

Quantum Monte Carlo and the CASINO program X



Cambridge University International Summer School
Saturday 23rd July - Saturday 30th July 2016
The Apuan Alps Centre for Physics @ TTI, Vallico Sotto, Tuscany, Italy

vallico.net/tti/tti.html
vallico.net/casinoqmc

This is the programme for the tenth international quantum Monte Carlo Summer School to be held at TTI. The event will be organized and run by members and ex-members of 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 software 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, formal lectures are restricted to the mornings, and participants are encouraged to spend much of the rest of the day in active contemplation and discussion of the issues at hand. Practical computer exercises after lunch will be followed by a programme of recreational activities such as mountain walks, cave trips, and city visits organized for the latter half of most afternoons; the days generally conclude with evening meals in local family restaurants.

1 LIST OF REGISTERED PARTICIPANTS

Sergey Artyukhin	Istituto Italiano di Tecnologia, Genova, Italy	Sergey.Artyukhin at iit.it
Chandler Bennett	North Carolina State University, U.S.A.	mcbennet at ncsu.edu
Fausto Cargnoni	CNR-ISTM, Milano, Italy	fausto.cargnoni at istm.cnr.it
Marco Cazzaniga	CNR-ISTM, Milano, Italy	marco.cazzaniga at istm.cnr.it
Davide Ceresoli	CNR-ISTM, Milano, Italy	davide.ceresoli at cnr.it
Guo-Liang Chai	University College, London, U.K.	g.chai at ucl.ac.uk
Alvaro Charlet	EPFL, Lausanne, Switzerland	alvaro.charlet at epfl.ch
Marilu Chiofalo	University of Pisa, Italy	maria.luisa.chiofalo at unipi.it
Roberto Di Remigio	University of Tromsø, Norway	roberto.d.remigio at uit.no
Matej Ditte	Comenius University, Bratislava, Slovakia	matejditte at gmail.com
Alexander Edstrom	Uppsala University in Sweden	alexander.edstrom at physics.uu.se
Alexander Hofmann	Umicore AG & Co., Germany	alexander.hofmann at eu.umicore.com
Ryan Hunt	University of Lancaster, U.K.	r.hunt4 at lancaster.ac.uk
Vamshi Katukuri	EPFL, Lausanne, Switzerland	vamshi.katukuri at epfl.ch
Ekaterina Klyushina	Helmholtz-Zentrum Berlin, Germany	ekaterina.klyushina at helmholtz-berlin.de
Andrey Lugovskoy	NUST 'MISIS', Moscow, Russia	andrey.lugovskoy at misis.ru
Cody Melton	North Carolina State University, U.S.A.	camelto2 at ncsu.edu
Mahmoud Mirzaei	Isfahan Univ of Medical Sciences, Iran	mahzaei at gmail.com
Verena Neufeld	University of Cambridge, U.K.	van26 at cam.ac.uk
Wycliffe Onkeo	Kenyatta University, Kenya	wickymozzit at gmail.com
Theo Pavloudis	Aristotle University of Thessaloniki, Greece	tpavlo at auth.gr
Guido Roma	DEN-SRMP, CEA, Université Paris-Saclay, France	guido.roma at cea.fr
Lalit Kumar Saini	S. V. National Institute of Technology, India	drlalitsaini75 at gmail.com
Charles Scott	University of Cambridge, U.K.	cs675 at cam.ac.uk
Rajeshkumar O. Sharma	S. V. National Institute of Technology, India	sharmarajesh0387 at gmail.com
Shiv Upadhyay	Duquesne University, U.S.A.	upadhya1 at duq.edu

Family/Friends: Ekaterina Artiukhina (Sergey sister), Natalie (Mia's friend), Olly (Rory's friend)

Staff: Mike Towler, Neil Drummond, Sam Azadi, Samantha Keil, Saska Towler, Jamie Towler, Rory St. John, Lucy St. John, Mia Krikler

2 FLIGHTS AND TRANSPORT

In this section we explain how to get to the Institute for people flying into our recommended airport - Galileo Galilei Airport, Pisa. It is also possible to fly to Peretola airport, Florence (Firenze) which is only slightly further away, though flights to this airport are more limited - not least since Ryanair don't go there. In principle one could also fly to other airports such as Perugia, Bologna, Ancona, Parma, Milano, Verona, Genova or Roma but you should count on a train ride of up to four or five hours to get to the Institute (we can arrange this for you). A list of airlines flying to Pisa with links is given on the TTI web page (see 'Flying to Italy' in the left-hand column) and there is a map on the Pisa airport web page (http://www.pisa-airport.com/index.php?lang=_en - click the 'Destinations' link). Americans should note that Delta Airlines operate a direct service to Pisa from New York (the only direct service from outside Europe). Further details about transport, including how to drive to the Institute, are also given on the TTI web site.

Participants should aim to arrive at Pisa airport on Saturday 23rd July. If this is not possible - perhaps if flights from your country are irregular - then we recommend having a brief holiday somewhere in Tuscany before coming to Vallico Sotto, or you could always volunteer to arrive early and be put to work! Late departures are in principle possible - please ask.

How to get to TTI from Pisa airport on Saturday 23rd July:

Go to Pisa Centrale train station. To get there from the airport we normally recommend you take a taxi - you can see the taxi rank as soon as you exit the airport terminal building. The *stazione* (phonetic: 'stasjonay ferrovia') is a 5-minute journey. However a new and much improved bus service has just been introduced which is much cheaper (1 EUR 30) and leaves every ten minutes (the bus stop is on the left as you walk out of the terminal building - look for the white tent-like structure with 'PisaMover' on the side). Tickets for the bus are available from the Pisamover kiosk in the terminal building (they will also sell you your train ticket..). This is a new service introduced because they've just dug up the railway connecting the airport to the train station in order to replace it with some kind of fancy monorail - see the video here:

http://www.pisa-airport.com/index.php?lang=_en&id_sect=438

Once at Pisa Centrale station 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 Serchio river valley 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 one of four final destinations: "Aulla-Lunigiana", "Minucciano", "Piazza al Serchio" or "Fivizzano". See the printed timetables on the station wall to check where each train stops (for the usual stopping trains Barga-Gallicano is the eighth station stop after leaving Lucca; start getting ready to leave the train after Fornaci di Barga station). The electronic screens in the station show the departure platform ('binario'). Note that in Italian, Departures is 'Partenze', and Arrivals is 'Arrivi' - make sure you're looking at the right screen!

You can't buy the train tickets in advance (this is only possible for big important trains) but it is easy to buy them either from PisaMover in the airport or at the station, where you can ask a human ("Uno a Barga-Gallicano. Solo andata.") or one of the red, white, and green ticket machines, which can be requested to speak English. On all Italian train journeys you are supposed to validate ('convalidare') your ticket by inserting it into one of the small wall-mounted green and white machines in the station or you may have to pay a fine - though you should know that in over ten years I have never seen a ticket inspector on any of the trains that you will take. Note that Italian trains are very (even absurdly) cheap by international standards, particularly British ones. The ticket should cost around 4 to 6 Euros.

One final thing that can cause confusion: at Lucca and Pisa some of the trains leave from a platform labelled '1TO' or '1TE', meaning 1 Tronco Ovest (west) and 1 Tronco Est (east). This is *not the same* as Platform 1. All the 'through platforms' are labelled 1, 2, 3 etc., and 1TO and 1TE refer to separate 'terminus platforms' which you can find by walking to either the west or east end of Platform 1.

