



Les Houches Workshop Series == Physics at TeV Colliders == 2019 Session : 10 to 28 June

LES HOUCHES



Introduction and Welcome The Organisers

SESSION I



IDEX Université Grenoble Alpes



MINISTÈRE
DE L'ÉDUCATION NATIONALE,
DE L'ENSEIGNEMENT SUPÉRIEUR
ET DE LA RECHERCHE

11th PhysTeV Les Houches

20 years of PhysTeV Les Houches

started in 1999

LH PHYSTEV THROUGH THE YEARS

In 1999 about 65 participants over 12 days, 1 session

2001 -> 85, 12 days

2003 → ~100 12 days

2005, 2 sessions 170 people, 3 weeks


2007, more than 300 applications! could not accommodate everyone,
two sites,

2009 about the same as in 2007! One site: The Centre

2011  2017: about 250 applications as in 2015 imbalance
between session 1 and session 2

**2019 increase in applications. More balance between
session 1 and session 2**

Aim and Format of the Workshop

Les Houches 2019	Home
Working Groups	Les Houches PhysTeV Series 
Wiki	
Topics for Consideration	<p>This series of Workshops aims at bringing together theorists and experimentalists working on the phenomenology of the TeV colliders with an emphasis on the physics at the LHC. The Workshops have also been a forum for the physics at the Tevatron, HERA and the Linear Collider. The series gives as much attention to progress in new techniques for the simulation of Standard Model processes as well as to the latest developments concerning new mechanisms of symmetry breaking and the New Physics. With the discovery of a Higgs-like signal in July 2012 this aspect takes on a whole new perspective. The interdependence between the signals from the New Physics and their respective backgrounds has always been stressed. Studies are conducted within 3 to 4 Working Groups covering these various aspects of collider physics. In addition an inter-group dedicated to Tools and Monte Carlos is set up. This inter-group liaises with all WG with the task of incorporating some of the issues and new techniques developed in these groups in view of improving Monte Carlos and setting standards and accords among the simulation codes to better meet the experimental needs.</p>
Programme in LH	
Registration	
Organising Committees	<p>One of the most appreciated originality of the Workshop is that it runs over a whole year with the meeting in Les Houches, usually in May or June for 2 or 3 weeks, being the central point of the Workshop. In addition to the Working Group activities, a few lectures and review talks are planned. Most of the time is dedicated to collaborations, intense discussions and brain storming. Talks by participants are kept to a minimum unless they are informal presentations in the discussion groups.</p>
Poster PhysTeV 2019	
Practical Info	<p>Due to space limitation in Les Houches, attendance to the meeting is limited to 70 participants at any given point.</p>
Contact, Secretariat	<p>Les Houches School for Physics is located in the French Alps, about an hour from Geneva and an hour from Annecy. The School has a tradition of organising Schools, Workshops and Conferences for more than five decades now and boasts an excellent library. For the purpose of this Workshop a special computing system is installed.</p>
LH PhysTeV Series	
Freeman Dyson in LH	
Previous Sessions	

Session 1: 10-19 June 2019

Main topics are progress in NLO multi-leg calculations and techniques, and NNLO computations. More generally this session covers issues related to precision physics and better understanding of standard model processes (including Higgs production), and their implementations in tools and Monte-Carlo generators (e.g MC vs. NLO connections). The importance of electroweak corrections is another example of topics to be discussed in this session. Related to all these issues is the progress in computations and the improvement of search techniques relevant for Higgs studies. Physics of jets, notably jet substructure, boosted objects and reducing uncertainties of jet-binned predictions, will also be addressed in this session.**The list of topics will be updated on the Wiki (see here).**

Higgs: SM Issues

Theory	Experiment
D. de Florian, ICAS-Universidad de San Martin, Argentina	M. Duehrssen (ATLAS), CERN, Switzerland
S. Jones, CERN, Switzerland	M. Donega (CMS), ETH Zurich, Switzerland

