-Gallicano
dep 17:50			arr 18:57
Pisa Centrale	Viareggio		Barga-Gallicano
dep 18:20	arr 18:35	dep 18:52	arr 19:59
Pisa Centrale			Barga-Gallicano
dep 19:50			arr 21:34

4 SPECIFIC TRAVEL PLANS

Mikhail Kibalchenko

Arrive Pisa Sunday 29th July 09:45

Pick up Rental Car at airport. Drive to TTI.

Depart Pisa Sunday 5th August 22:40

Colin Glass

Arrive Pisa Aeroporto station by train Sunday 29th July 15:25

Pick up Rental Car. Drive to TTI.

Depart Sunday 5th August by train Pisa Aeroporto 11:05

Cono di Paola

Driving to TTI in own car

Ching Cheng and Ru-Fen Liu

Arrive Pisa Sunday 29th July 10:40

Train Pisa Centrale 13:43-->Barga-Gallicano@14:50

TTI Pickup Barga-Gallicano 14:50

Depart Pisa Sunday 5th August 18:25

Ching-Liang Huang and Hsien-Yao Chang

Arrive Rome Thursday 26th July

Arrive by train at Barga-Gallicano@14:50

TTI Pickup Barga-Gallicano 14:50

Depart TTI Saturday 4th August from Barga-Galliano@15:14. Taxi to be arranged.

Train Barga-Gallicano 15:14 --> Lucca@16:00

Train Lucca 16:32 --> Firenze S.M. Novella@17:52

Train Firenze S.M. Novella 18:43 --> Roma Termini@20:18

Depart Rome Tuesday 5th August

Hamad Alyahyaei

Arrive Pisa Saturday 28th July
Times to be confirmed (due to missed flight)
Depart Pisa Sunday 5th August 10:35

Wendy Lampart
Arrive Pisa Fri 27th July
Train Pisa Centrale Sunday 29th July 13:43-->Barga-Gallicano@14:50
TTI Pickup Barga-Gallicano 14:50
Depart Pisa 7th August

I-Chun Lin
Arrive Pisa Saturday 28th July 16:40
Train Pisa Centrale Sunday 29th July 13:43-->Barga-Gallicano@14:50
Depart Pisa Sunday 5th August 12:15

Alvaro Rodriguez
Arrive Pisa Saturday 28th July.
Train Pisa Centrale Sunday 29th July 13:43-->Barga-Gallicano@14.50
TTI Pickup Barga-Gallicano 14:50
Depart Pisa Sunday 5th August 16:00

Maja Stojkovic
Arrive Pisa Sunday 29th July 11:40
Train Pisa Centrale Sunday 29th July 13:43-->Barga-Gallicano@14:50
TTI Pickup Barga-Gallicano 14:50
Depart Pisa Sunday 5th August 12:15

Haibin Su
Arrive Pisa Saturday 29th July 9:25
Train Pisa Centrale Sunday 29th July 13:43-->Barga-Gallicano@14:50
Depart Pisa Sun 5th August 7:20

Amit Raj Sharma
Arrive Pisa Sunday 29th July 13:55
Train Pisa Centrale 15:50-->Lucca@16:15, 16:20-->Barga-Gallicano@17:02
TTI Pickup Barga-Gallicano 17:02
Depart Pisa Sunday 5th August 14:20

Dan Fors
Arrive Pisa Saturday 28th July
Train Pisa Centrale Sunday 29th July 17:50-->Barga-Gallicano@18:57
TTI Pickup Barga-Gallicano 18:57
Depart Pisa Sunday 5th August 11:15

Flavia Rolim
Arrive Pisa Saturday 28th July 22:00
Train Pisa Centrale Sunday 29th July 17:50-->Barga-Gallicano@18:57
TTI Pickup Barga-Gallicano 18:57
Depart Sunday 5th August from Barga-Gallicano 07:56 by train to Milano

Aleksandra Vojvodic and Jonas Hartwig
Arrive Pisa Sunday 29th July 17:20
Train Pisa Centrale 18:20-->Viareggio@18:35, 18:52-->Barga-Gallicano@19:59
TTI Pickup Barga-Gallicano 19:59
Depart Pisa Sunday 5th August 11:15

Emmanuel Baribefe Naziga
Travelling from Rome
Train Pisa Centrale 18:20-->Viareggio@18:35, 18:52-->Barga-Gallicano@19:59