At Barga-Gallicano station you should find a TTI representative who will meet each train as required and take new arrivals to the Institute. If no-one is there you can wait in the station café - call us if you find yourself waiting too long. Clearly we need to know in advance the time of the train on which you intend to arrive. The timetable is linked from the TTI web site, but all Sunday train times are in fact given in the table below. 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 (particularly if you want to enjoy the welcome buffet dinner at 19:30 - remember that staff members who have to pick up latecomers miss their dinner too!).

In emergencies - or if you arrive at an unusual time after the first day when our drivers might be busy - it is possible to get a taxi to Vallico Sotto from the station. In general this needs to be pre-booked - see the instructions on the web site (Barga Taxi : bargataxi@libero.it Tel. 331 3378051 or 339 5678336) but we can do this for you on request. If you are

a non-Italian speaker who hasn't pre-booked and you need to talk to the guy (Massimo) on the phone you will find he doesn't speak English so just say (phonetic) "Taxi a Vallico Sotto da la stationay di Barga-Gallicano?" or similar down a phone at him - the trip should cost around 35 Euro. Note that "I don't speak Italian" is "Non parlo italiano" - though that should probably be self-evident.

In case of problems contact Mike on his mobile - 3461022097. (Additional emergency assistance may be available from Samantha Keil on 3420731511 but she doesn't deal well with emergencies, so try to keep calm and pretend everything's OK - screeching or hyperventilating or anything like that would probably be counterproductive, even if the train's on fire). TTI has a direct phone lines 0583 1805441 which you should use as a last resort, since the people you want are unlikely to be standing next to it.

3 TRAIN TIMETABLES

See <http://trenitalia.com> and click the Italian flag at the top right to switch into your language.

Saturday 23rd July - Pisa Centrale to Barga-Gallicano stations

dep. Pisa	arr. Lucca	dep. Lucca	arr. Barga-Gallicano
05:25			06:47
06:13	06:39	06:55	07:37
07:50			09:19
10:20	10:47	11:30	12:13
12:50	13:17	13:32	14:17
13:43			14:57
15:20	15:47	15:52	16:35
16:20	16:44	17:00	17:46
17:50			19:06
19:20			20:32
19:50	20:17	20:53	21:38
20:50	21:17	21:48	22:29

Saturday 30th July, Fornaci di Barga to Pisa Centrale station (we go from Fornaci since as of this year not all southbound trains stop at Barga-Gallicano..)

dep. F.d.Barga	arr. Lucca	dep. Lucca	arr. Pisa
06:00	06:40	06:52	07:16
06:42			08:13
07:36			09:13
08:33	09:15	09:42	10:13
09:33	10:20	10:42	11:09
11:33	12:20	13:12	13:43
12:33	13:20	13:42	14:13
13:33	14:20	14:42	15:13
14:33	15:20	15:42	16:13
15:33	16:20	16:42	17:13
16:33	17:20	17:42	18:13
17:33			19:13
18:33			20:14
19:33	20:20	20:42	21:13
20:33			22:14

3.1 From Milano

People coming from more distant countries often only have a choice of coming to Milano airport. Here is a summary of advice for them.

Travel from Milano Malpensa airport to Milano Centrale train station:

The Malpensa Express train departs from Terminal 1 for Milano Centrale train station around twice an hour. (One can also get to other Milano stations Cadorna, Bovisa and Saronno but Centrale is the main train station where you need to catch onward trains.) On weekdays, the first train departs Malpensa at 05.43, the last train departs 22.56. Journey time is around 40-50 minutes. Fare: 10 Euro one-way. Best not to get in a taxi as it will cost you 65+ Euro.

Travel from Milano Linate airport to Milano Centrale train station:

This smaller airport is much closer to the centre than Malpensa, and therefore it is feasible to use buses or taxis to get to the train station. See the Linate Airport section of <http://wikitravel.org/en/Milan> for details about the various options.

From Milano Centrale train station to Barga-Gallicano

Saturday 23rd July 2016

From Milano Centrale as above. Then choose one of the following trains - the 08:10 and 13:15 are probably best since you don't have to get up too early, there is only one change, and no later train will get you to Vallico Sotto in time for dinner. (There are other, less convenient, possibilities). Make sure you book these online on the Trenitalia site, as they can get booked up.

OPTION 1 - (from 21.40 EUR)

Milano Centrale	06:45	--> Aulla Lunigiana	10:20
Aulla Lunigiana	10:50	--> Barga-Gallicano	12:01

OPTION 2 - (from 26.00 EUR) *** - BEST

Milano Centrale	08:10	--> Pisa Centrale	12:23
Pisa Centrale	13:43	--> Barga-Gallicano	14:57

OPTION 3 - (from 36.00 EUR) *** - SECOND BEST

Milano Centrale	13:15	--> Pisa Centrale	17:07
Pisa Centrale	17:50	--> Barga-Gallicano	19:06

OPTION 4 (from 17:40 EUR)

Milano Centrale	14:05	--> La Spezia Centrale	17:21
La Spezia Centrale	17:29	--> Aulla Lunigiana	17:53
Aulla Lunigiana	19:18	--> Barga-Gallicano	20:24

OPTION 5 (from 15.10 EUR)

Milano Centrale	16:05	--> Viareggio	20:00
Viareggio	20:10	--> Lucca	20:27
Lucca	20:53	--> Barga-Gallicano	21:38

If you fly into Milano before Saturday, another option is to stay in a suitable hotel in Milano and take a train the day after.

Before you arrive, write down the details of suitable hotels near the station. There is a good site where you can book these and print out maps at:

<http://www.traveleurope.it/milano.htm>

The Hotel Monopole seems a good one to me (prices from 60 EUR)

4 SPECIFIC TRAVEL PLANS

ARR FRIDAY

Lucy St. John, Rory St. John, Mia Krikler, Natalie Mia-Friend
Arr via private arrangements Fri 22 July.

Sam Azadi, Guo-Liang Chai

Arr Pisa 12:00 Thu 21 July. Arr in rental car Fri 22 July late afternoon
Dep Pisa ??

Matej Ditte

Arr Milano 07:50 Fri 22 July. Train dep Milano 13:15 Arr Barga-Gallicano 19:06
Dep 10:33 Sun 31 July from Fornaci di Barga

Mahmoud Mirzaei

Dep Pisa Fri 22 July. Arr. Barga-Gallicano 19:06

Dep Sat 30 July 09:00.

ARR SATURDAY

Rajesh Sharma, Lalit Saini

Arr Roma 19:05 Fri 22 July. Train dep Fiumicino 23:27 arr Roma Ostiense 23:59

Train dep Roma Ostiense 01:08 arr Pisa 04:24

Train dep Pisa 05:25 arr Barga-Gallicano 06:47

WORST JOURNEY PLAN IN TTI HISTORY :-)

TAXI BOOKED FOR PICKUP

Dep Pisa 17:10 Sat 30 July

Fausto Cargnoni, Marco Cazzaniga, Davide Ceresoli

Arr Sat 23 Jul Aulla --> Barga-Gallicano 12:01

Dep Sat 30 Jul ??