SM: Loops and Multilegs

Theory	Experiment
A. Huss, CERN, Switzerland	J. Huston (ATLAS), Michigan State University, USA
D. Maitre, IPPP, Durham, UK	J. Bendavid (CMS), CERN, Switzerland
S. Kallweit, University of Milano-Bicocca, Italy (Electroweak)	
<u>Jets</u>	
S. Marzani, University of Genova, Italy	B. Nachmann (ATLAS), Berkeley, USA

Tools and Monte-Carlos

Theory	Experiment
S. Prestel, Lund University, Sweden	V. Ciulli (CMS), Firenze University and INFN, Italy
E. Re, LAPTh Annecy, France and CERN, Switzerland	

Session 2: 19-28 June 2019

The discovery of a Higgs-like signal at the LHC will be at the centre of the work and discussions in this session. Among the topics to be reviewed is the role of naturalness for example. Another issue is the impact of the discovered scalar on scenarios of Beyond-the-SM physics. Connected to searches for New Physics is in turn the issue of how to present the data. Other topics relate to flavour physics and Dark Matter. **The list of topics will be updated on the wiki.**

Higgs: New Physics

Theory	Experiment
A. Falkowski, LPT Orsay, France	A. Gilbert (CMS), CERN, Switzerland
J. M. No, Madrid, Spain	W. J. Murray (ATLAS), Warwick, UK
Tevong You, DAMTP, Cambridge, UK	

BSM: Beyond the SM

Theory	Experiment
M. Nardecchia, INFN SISSA, Trieste, Italy	G. Brooijmans (ATLAS), Columbia University, USA.
R. Torre, CERN, Switzerland and INFN Genova, Italy	G. Zevi Della Porta (CMS), UC San Diego, USA.

Tools and Monte-Carlos

Theory	Experiment
	A. Buckley (ATLAS), Glasgow Univ., UK
B. Fuks, LPTHE, Paris, France	Machine Learning and Artificial Intelligence
	S. Caron, Nikhef, Amsterdam, The Netherlands

Les Houches Higgs Working Group

List of Participants (Access restricted to registered participants)

- Present in Les Houches in session 1
- Present in Les Houches in session 2
- The Global List including all registered participants for the Higgs

List of Topics

To be updated

SM Issues (Session 1)

- Parton shower and underlying event related systematics in Higgs measurements for signal and background (together with Loops, Multilegs, Jets)
- Prospect of quark/gluon jet tagging for VBF (synergy with Jets session)
- Predictions+uncertainty models for backgrounds to ttH production: tt+HF, ggH+HF, tt+V
- Background function choice for $H \rightarrow \text{gamgam}$ and $H \rightarrow \text{mumu}$: how to evaluate the functional choice systematics
- STXS:
 - Brainstorming on “STXS for Higgs decays” or something similar for decay property measurements
 - Updates on STXS for production
- Probing Higgs Width and Top Quark Yukawa Coupling from ttH and tttt
- Higgs pair production and self-coupling observables, top quark mass-scheme uncertainties
- EFT description of Higgs production

Higgs: new physics. Session 2

- Higgs pairs: λ_{HHH} from single & double;
- Natural Higgs alignment, low upper limits on new Higgs masses, and non-SM multi-H couplings in the Gildener-Weinberg scheme.
- VBF Higgs pairs: C_{2V} , C_V relation
- Rare decays: benchmark for $H \rightarrow aa \rightarrow \text{gamgamgamgam}$
- Rare and exotic Higgs decays: further channels not searched for? motivation in specific BSM scenarios?
- CP violation and Higgs: (HL-)LHC sensitivity, complementarity with other probes (e.g. EDMs)
- Lighter than 125 GeV scalars: how well are they covered by LHC and LEP?
- Interpretation of SM coupling/STXS constraints in BSM benchmarks
- MSSM: how to close the gap in the high m_A (≥ 500 GeV), intermediate $\tan(\beta)$ range?
- Precision measurements to sharpen interpretation of Higgs results (W mass, TGCs, W/Z coupling to quarks, CKM ...)
- New physics at the high-energy tail of Higgs distributions

- ♦ Les Houches Higgs Working Group
 - ♦ SM Issues (Session 1)
 - ♦ Higgs: new physics. Session 2

Les Houches Spirit?