Matus Dubecky
Arrive Pisa Saturday 28th July
Train Pisa Centrale Sunday 29th July 07:50-->Barga-Gallicano@09:13
Will walk to Vallico Sotto from the train station. Oh yes.
Depart Pisa Saturday 4th August 16:55

5 ACCOMMODATION

LUXURY BEDOUIN TENT
Wendy Lampart (F)
Maja Stojkovic (F)

TTI : ATTIC
Neil Drummond
Pablo Lopez Rios

TTI : TOP FLOOR ORANGE ROOM
Mike Towler
Samantha Keil (F)
Saska (F)

TTI : TOP FLOOR NURSERY
Ching Cheng (F)

TTI : TOP FLOOR PLAYROOM
Mikhail Kibalchenko
Cono di Paola

TTI : GARDEN BEDROOM
Matus Dubecky
Emmanuele Baribefe Naziga

TTI : MIDDLE FLOOR DOUBLE
Flavia Rolim (F)

TTI : MIDDLE FLOOR TINY ROOM
Hsien-Yao Chang

TTI : MIDDLE FLOOR LILAC ROOM
I-Chun Lin (F)
Ru-Fen Liu (F)

DOCTOR'S HOUSE : LARGE ROOM
Aleksandra Vojvodic (F) + Jonas Hartwig

DOCTOR'S HOUSE : MIDDLE ROOM
Haibin Su
Ching-liang Huang

DOCTOR'S HOUSE : RIGHT-HAND ROOM
Dan Fors

Alvaro Rodriguez

ADELINA'S HOUSE
Amit Raj Sharma
Hamad Alyahyaei
Colin Glass

6 SUMMER SCHOOL VEHICLES

Number of participants is 26.5.

Transport for at least 27 people

Fiat Multipla (6 seats) - driver : Mike Towler
Ford Transit (9+ seats) - driver : Pablo Lopez Rios
Fiat Ulysse (7 seats) - driver : Colin Glass
Alfa Romeo 159 (5 seats) - driver : Mikhail Kibalchenko

Fort Transit retained by Pablo from International Workshop the previous week.

Alfa Romeo to be picked up at airport by Mikhail Kibalchenko.

Fiat Ulysse to be picked up at Pisa airport by Colin Glass at 15:30 on Sunday 29th.

Ford, Fiat Ulysse, and Alfa Romeo to be returned to airport on Sunday 5th August.

Multiple drivers of a single vehicle *must* be simultaneously present at the airport when it is booked out.

Number of seats in Ford Transit at least nine but it may have more.

7 THINGS TO BRING WITH YOU

Whatever you like, plus :

- Paper and pens.
- Your wireless-enabled laptop, if you want - see note in Technical Equipment section. We have fifteen of them, so this probably isn't necessary.
- Summer hiking gear such as boots, socks, mini-rucsacs etc. Last year somebody managed to do all the walks in a pair of flip-flops but this is emphatically not recommended.
- 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) although there are quite a few English plug sockets available too.
- 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. (NOTE for 2007 : a cash machine has now been installed in Fabbriche di Vallico a few kilometres away, but it is flaky and only occasionally has any cash inside - don't rely on it).
- People who intend to visit caves should bring some clothes that you don't mind getting wet and a torch. Also useful for canyon walking.
- Sunscreen. It is likely to be quite hot in the first week of August, but note that because we are in the mountains occasional afternoon rain showers are not unknown.

- A towel.
- Climbing equipment (harness, boots, helmet plus via ferrata gear) if you intent to take part in this activity. Helmets also useful for caving. We have limited supplies but certainly not enough to go round.
- Blankets/light sleeping bag (if you intend to sleep in the Bedouin tent).
- Hay fever tablets, if you don't like living in the countryside.
- Swimming costume.

In the tradition of events at this venue, you might also optionally like to bring

- A nice bottle of wine (or whatever passes for it in your country).
- An interesting thing

8 SUMMER SCHOOL SCHEDULE

Here is the proposed schedule for the Summer School. The instructors are Dr. Mike Towler, Dr. Neil Drummond and Dr. Pablo Lopez Rios (Prof. Richard Needs is no longer able to attend). 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. People are also welcome to bring posters of your work which can be attached to various flat surfaces in the monastery.

Sunday 29th July

ARRIVALS

~7:30pm : Buffet dinner in the Institute garden.