Cody Melton, Chandler Bennett

Arr Pisa 11:50 Sat 23 July. Train dep Pisa 13:43 arr Barga-Gallicano 14:57

Dep Pisa sometime in August

Vamshi Katukuri

Arr Sat 23 July Train (Lausanne-->Milano->Pisa) arr Barga-Gallicano 14:57

Dep Sat 30 July (to be decided)

Charles Scott

Arr Pisa 12:00 Sat 23 July. Train dep Pisa 13:43 arr Barga-Gallicano 14:57

Dep Pisa 18:00 Sat 30 July.

Shiv Upadhyay

Arr Pisa 11:50 Sat 23 July. Train dep Pisa 13:43 arr Barga-Gallicano 14:57.

Dep Pisa Sat 30 July anytime.

Neil Drummond, Ryan Hunt

Arr Pisa 14:10 Sat 23 July. Train dep Pisa 15:20 arr Barga-Gallicano 16:35

Dep Pisa 14:45 Sat 30 July.

Alexander Edstrom

Arr Pisa 10:20 Sat 23 Jul. Train dep Pisa 15:20 arr Barga-Gallicano 16:35

Dep Pisa Tue 2 Aug.

Alexander Hofmann

Arr Pisa 13:10 Sat 23 Jul. Dep Pisa 15:20 arr Barga-Gallicano 16:35.

Dep Pisa 13:35 Sat 30 Jul.

Verena Neufeld

Arr Pisa 13:10 Sat 23 Jul. Train dep Pisa 15:20 arr Barga-Gallicano 16:35

Dep Pisa 18:00 Sat 30 July.

Ekaterina Klyushina

Arr Pisa 14:30 Sat 23 July. Train dep Pisa 15:20 arr Barga-Gallicano 16:35
Dep Pisa 15:00 Sat 30 July.

Sergey Artyukhin, Ekaterina Artiukhina
Arr Sat 23 Jul dep Genova Bolzaneto 14:36 arr Barga-Gallicano 18:50
Dep Sat 30 Jul

Alvaro Charlet
Arr Milano Fri 22 July. Dep Milano 13:15 Sat 23 July. Arr Barga-Gallicano 19:06
Dep Sat 30 July.

Theo Pavloudis
Arr Roma 11:20 Sat 23 July. Train dep Roma 13:57 arr Pisa 16:27
Train dep Pisa 17:50 arr Barga-Gallicano 19:06
Dep Roma 07:20 Sun 31 July

Andrey Lugovskoy
Arr Verona Sat 23 July. Dep Verona Sat 23 July 16:52. Arr Barga-Gallicano 21:38
TAXI BOOKED FOR PICKUP
Dep Barga-Gallicano 14:16 Sat 30 July.

Roberto di Remigio
Arr Sat 23 Jul late afternoon in rental car
Dep Sat 30 Jul in rental car

Guido Roma
Arr Sat 23 Jul late afternoon in own car
Dep Sat 30 Jul in own car

Marilu Chiofalo
Will commute from Pisa in own car Sun 24th to Wed 27th.

Wycliffe Onkeo
Arr Milano Fri 18:55 22 July. Train dep Milano ?? [WILL CALL ON DAY]
Dep Milano Mon 10:35 Mon 1 Aug.

5 ACCOMMODATION

TTI, ATTIC - one single mattress, one sofa bed
Mike Towler

TTI, NURSERY - one single bed, one pile of cushions on floor
Lucy St. John, Jamie Towler

TTI, PLAYROOM - two single beds
Neil Drummond

TTI, PINK ROOM
Samantha Keil, Saska Towler

TTI, LILAC ROOM - two single beds
Ekaterina Klyushine, Verena Neufeld

TTI, TINY ROOM - one single bed
Marilu Chiofalo

TTI, RED ROOM - one double bed
Rory St. John

TTI GARDEN ROOM, two single beds (bunk)
Mia Krikler, Natalie

DOCTOR'S HOUSE, FIG TREE ROOM - one double bed
Sam Azadi

DOCTOR'S HOUSE, UPPER TWIN ROOM - two single beds
Chandler Bennett, Cody Melton

DOCTOR'S HOUSE, UPPER SINGLE ROOM - one double bed
Guo-Liang Chai

DOCTOR'S HOUSE, LOWER APARTMENT - one double bed, two single bunk beds, one sofa
Sergey Artyukhin, Ekaterina Artiukhina

CASA LUCIANA - ROOM 1 - 1 double bed
Lalit Kumar Saini

CASA LUCIANA - ROOM 2 - 1 single bed
Rajeshkumar Omprakash Sharma

CASA SARDA - ROOM 1 - 1 double bed
Andrey Lugovskoy

CASA SARDA - ROOM 2 - 1 double bed, 1 sofa bed
Alexander Hofmann

CASA SARDA - ROOM 3 - 2 single beds
Matej Ditte, Alexander Edstrom

CASA GIOVANNI - ROOM 1 - 1 double bed
Vamshi Katukuri

CASA GIOVANNI - ROOM 2 - 1 double bed
Wycliffe Onkeo

CASA GIOVANNI - ROOM 3 - 2 single beds
Ryan Hunt, Charles Scott

CASA LIANA - ROOM 1 - 1 double bed
Guido Roma

CASA LIANA - ROOM 2 - 1 single bed
Shiv Upadhyay

CASA LIANA - ROOM 3 - 1 single bed
Alvaro Charlet

CASA LIANA SECONDO - 1 double bed
Mahmoud Mirzaei

CASA LIANA SECONDO - 2 single beds
Theo Pavloudis

CASA LONTANA - ROOM 1 - 3 single beds

Fausto Cargnoni

Marco Cazzaniga

CASA LONTANA - ROOM 2 - 1 double bed

Davide Ceresoli

CASA LONTANA - ROOM 3 - 1 sofa bed

Roberto di Remigio

BEDOUIN TENT (vallico.net/tti/tti_tent.html)

Available on request

CASA FRANCA - ROOM 1 - 1 double bed

Not available

CASA FRANCA - ROOM 2 - 1 double bed

Not available

CASA FRANCA - ROOM 3 - 1 double bed

Not available

CASA FRANCA - ROOM 4 - 1 single bed (attic)

Not available

CASA GIANPIERO - ROOM 1 - 1 double bed

Now available from 23rd (recently changed his mind)

CASA GIANPIERO - ROOM 12- 2 single beds

Now available from 23rd (recently changed his mind)

DA SANDRA

(multiple commercial rooms/apartments available)

DA SANDRA - ROOM 1 - 1 double bed

Not available

DA SANDRA - ROOM 2 - 1 double bed

Not available

DA SANDRA - APPARTMENT 1 - 1 double bed

Not available

DA SANDRA - APPARTMENT 2 - 1 double bed (+ 2 children's beds if required)

Not available

CASALE DEI RUSCELLI (www.casaledeiruscilli.com)

(posh apartments for rich people requiring privacy - 10 min drive - car and extra payment required)

6 SUMMER SCHOOL VEHICLES

35 people, 37 seats

(+4 in Guido Roma car sometimes)