LES HOUCHES SPIRIT IN ACTION

WHEN NOT RAINING



- Avoid succession of formal, *normal* talks





Lectures....in a very informal style



SESSION I 2017

CONTINUES EVEN IN THE BAR



GRASS IS BACK AND CUT



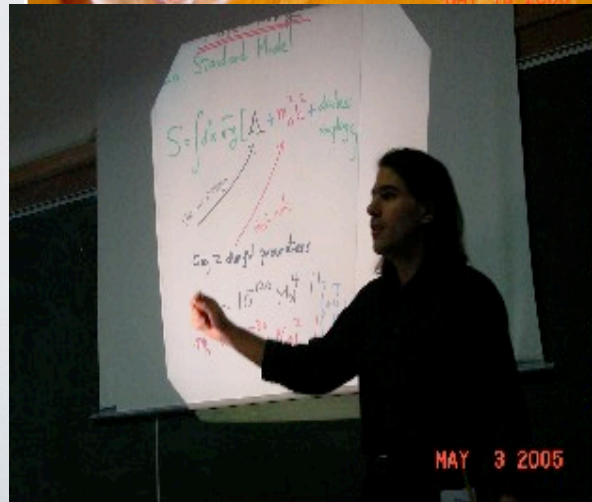
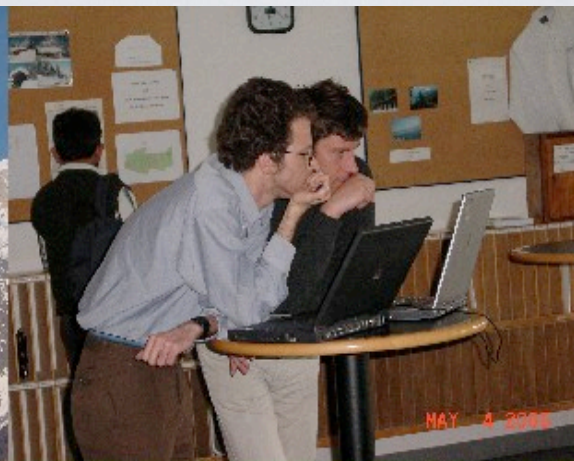
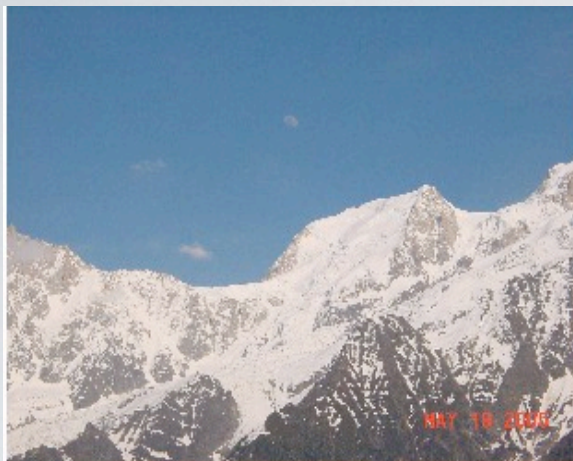
A LES HOUCHES ACCORD

IN THE MAKING IN

THE BAR



DM LH NON ACCORD !!



LH Accords, Discords, Proposals, Wishlists

The *(original)* Les Houches Accords

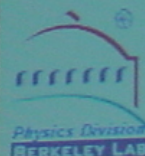


HepUP Event Record

- Successful!
 - ⊗ Majority of MC talks at Les Houches mention it.
 - ⊗ Every ME/PS project that I've heard discussed in last 12 months uses it.
- Should extra info for ME/PS be included?
 - ⊗ No: generic information content is not yet established, everyone is trying new/different things. Still need max. freedom.
- Requests for a specified file format, -- but fear that forcing such a format would limit users.
 - ⊗ Tevatron uses FNAL MCFIO
 - ⊗ CERN MCDB using XML-like text files.