Monday 30th 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

Tuesday 31st July

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 : Pablo Lopez Rios - "Pseudopotentials for quantum Monte
Carlo" (40 minutes)
10:10am : Mike Towler - "Pseudopotentials : practical details" (30 minutes)
10.40am : BREAK
11.00am : Neil Drummond - "Jastrow factors and wave function optimization"
(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 1st August

8.30am : Neil Drummond - "Solid state calculations. Interactions and finite
size effects" (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 - Mulino

Thursday 2nd 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 - Al Laghetto

Friday 3rd 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 - Eremo di Calomini

Final evening party and fireworks

Saturday 4th August

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

AFTERNOON/DINNER - Long distance excursion to Cinque Terre

Sunday 5th August

DEPARTURES

9 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 some of these excursions will no longer be feasible. Nevertheless we shall try to get through quite a few of them, according to the 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 more than 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, old and corpulent doing the more relaxed activities. What to do can be debated in the morning each day - all according to taste. Of course, as there will be multiple vehicles, we can do different activities simultaneously.

9.1 Very strenuous activities

- Climb the peak of Monte Procinto. This is the cylindrical barrel-shaped mountain visible in the photograph on the upper right of the main page of the TTI web site. Yes - the walls are more or less vertical, but there is a *via ferrata* to clip yourself onto. Instruction, assistance, and the necessary equipment will be supplied (except climbing boots).
- 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). Also features in Dante’s *Divine Comedy*. Alexander has now failed to get up this twice, and he’s angry.
- 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 both of the previous Workshops, probably on account of the city boys’ inept map reading.
- Mike has recently bought the Italian book *The ninety caves of Fornovolasco* and is currently translating it into English. These caves litter the slopes of Pania della Croce and the various other mountains surrounding the little village of Fornovolasco in the next valley along from ours. How many of these can we find? Dare we enter the ‘Garfagnana Abyss’?
- Mad people! Have a fun 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.
- Complete the Cinque Terre coastal walk, a four hour excursion through some of Italy’s most spectacular scenery.
- 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.

9.2 Quite strenuous activities

- Go to Alta Matanna at the end of the Turrtecava valley and visit the beautiful nineteenth-century hunting lodge that was once the destination for travellers in Rosetta the Balloon on her aerostatic cableway. See the old balloon station at Foce del Pallone and the extraordinary view. On clear days you can see Elba - 100 miles to the South - and sometimes the even more distant Corsica and the French Alps. Come back over the top of Monte Matanna and descend back to the lodge. Take one of the Institute’s antique telescopes with you!
- From the Matanna hotel, climb up to the cross for a spectacular view of Monte Procinto, Stazzema and the Apuan Alps. From there you can climb Monte Matanna the other way around, or visit the donkey and his little horse friends who live on the top of Monte Nona. Or you could go on a longer walk below the Giant West Wall of Nona, threading past Monte Procinto, and round the back of Monte Nona which will take several hours. Finish up the day with a fabulous dinner in the Matanna hotel.
- Take part in the latest 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 Mike and available on the TTI web site (click the Local History Projects link). 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” which was the name Magri’s group

gave to an extensive cave whose entrance is a 6 foot hole about thirty feet up a cliff - a picture of which is on the web site. Last year with great exertion we got a ladder up there but it turned out to be a few feet too short. Rock climbing up there is going to be hard, so some serious thinking will be required. It is also known that the cave continues for a kilometre beyond where we have penetrated before - last year intrepid Cave Explorer Neil Drummond possibly found the way forward - do you dare follow him? To be followed by cold beers and refreshments in the lovely village of Cardoso, or a circuit of Monte Penna hunting for the lost Cave of the Fairies..

- *Orrido di Botri* guided canyon walk. The Orrido is a giant canyon created by the Pelago river in the Appenines (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. This is a geologists' and naturalists' paradise. It can only be visited with helmets and suitable clothing you don't mind getting wet.
- 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!).
- Explore the cave (apparently called the *Buca della Freddana*) near the mule trail from Vallico Sopra to San Luigi. This was (re-)discovered by Mike in Easter 2007 following conflicting and confusing advice from several local old ladies who remembered its existence from 40 years ago. He has also found the upper entrance of the same cave on the summit of Monte Penna - the two are apparently connected by a 1 kilometre passage. The old ladies have advised us not to go inside because of the evil monsters and dark pits that lurk within, but then again, they always say that. Dare you explore?
- 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. Don't forget to bring climbing boots and a harness that fits.
- Pietro Magri in his 1880 book mentioned above states that there are two other caves in Monte Gragno besides the Tana di Cascaltendine. Today no-one seems to know where they are. Having found the Buca della Freddana, Mike has narrowed down the lost "Cave of the Fairies" to a relatively small area. Can you find it?
- Traverse from Santa Luigi via Monte Palodina and the 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 suitable for your mum - 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/attivita/pubblicazioni/fornovolasco.3.pdf.
- Go on a ravishingly beautiful walk over the highest stone railway bridge in Europe to the church in Sambuca.
- Go wild boar hunting. Find, point, shoot (with a camera anyway).
- Learn to play local sport *palla elastica* (elastic ball) with the local youths.
- Go kayaking on the Turrtecava. Bring your own canoe.
- Explore the ancient *Vasaio di Motrone* cave in the nearby village of Motrone. (See www.apuane2007.it/italiano/vasaio/zona_vasaio.htm).