OFFICIAL VEHICLES

17-seat minibus (RHD) - Driver : Mike Towler

9-seater rental car (LHD) - Driver : Sam Azadi

5-seater rental car (LHD) - Driver : Roberto di Remigio

6-seat Fiat Multipla (RHD) - Driver : Vamshi Katukuri
5-seat Peugeot 106 (RHD) - Driver : VANDALIZED IN LOCAL BUILDER DISPUTE
4-seat Alpina B3S (RHD) - Driver : MIKE'S NICE CAR. BUT HE'S DRIVING THE BUS.
1-seat Piaggio Ape - Driver : ANYONE CRAZY ENOUGH.
1 bright pink Vespa scooter- Driver : PENELOPE PITSTOP. PINK HELMET AVAILABLE.
1 mountain bike

STUDENT VEHICLES

Guido Roma car (+33 7 82989263)

SPARE DRIVERS FOR EMERGENCIES (please bring driving license):

Alexander Edstrom

7 THINGS TO BRING WITH YOU

- Notebook and pen.
- Your laptop (normally this wouldn't be necessary, as we used to have 24 of them, but as TTI was closed for refurbishment last year a surprising number have died in the 18 months since they were last used. So if you can bring one, do..)
- 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). The sockets in the village mostly have two round pins (with an optional third one between them). There are two types of thin prongs on European adaptors. You want the thinner of the two. Just to confuse things, there are also lots of English plug sockets into which English equipment can be plugged directly (including the majority of those in the lecture hall).
- Some Euros for spending in restaurants and shops. Please note that there is no cash machine within walking distance of 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 left as you emerge into the arrivals hall (look under the escalator leading to the upper level). Go up the escalator to find an alternative cash machine if that one isn't working. A few years ago a cash machine was in fact set up in Fabbriche di Vallico a few kilometres away from the Institute, and it now usually works - this is where you should go if you run out of cash during the week (if you can't find it, find a local and say 'Bancomat?').
- People who intend to visit caves or canyons (most of you I hope) should bring some clothes/shoes that you don't mind getting wet.
- Climbing/caving equipment (harness, boots, helmet, via ferrata 'absorber', head torch) if you intend to take part in such activities and already have some (don't buy them just for this trip). We have a fair amount of gear we can lend but not enough for everyone.
- Sunscreen. It is likely to be quite hot at this time of year, but note that because we are in the mountains occasional afternoon rain showers or even rain storms are not unknown.
- A towel
- Light sleeping bag (if you intend to sleep in the Bedouin tent).
- Hay fever tablets. Some students who have lived in darkened basements in huge cities most of their lives sometimes have difficulty with pollen when they come to live in the countryside.
- Swimming costume (if you want to go swimming).
- Earplugs - if you are sharing a room - to avoid being disturbed by snoring people.

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 main instructors are the principle authors of the CASINO program Dr. Mike Towler and Dr. Neil Drummond; they will be assisted by Dr. Sam Azadi. (Dr. Pablo López Ríos, the other principal author, is a late withdrawal). Some of the students may already have some 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.

Note that the list of 'Possible Excursions' is intended only as a guide to typical things that might go on. What actually happens in the late afternoon of any given day is usually made up by MDT and his advisors during the morning; they are always very open to suggestions and requests.

Friday 22nd July

EARLY ARRIVALS

DINNER : Al Canapale, Vallico Sopra (TO BE BOOKED FOR 11+bambino)

Saturday 23rd July

ARRIVALS

~7:30pm : Buffet dinner in the Institute garden, cooked by the lovely Samantha and her team of chefs.

Sunday 24th 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)

11.15am : Mike Towler - "An introduction to the CASINO program" (1 hour)

12.15pm : Mike Towler - "Distribution, setup and compilation of the CASINO program. Local and remote computer resources. How to apply for computer time on big parallel computers. Web resources. (MDT)

12:45pm LUNCH

PRACTICAL SESSION -

Basic use of CASINO program - simple VMC, DMC calculations (NDD)

3pm EXCURSIONS

Trip to Alto Matanna. Four spectacular walks of varying difficulty. See the entire Versilia coast, Elba, Corsica and sometimes even France from the easily accessible summits of some of the more beautiful scenery in the Apuan Alps. Bring one of the Institute's antique telescopes to watch the more courageous of you scale the 500 foot cylindrical barrel of Monte Procinto. Followed by drinks and dinner in 19th Century Alpine hotel.

- Balloon station walk
- Monte Matanna walk
- Monte Procinto climb
- Grotta all'Onda walk (Neanderthal cave)

DINNER : Alto Matanna 0584 776005 (BOOKED FOR 36+bambino) ACTUAL 35+b

On return Mike and Sam will be available in the lecture hall to help with setup of CASINO on personal machines.

Monday 25th July

8.30am : Mike Towler - "Statistical analysis of VMC results. Basic DMC - how to run a calculation. Stopping criteria: number of moves, target_error, small_error. How to extract and analyze DMC results. Serial correlation. Timestep optimization. Correlation time. Reblocking. Use of graphdmc script. Other statistical issues."
(1 hour)

09:40am: Mike Towler - "Pseudopotentials for quantum Monte Carlo" (1 hr)

10.50am: Mike Towler - "Scaling with system size. Localized orbitals and localized basis sets (Gaussians/blips). All-electron calculations. Heavy atoms - timestep errors. Scaling with number of processors. Exploitation of parallel hardware. CUDA and exploitation of GPUs. Future trends in parallel computing. Embedding techniques.
(1 hour 40 minutes)

1pm LUNCH

2pm PRACTICAL SESSION -

- Wave function optimization with CASINO (NDD)

EXCURSIONS

- Scything lessons
- Archaeology: the lost fortress and the secret tunnel
- Turrite di San Rocco canyon walk
- Tana di Cascaltendine + search for the Cave of the Fairies
- One hour walk around Barga countryside (then town centre). Optional swimming.

DINNER : Da Sandra 0583 761712 (BOOKED FOR 36+bambino) ACTUAL 34+b

Tuesday 26th July

8:30am : Neil Drummond - "Jastrow factors and wave function optimization"
(2 hours)

10.40am : 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." (1.5 hours)

12.15am: Mike Towler - "Introduction to other trial wave function generation with CRYSTAL, CASTEP, PWSCF, ABINIT, GAUSSIAN, ORCA, MOLPRO, GAMESS, TURBOMOLE, CFOUR, PSI4, MCEXX, ADF, JEEP/GP/QBOX, ATSP2K, 2DHF. Constructing an interface for your unsupported code." (45 minutes)

1pm LUNCH

2pm PRACTICAL SESSION

- Trial wave function generation with external programs (CRYSTAL/PWSCF/CASTEP/GAMESS currently planned to be available - please ask for others) (MDT)

EXCURSIONS

- Walk Matanna to Monte Forato (rock arch) to Fornovolasco
- Tana che urla ('Cave that screams') exploration + optional cave hunting
- Grotta del Vento tourist cave

- Fornovolasco church and flood frescoes
- Swimming at Bagni di Lucca/Barga/Galliciano

DINNER: Eremo di Calomini 0583 767020 (BOOKED FOR 35+bambino) ACTUAL 34+b

Wednesday 27th July

-
- 08.30am : Neil Drummond - "Solid state calculations. Interactions and finite size effects" (1.5 hours)
 - 10:10am: Mike Towler - "Applications : systems with atoms. Interesting calculations for big, complicated systems" (1.5 hour)
 - 11.50 am : Neil Drummond - "Orbital optimization, multideterminants and backflow, with numerical results" - part 1 (1 hour)
- 1pm LUNCH

PRACTICAL SESSION

- Advanced use of the CASINO program (NDD/SA)

A DAY IN THE VILLAGE

- Relaxing, sunbathing, reading, studying, discussing
- Archaeology: the lost fortress and the secret tunnel
- Scything, strimming, and the motofalciatrice.
- Metal detecting
- Abseiling to the Buca della Fate di Vallico di Sotto
- Football match - Vallico Sotto against the world/Vallico Sotto contro il mondo

DINNER : Provided by ladies of Vallico Sotto (BOOKED FOR 35+bambino) ACTUAL 34+b

Thursday 28th July

-
- 08.30 am : Neil Drummond - "Orbital optimization, multideterminants and backflow, with numerical results" part 2 (1 hour)
 - 09:30 am: Mike Towler - "Forces and derivatives. Dynamical calculations. Excited states, both for solids and big molecules. MCSCF for trial wave function generation. Efficient QMC evaluation of large multidet expansions. Expectation values other than the total energy computable with CASINO. Charge, spin, magnetic moment, fluctuations and covariances and the analysis of strongly correlated materials. Free energy etc. How to generate accurate potential models; GAP potentials. New Dario thing. (2.5 hours)
 - 12.10am : Neil Drummond - "Applications : electron-only systems (fluid phase, Wigner crystals etc.) Electron-hole systems. (45 minutes)

1pm LUNCH

PRACTICAL SESSION

- General CASINO applications (NDD)

EXCURSIONS

- Orrido di Botri/Montefegatesi
- Lucca

7.30pm DINNER : Al Laghetto 0583 75798 (TO BE BOOKED FOR 34+bambino)

Friday 29th July

MORNING

Posters

9.am : Talks by participants (feel free to volunteer)
Cody Melton: 'Spin-orbit interactions in quantum Monte Carlo'

9.30-10am : "Ask Neil + Mike" - QMC Q+A session. Advice on using QMC for your particular problems.

10 am
Exercises with CASINO and QMC exam (with prizes)

AFTERNOON/DINNER

- Long distance excursion, probably to the seaside at Lerici/Portovenere if the vehicles hold together. If not - suggestions welcome.

11.30 pm
Prize giving ceremony in the monastery garden.

Saturday 30th July

DEPARTURES

9 EXCURSIONS AND ACTIVITIES

Here is the list of excursions and activities generally offered at TTI. Clearly with the Summer School we have less time in the afternoons than is normal 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 are usually well over 30 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 Pizzo d'Uccello. Requires early start with no other activities (e.g. day before conference). See http://www.tcm.phy.cam.ac.uk/~mdt26/tti2/photos/pizzo_ducello.jpg. Enough said. They don't call it the 'Matterhorn of the Apuan Alps' for nothing.
- The ascent of Monte Procinto. This is a huge cylindrical rock tower with a belt of trees around its middle from which rise 500-foot walls, overhanging on every side. Michelangelo had the idea of carving it into a gigantic sculpture along the lines of Mount Rushmore but never got round to it. You can see the mountain here: <http://vallico.net/procinto.jpg> or <http://vallico.net/casinoqmc/wp-content/uploads/2014/01/procinto.jpg>. Yes - the walls are more or less vertical, but there is a *via ferrata* to clip yourself onto. Instruction, assistance, and the necessary equipment can usually be supplied - but we only have about eleven harnesses so bring your own if you have one!
- Reach the high peak of Pania della Croce from Pignone (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*. This defeated some of TTI finest mountaineers for several years before they finally succeeded in 2007 (note - it isn't that hard if you move quickly).
- Find the spectacular natural rock bridge of Monte Forato (under which someone once flew a biplane). Start from Fornovolasco (lots of up) or from Matanna (much easier) or even have two groups that meet in the middle and exchange car keys. There is a fun *via ferrata* traverse on the way to the arch from Matanna, and we can also do a new route via Foce di Valli.

- Learn to scythe. MDT has obtained an excellent quality scythe with all its accoutrements from Simon Fairlie's excellent website at <http://www.thescytheshop.co.uk/index.html>. Just above TTI, there is a huge set of neglected terraces whose grass is just asking to be cut down; we will try to scythe them all during the school.. ;-) To quote Simon Fairlie:

"The art of scything has been lost in the British Isles and my aim is to revive it. I subscribe to Ivan Illich's aim of retooling society with convivial tools that "allow men to achieve purposes with energy fully under their own control".

"Scything summer growth by hand is usually quicker than using a strimmer, and there is no noise, vibration or pollution. Mowing an acre of grass with a scythe is probably less hassle than maintaining and using a motor scythe. Once you have learnt how to sharpen and use an Austrian scythe properly, mowing a meadow by hand becomes a joy, rather than a struggle."

Scything with a good tool relaxes the mind and attunes the body. As Levin says to his brother after a day's mowing, in Tolstoy's Anna Karenina : "You can't imagine what an effectual remedy it is for every sort of foolishness."