9.3 Relaxed activities

- Look in the latest issue of "Grapevine" magazine for local cultural activities and concerts etc.. - in English!
- Play with the Institute's Victorian Scientific Instrument Collection.
- 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.
- Watch the night sky through the Institute's giant telescope.
- Samantha has two other favourite open-air pools at Gallicano 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. In the summer there are Opera and Jazz Festivals.
- Visit the beautiful city of Lucca.
- Visit Castelnuovo di Garfagnana, where you can find Andrea's (the 'Indiana Jones of the Garfagnana') famous Osteria, where all day you can sample fabulous local wines, cheeses and snacks.
- Follow in the footsteps of Michaelangelo, and visit some of the Apuan Alps famous marble quarries.
- Day trip to Florence.
- 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 or clearing paths (I say this merely in hope..).

9.4 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 board games, jigsaws, and similar entertainments together with a number of Victorian books with titles like "What To Do On Cold Winter Evenings Given That We Haven't Invented Television Yet".
- Debate physics or whatever you happen to be interested in with the help of the Institute blackboards.
- Listen to one of Mike's tedious lectures inspired by the contents of the TTI Antiquarian Library such as *Richard Burton and the Source of the Nile* (Burton the Victorian explorer and polymath, not the one out of *Where Eagles Dare*..) or *Up The Orinoco with Humboldt and Bonpland*.
- Mike is translating some chapters of a book on the history of Vallico Sotto. If he's finished it by the time you visit, then walk around the village looking at the buildings and places it describes.
- Spa treatments in the Bagni di Lucca "Thermal resort".

9.5 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*.
- The Towler Institute Exploration Society also has a photographic competition running - see the web site for details.
- Revitalize the economy of Vallico Sotto. It's barely 40 years since 450 people lived here. Now less than 100 do so. Just because modern lazy teenagers want to be fashion models smoking drugs in Milan rather than having a nice healthy outdoor life, the population of rural Italy has been denuded. Let's bring back the time when all the mountain terraces were in production, packs of nice mules helped carry things, teams of volunteers kept paths and bridges open, and everyone knew how to bake chestnut cakes. All serious suggestions gratefully received.

10 TTI TECHNICAL EQUIPMENT

There should be twelve or thirteen modern laptop computers in the Institute available for use during the summer. Most run both Suse Linux 9.3/10.0 and Windows XP, but the CASINO practical sessions will be run under Linux. However, if you wish to bring your own laptop then this is fine, and even useful. 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 'tti' 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.

11 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.

In the unlikely event of the NEC not functioning correctly with your laptop, or if you wish to project two images at once (e.g. one from a laptop, one from the document camera), there is also an auxiliary Toshiba DPD TDP-T250U projector.

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.

12 DINNER

In general breakfast and lunch will be taken in the Institute. Basic food staples will be provided which participants should feel free to consume, 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 (25 minutes drive).

You are of course welcome to make use of the Institute's cooking facilities whenever you want. There is a big downstairs kitchen with a total of 10 rings formerly run by a proper cook, and a small upstairs kitchen, plus a couple of other kitchens in the other houses in the village that we use. 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

- Mulino Biologico (3280 707037, Fabbriche di Vallico)
- 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, Matanna)

RESTAURANTS SLIGHTLY FURTHER AFIELD

- Circolo dei Forestieri, Bagni di Lucca
- Antica Trattoria dell'Eremita, Vergemoli
- Il Garfagnino, on the main road near Turrtecava
- MANY MORE

13 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 2007 there will be a weekly film to which the whole village will be invited. 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.

14 QMC CONFERENCE

The Summer School will be preceded by an International Quantum Monte Carlo workshop so your instructors should at least be up to date with the latest developments. The programme for this event can be found on the TTI website for anyone interested.

15 FINALLY

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

HAVE FUN AT THE TOWLER INSTITUTE!