- Find the Neanderthal cave (Grotte all'Onda) down the slope from the balloon station near Matanna. *"This vast grotto stretches 40 x 60 meters and it originally hosted numerous internal tunnels, which are obstructed today. Its enormous cavity offers important evidence that suggests the frequency with which people entered the grotto, from pre-historical times to more recent periods. The first people to use the cave were Neanderthals; they hunted throughout the surrounding area and probably used it to hoard their tools and weapons, together with the bones of the animals they cooked. Hunters from the Superior Palaeolithic period (Homo Sapiens) lived in the more external part of the grotto where they set up a giant hearth. Later, Neolithic farmers and shepherds planted their huts in the shelter of the grotto's vast vault, carrying out their daily activities there during many seasons. This cave was also used during the Neolithic period (the Bronze Age), during which new models were developed for decorating ceramic. During this period, new raw materials, imported from distant locations, were adopted to make special equipment. From the post-Bronze Age until recent times, the grotto was not continuously frequented."*
- The *Geoscopio* web site – linked from http://vallico.net/tti/tti_mountaineering.html – shows precise locations of all of the thousands of caves in Tuscany (even the crap ones) together with a brief technical description and a plan of the cave. Interesting little expeditions may be made that have the aim of finding the entrance to particular caves, as well as exploring them. This is of course the most fun that a boy can have. The Apuan Alps have more caves than you can possibly imagine, so this will still be a viable activity in 2050. In particular, ask Mike about the untried Campolemisi, Fabbriche di Vallico, Motrone, and Antro della Paura expeditions.
- Explore the canyon of the Turrite di San Rocco river. This starts from the fork in the river upstream from Fabbriche di Vallico before you get to Gragliana. Take the left-hand fork. The aim is to go all the way through it to take coffee at the cafe near the Chiesa di San Rocco in Turrite. Be prepared to get wet - you basically can't avoid it. There are various natural swimming pool in there. Once reaching the village where the cafe is (there is also a children's playground and a nice river) you will have to bribe a local to give your driver a lift back via Focchia to your van. Or perhaps all your drivers drove a convoy out there beforehand, left most of the vehicles, and returned to the start of the canyon in a single car - use your initiative here.
- Morning workout. Run from the Institute 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. Mad people only.
- Complete the Cinque Terre coastal walk, a four-hour excursion through some of Italy's most spectacular scenery, or a similar walk near the famous seaside haven of Portofino.
- *Orrido di Botri* 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. There are some nice long walks in the country above the canyon (watch out for marmites and Royal Eagles - this is one of your best chances to contribute to the TTI Wildlife Photography expedition).
- 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 Alto 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 on the adjacent ridge 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 2007 summer school crew were able 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 forty feet up a cliff - the full story is on the News from the Towler Institute blog here: <http://www.barganews.com/blogs/towler/?p=21>. It is also known that the cave continues for a kilometre beyond where we have penetrated before and this remains to be explored (note that in summer 2007, Mike and Evans went up the big wall in the final chamber with the dangling rope - a place many TTI visitors have visited before - with somewhat amusing consequences - see the blog story 'Bronze Hermaphrodites and the Fat Boy Filter': <http://www.barganews.com/blogs/towler/?p=28>). Expedition 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..
- Visit the Selva del Buffardello adventure park:
<http://www.selvadelbuffardello.it/index.php?lang=eng>
I quote from their web site: *"Among the centuries-old fir trees some acrobatic forest paths, open to everybody, have been created and their aim is to show the wood from a different and adventurous point of view: hanging in the air. It is a challenge for children, youth and adults, who can test their ability with suspension bridges, swinging beams, vertical nets, ropes and obstacles, finding again their lost adventurous spirit. The Adventure Park 'Selva del Buffardello' in San Romano in Garfagnana (locality Pra' di Lago) is a real novelty in the Appennino Tosco Emiliano. An old wood of two hectares and a half in the heart of Garfagnana, near the natural 'Parco dell'Orecchiella', with a wonderful view on the Alpi Apuane and on the Fortezza delle Verrucole (old castle). The park entrance is free if you don't practise in the adventure paths."* We have never tried this, but it looks like great fun, even for grown-ups.
- TTI management has discovered that there is a secret underground tunnel in Vallico which starts from the Doctor's House next door to the Institute (a former army barracks 500 years ago) and which goes up to the Rocchetta above the village (the site of an old castle on the summit of a little hill, where we now pitch the Bedouin Tent). This was used in mediaeval times for escape from the frequent warfare so common in these parts. The supposed entrance to the tunnel was bricked up (we think) at the end of the last war - there are a couple of elderly men in the village who remember (but don't really want to). We've learned a lot through ground-penetrating radar and geoelectrical tomography studies, and this summer we hope to unblock the entrance(s) and explore. This will probably be one of the next thrilling tales in 'News from the Towler Institute'. See <https://vallico.net/casinoqmc/secret-tunnel/> for further details.
- 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 *Canyon of the Pili* carved by the Rio Selvano (you will get wet!). EDIT: and they will fail - I have recently discovered the only way you can feasibly do this is to *descend* from the top. Apparently this canyon is quite famous - the Apians group from Castelnuovo organize tours through it. One of these days I will have to attach

myself to one of these expeditions to learn how to do it. Apparently there are 12 major waterfalls to descend - photos and rough maps are linked from the Mountaineering page of the web site.

- Explore *Buca della Freddana* cave 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 was constructed in Vallico a couple of years ago) or regular football (on the local full-sized pitch).
- Rock climbing or low-level bouldering - the Institute should have some ropes and climbing equipment. I've read that there is good climbing near the Trombacco dam in the next door Fornovalasco valley - ask MDT for more details. Don't forget to bring climbing boots and a harness that fits if you want to do this seriously (we have a rope you can borrow).
- 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. Come back along the road past La Fornace.
- 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 Fornovalasco. 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 http://lnx.buffardello.it/images/file/DI_ALCUNE_GROTTE.pdf
- Go on a beautiful walk over the highest stone railway bridge in Europe to the church in Sambuca.
- Go wild boar hunting.
- Learn to play local sport *palla elastica* (elastic ball) with the village youths.
- Use TTI's two inflatable boats to play on the Turrtecava lake - accompanying picnic recommended. Have races. Try to find the Buca del Lago della Turrte Cava (as you sail towards the dam, it is on the left just after the exit of the second road tunnel. (NOTE: the boats were only in principle inflatable, and have now been dumped in the bin.)
- Go kayaking on the Turrtecava. Bring your own canoe.
- Explore the ancient *Vasaio di Motrone* cave in the nearby village of Motrone (see http://www.apuane2007.it/italiano/vasaio/zona_vasaio.php).

9.3 Relaxed activities

- Visit the Pinocchio park, the Garzoni gardens, and the Collodi butterfly house in Collodi. See <http://www.pinocchio.it/park.htm>.
- The Opera Barga festival is usually on around the same time as the conference (but too early in July for 2016). Ask Mike in advance for tickets and reservations, or see: <http://www.operabarga.it/english/>.
- Look in the latest issue of Lucca "Grapevine" magazine in English for local cultural activities and concerts etc.. See <http://www.luccagrapevine.com/>
- 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.

- 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.
- Watch the night sky through the Institute's astronomical telescope.
- Visit the ancient city of Barga (<http://barganews.com>) for an afternoon's relaxed sightseeing, shopping and culture.
- 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 (<http://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..).

9.4 Very relaxed activities

- TTI has a high-definition video camera. Make a film of life at one of the world's best conferences.
- Budding archaeologists may use the TTI metal detector - bought following a recent spooky event when Evans and Mike were digging a hole in the ground for the satellite dish (I'm really not making this up): MIKE: Hey Evans, watch out for crucifixes when you're digging that hole. This used to be a monastery you know. EVANS (REACHING INTO THE HOLE) What, like this one? (HOLDS UP A THOUSAND YEAR OLD BRONZE CRUCIFIX FROM FIVE FEET DOWN). The crucifix is stored in the monastery in a secret place; please ask to have a look at it.
- 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 with the help of the Institute blackboards.
- Listen to one of Mike's 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 Alexander von Humboldt*.
- Spa treatments in the Bagni di Lucca 'Thermal resort'.
- 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.

9.5 General

- Volunteer to help clear overgrown local woodland paths (and also to repair some of the ones that collapsed in the great storm of November 2013). Mike can supply gloves and tools..
- 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 some photographic challenges available - 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.
- After the forthcoming Carrington Event (http://en.wikipedia.org/wiki/Solar_storm_of_1859) when all electricity supplies have permanently failed (or some similar apocalyptic event), Vallico Sotto will be the ideal place to shelter from marauding gangs and to begin to rebuild civilization. The recent book 'The Knowledge: how to rebuild our world from scratch, by Lewis Dartnell' explains how to do this. As an exercise, and to help Mike prepare, see if you can figure out how to do some of the essential things that we will need (rig a water-powered electricity supply; find edible plants; make limestone mortar; fortify the monastery against enemy incursion; stuff like that). Buy it here: http://www.amazon.co.uk/Knowledge-How-Rebuild-World-Scratch-ebook/dp/B00H4EM594/ref=sr_1_1?s=books&ie=UTF8&qid=1400500727&sr=1-1

10 TTI TECHNICAL EQUIPMENT

There are various laptop computers in the Institute available both for general use and for CASINO practical sessions. Most offer some recent version of Black Lab Linux (a derivative of Ubuntu) with only a few left (those kept out of the hands of our anti-Microsoft activist Pablo) still able to dual boot into Windows. There are absolutely no Macs. The practical sessions will be run under Linux. You may of course bring your own laptop if you wish - and for the first time this year we encourage you to do so as our casualty list of failed computers is piling up. It would help if you could set up a Fortran (95) compiler on it before arriving at the school (we recommend both GNU's gfortran and Intel's free ifort compiler - available for download on their website). If you're a dedicated Windows user and you bring your own laptop, you also need to set up the Cygwin environment on it, see Q. A11 of the online FAQ: <http://vallico.net/casinomc/faqs/>. Please be careful of the electrics when plugging in your own machine in order to avoid shorting out the projector etc. - in fact, it's better to ask where to do so. Note that most of the available plug sockets in the lecture hall are of the *English* type, though some Italian ones and various adaptors are available.

All internet connections are made - via two dishes on the roof - through a high quality wireless network (the TTI infrastructure was comprehensively upgraded in June 2014, and again in June 2016). The relevant SSIDs are 'TTI-Wifi' (TTI main building) and 'TTI-external' (in and around the Doctor's House) with a common password 'ttivallico'. There is a third network 'TTI-Wife' which is intended to allow my wife to continue to watch TV when 50 other people are trying to use the network, and the password is a closely guarded secret.

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

- A HP Laserjet P3010 black and white laser printer (on a wireless print server at 172.16.0.201) in the attic of the main building. The relevant print queue is called 'hp'.
- A HP Laserjet Pro M127fw black and white laser printer/scanner (172.16.0.202 port 9100) located at the back of the church. The relevant print queue is called 'hp2'.
- Sony 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). Note that we have limited supplies of the expensive paper and ribbons, so try not to print off your entire collection.
- Epson Perfection 4990 scanner (usually upstairs in main building near MDT's desk)

- A3 laminator
- Guillotine
- A HD video camera
- Four or five USB memory sticks (labelled TTI)
- A supply of writeable CD-Rs, CD-RWs and DVD-Rs.
- The usual stationery and staples etc..

There are also a very large number of scientific and technical books which may be borrowed (top floor and attic of the main building, and in the various bookshelves in the church). Please don't steal these.

Please note that there is also a pigeon-hole bookcase intended for printouts of 'the literature', which may be used for various purposes at any given meeting.

11 INTERNET USE

TTI laptops are mainly black/grey Sony Vaios with a few red Acer Ferraris (note the difference in power supplies - the ones for the Ferraris have yellow ends, the Sony machines have black ones). All should connect themselves to the wireless network TTI.Wifi as soon as they've finished booting up.

All local machines have static IP addresses 172.16.0.2x on the TTI.Wifi network (where 2x is 20 plus the number of the machine - a red plastic label saying e.g. `tti_laptop9` implies 172.16.0.29) so they can all talk to each other via ssh or sftp etc. Machines automatically given addresses by DHCP will have addresses such as 172.16.1.xx.

Other network details for administrators: TTI.Wifi network 172.16.0.xx, Subnet mask 255.255.252.0 (not a misprint), Gateway 172.16.0.1, Primary DNS 185.37.37.37, Secondary DNS 185.37.39.39. Other equipment attached to the network: a phone adapter, Various Sonos wireless speakers, a wireless print server (172.16.0.201) for the print queue 'hp', and the 'hp2' printer/scanner on 172.16.0.202), the wireless central heating controller, security cameras, and possibly the NEC projector on DHCP. Do not assign your own static IP number on personal hardware without consulting MDT.

There is a central file server (a Synology DS1513+ 5 Bay DiskStation Desktop NAS with 10 TB of storage) attached directly to the main router box on 172.16.0.200. This will be used in the summer school to access common files via NFS (a 'summer_school' folder should appear on the desktop of TTI machines). It also acts as a web server - external access is through <http://vallico.it>. MDT's personal workstation - brutus - is on 172.16.0.199. This is a 24-core beast that may be used for larger calculations; the guest account is available on request.

Please be mindful of the needs of other users of the network. Although we have an excellent connection, it is clear that most people are now turning up with WiFi-enabled smartphones and tablets, and simultaneous use by up to 60 devices can in principle lead to certain issues.. The network was upgraded recently for this reason, but it is gently suggested that downloading Gb of files, playing streaming music or videos through your smartphones, enabling automatic software updates, might not be a good idea.. (Please install ad blocking software if you can). Remember we're in the middle of nowhere - it's amazing that it works at all.

Note also that currently there is network coverage only in the main TTI building and garden, in the Luxury Bedouin Tent (if erected), and in the Doctor's House, but not in any of the other houses we use for accommodation (Casa Franca, Casa Gianpiero, Casa Luciana, Casa Sarda, Casa Lontana, Casa Liana, Casa Giovanni, etc..).

The local network is normally configured to believe it is in England (via a smart DNS proxy) for purposes of watching TV etc.. It can also be convinced it is part of Cambridge University via its VPN service. This is very useful for e.g. accessing restricted content scientific articles. Sadly, Cambridge rules prevent us providing such access to TTI visitors, and so the VPN is normally turned off during conferences. Ask MDT if you want to make (indirect) use of this service.

12 PRESENTATION EQUIPMENT

The church is equipped with a good quality NEC MT1075 projector and an auxiliary Toshiba DPD TDP-T250U projector with DVI and regular RGB cabling . There is a giant 16' by 12' main screen, an Avervision document camera,

various projection stands, a projection laptop, a DVD player with decent speakers, and various wireless control devices. (There was a 7'8 x 5'9 electric auxiliary screen on the side wall, but this was stored in the cellar during the 2016 refurbishment and hasn't yet re-emerged). There is a large blackboard in the church and a smaller one in the lower main corridor of the main building stolen from the TCM Seminar room in the Cavendish Laboratory. There are two blackboards outside, and a portable one which can be taken on excursions if you wish to debate physics in restaurants or up mountains.

The NEC projector is wireless capable, so you can beam your talk 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 Institute projection laptop - though normally bootable into either Linux or Windows - will normally be running under Windows because Linux Powerpoint viewers mostly do not display Microsoft-generated files correctly. Obviously it will accept CDs and memory sticks and have the usual software such as Acroread and Powerpoint. On balance if you are giving a presentation it is probably best to bring the file on a USB drive or email it to MDT beforehand and he will ensure that it is on the projection laptop ready for your talk. We would be grateful if you could leave your talk on the Desktop of this machine so that your talk can be made available (password protected if you request it) on the conference/school web page after you've all gone home.

The Avervision document camera is a sort of cool overhead projector. It will display any printed document, photo, slides, X-ray film or 3D object straight through the 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 on 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..

13 FOOD

In general breakfast will be taken in the Institute, lunch in the little bar in Vallico Sotto run by the lovely Monica, and dinner in some local restaurant (on all but one or two evenings outside the village).

In the institute some basic food staples will be provided which participants should feel free to fight over but in general you might like to buy your own food in the village shop run by the lovely and friendly Adelina. However sadly you can't because it closed in late 2007 - much to the consternation of all she relocated to a big new shop down in the main valley in Pian di Coreglia. To replace her, there are two food shops in Fabbriche di Vallico - a five minute drive downhill - and a giant Leclerc supermarket in Gallicano (twenty-five minutes drive). In principle there is also a tiny food shop in Vallico Sopra which seems to open 'on request' by ringing the bell, but I wouldn't rely on it.

To find the Vallico Sotto bar for lunch, go down the tunnel underneath the Doctor's house (the big house opposite the TTI church front door). Then take any path downwards until you get to the Vallico main square - the bar is just underneath that.. You are strongly encouraged to take your lunch here, as normally it doesn't serve food and Monica is doing us a big favour by buying food and preparing it - so we need to make it worth her while. Note you can also get beers, coffees, ice creams and so on here..

Note that people in local shops - or indeed anywhere round here - tend not to 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!

You are of course welcome to make use of the Institute's cooking facilities whenever you want. There is a big downstairs kitchen in the main building formerly run by a proper cook - who wrote the *Il Collegio Cookbook* whose recipes you are encouraged to try (it's in the little bookshelf in the kitchen). There are also two kitchens in the adjacent Doctor's house which will be rented for the duration of the conference, and similar facilities in most of the other houses.

On the first evening a simple buffet dinner will be provided. Later in the week the Institute's 16th Century pizza oven may be pressed into service. The rest of the time we will make use of the excellent local restaurants. When very large numbers of people are staying at the Institute, people are encouraged to break up into at least two groups, although many of them - especially Da Sandra - are large enough to handle everyone. Unless told otherwise, Mike will simply assume that you will be coming to each evening meal and will make bookings accordingly (generally a few weeks in advance). These bookings can be changed but please give Mike plenty of notice.

Finally, if you are a vegetarian - either for religious reasons or because you don't like being cruel to fluffy animals - you need to be aware that the locals will consider you to be certifiably insane and will feel very sorry that you are unable to enjoy their passion for delicious animal products of all kinds - particularly those made from parts of pigs. Don't worry about this. Following more than a decade of TTI activities, they are now used to us bringing strange foreigners to their

restaurants and most are now able to supply vegetarian meals of some kind.

A FEW LOCAL RESTAURANTS

- Da Ramona (0583 1805897, Fabbriche di Vallico <https://vallico.it/da-ramona>)
- Il Molino Vecchio (3401557521 or 3471447248, Fabbriche di Vallico)
- Da Sandra (0583 761712 or 3403730040 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)
- Alto 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

SPECIAL RESTAURANTS

- La Buca di Sant'Antonio, Lucca
- La Mora, Ponte a Moriano
- Butterfly, Lucca

See also the TTI Restaurant Guide page on the website.

14 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). During the conference you are welcome to use the projectors and it is expected that movies will be shown on several 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.

15 NEWS FROM THE TOWLER INSTITUTE

MDT has on occasion written stories about events at the Institute and published them on the local Barga News website. See <http://barganews.com> and the "News from the Towler Institute" blog (or go to the TTI web site <http://vallico.net/tti/tti.html> and click on the relevant link in the left-hand column). So far these are mainly about cave explorations and similar adventures. However, Mike doesn't have a monopoly on this. If you wish to contribute your literary efforts then please send your stories about your adventures in Italy to him, and he will ask Keane the Editor to publish them on Barga News.

16 FOOTBALL MATCH: VALLICO SOTTO CONTRO IL MONDO

The thrusting young lads of Vallico Sotto have challenged the Rest of the World - i.e. you - to a game of 5-a-side football on the village pitch. This tradition - which we began many years ago - attracts a large crowd and we always get absolutely caned (even when I have had Brazilians and Spanish people available). Can a small mountain village with less than a hundred inhabitants continue to defy the other 6 billion of us? If you think you can stop them, please volunteer.

Volunteers:

Theo Pavloudis (goalkeeper) Vamshi Katukuri (“..though I am poor at it”, he says. Oh God..) Verena Neufeld (Captain). Er.. that’s it. This is not looking good.

17 MUSIC

After many years of patiently accumulating musical equipment, we have now acquired enough that the TTI church can in principle be used as a professional concert venue. Participants with musical talents are therefore encouraged to demonstrate them.. [New in 2016: theatre lights to illuminate the talented players on stage, and central heating so you can do it in the winter].

Our stringed instruments include a basic acoustic guitar, an Epiphone EJ-200CE electro-acoustic guitar, a Line 6 Variax 500 electric guitar, an electric violin, and an antique 17th century violin (currently broken). Note the Variax 500 is a *modelling guitar* (i.e. internal electronics process the sound from individual strings to supposedly model or replicate the sound of specific guitars and other instruments.)

We have two keyboards: (1) a top-of-the-range-in-1995 and still pretty good Technics KN3000 keyboard, which was also our principle source of drums until we bought a Boss DR-880 Dr.Rhythm Drum Machine, and (2) a beautiful red Nord Piano 2 HA 88 with triple pedal (MDT’s pride and joy). This latter is one of the best available stage pianos (really, it’s wasted on him) and despite his penchant for playing crude rock and roll songs, it’s perfectly capable of having classical music played on it and sounding like a Bösendorfer Imperial Grand (not surprising, because it explicitly samples one, as well as things like Saloon bar honky-tonks). (<http://www.nordkeyboards.com/products/nord-piano-2>).

There are 4 microphones, 3 of good quality, including two retro-styled Shure Super 55 Deluxe, one of which is used as a piano floor mike.

For amplification there is a Yamaha Stagepas-300 PA system with built-in mixer with multiple inputs. The Nord Piano has a couple of quality Electrovoice ZLX-12P powered loudspeakers which can act as monitors (there is also a basic wireless in-ear monitor system). There is also a Line 6 guitar amplifier (with built-in effects).

In his role of trainee Jerry Lee Lewis impersonator – limited by severe lack of time to practice – Dr. Towler has been threatening for years to attempt a full-on Fifties rock and roll concert (as detailed on the QMC web site at <http://vallico.net/casinoqmc/music/>). On payment of a suitable fee (such as a cigarette, which he only smokes during TTI meetings because of the stress), this might even happen - you never know. Anyone who might want to contribute a guitar solo or a backing vocal or even their own song should get in touch beforehand. Dr. López Ríos - who is actually a member of a proper band in Cambridge that plays in front of real people for money - is always happy to strum away on the guitar - but believes Jerry Lee Lewis is too ‘vintage’. Dr. Neil Drummond has no known musical talent whatsoever as he spends all his time studying and doing important scientific research, and Dr. Sam Azadi is just too busy with the ladies and/or going to the gym to bother practicing. So you can see we need some help.

18 HEALTH AND SAFETY

We should all recognise that climbing, mountaineering and caving are activities with a danger of personal injury or death. Participants in these activities during their stay at TTI are asked to be aware of and accept these risks and be responsible for their own actions.

The nearest Accident and Emergency Department is 25 minutes away in Barga Hospital (car drivers should satisfy themselves as to its location on Google Maps) - other hospitals are in Lucca (50 minutes) and Castelnuovo di Garfagnana (45 minutes). The Italian emergency telephone number is 112.

There is a large first aid kit in the TTI main building under the stairs above the washing machine on the middle floor.

Vallico Sotto is a mediaeval village built a thousand years ago on a steep slope with many steps, and naturally there

no facilities whatsoever for the disabled; furthermore it seems that the builders of long ago have intentionally set traps designed to kill or injure them. However don't let this put you off; wheelchairs and so on can be manhandled up the hill with you in it if required, and of course we are happy to do this as a way of keeping fit.

TTI is a smoking venue and visitors may smoke as much as they like (ashtrays will be provided).

19 FINAL NOTE

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

HAVE FUN AT THE SUMMER SCHOOL!