LHAPDF (structure functions)

- fewer users.
- evolves PDFs ... no long lookup tables
- Includes code==maintenance
 - ⊗ To be moved to Durham, maintained by Mike Whalley
- To do:
 - ⊗ Need to allow possibility of having many PDFs in memory at one time, to facilitate use of PDFs with uncertainties.
 - ⊗ Need access to:
 - Λ_s Λ_5 $c_{\text{threshold}}$ $b_{\text{threshold}}$ Q_{min} x_{min}
 - ⊗ allow for $p \rightarrow \gamma$ (need to include evolution)
 - ⊗ and other beam particles, π , ...
 - ⊗ Other smaller changes.
 - Map author strings onto integer
 - ⊗ Try to make everything backwards compatible.
- J. Huston to coordinate.



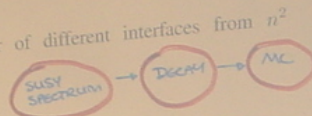
OKS

Les Houches 2001

B.C. Allanach

Les Houches Discord

- Les Houches 2001 accord between matrix element generators, Monte-Carlo programs
- Idea is to set same thing up between SUSY spectrum generators and other programs (co-ordinator: P Skands)
- Reduces number of different interfaces from n^2 problem to n
- long discussions
- At Les Houches 2003, then implemented one simple case (CMSSM); it **threw up** problems in the interface design
- Design principles: general structure which can be extended, conventions for particular case etc., higher loops very thorny



Homepage: <http://allanach.born.cern.ch/allanach/>

3

JUN 6 2003

PROGRAMME

Programme and Planning updated daily, **CONSULT the WiKi and do the Wiki, Wiki**



Les Houches



[Recent Changes](#) [Media Manager](#) [Sitemap](#)

Trace: • [higgs](#) • [2017](#) • [participants](#) • **2019**

2019:start

Les Houches

- [Website](#)
- [Wiki](#)
- [Contact](#)

2019 Session

- [Home](#)
- [Topics for consideration](#)
- [Programme in Les Houches](#)
- Working Groups Pages
 - [N\(N\)LO, Multi-legs, Jets](#)
 - [Higgs](#)
 - [New Physics](#)
 - [Tools and Monte-Carlos](#)
 - **(registered participants only)**
 - Use of wiki. Wifi access/set-up. Printing
 - Important info about lodging. Bus. Facilities
 - Bulletins.
- [Conveners \(Restricted Access\)](#)

Les Houches 2019

The 2019 wiki is being set-up

You will be able to contribute to some of these pages only after you have registered to the Workshop. This will be possible when registration opens.

- [Home](#)
- [Topics for Consideration](#): At the moment access and edit is only for conveners. Access will be available to all before registration.
- [Programme in Les Houches](#)
- Working Groups Pages
 - [N\(N\)LO, Multi-legs, Jets](#)
 - [Higgs](#)
 - [New Physics](#)
 - [Tools and Monte-Carlos](#)
- [Conveners \(Restricted Access\)](#)



Les Houches Spirit





Les Houches Spirit



What is a Quark Jet?

From lunch/dinner discussions

Tuesday 11 June

09h00-09h15	General Introduction and Welcome	Organisers	Auditorium
	Working Group Summaries		Auditorium
09h15-9h40	SM experimental	Joey Huston	Auditorium
09h40-10h05	SM theory	Alexander Huss	Auditorium
10h05-10h30	Jets	Simone Marzani	Auditorium
10h30-11h00	Break		Hall deWitt
11h00-11h20	Higgs theory	Stephen Jones	Auditorium
11h20-11h45	Higgs experimental	Michael Duehrssen	Auditorium
11h45-12h30	Tools and MC	Emanuele Re	Auditorium

12h30-14h30	Lunch, Coffee, Sport, ...	LH Restaurant
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14h30-16h00	General Discussion & Task Assignment, Round Table	All	Auditorium
16h00-16h30	Coffee/Tea Break		Lounge in Main Building

19h00-19h30	Welcome Drink, ...	LH Restaurant
19h30-	Dinner, ...	LH Restaurant

Wednesday 12 June

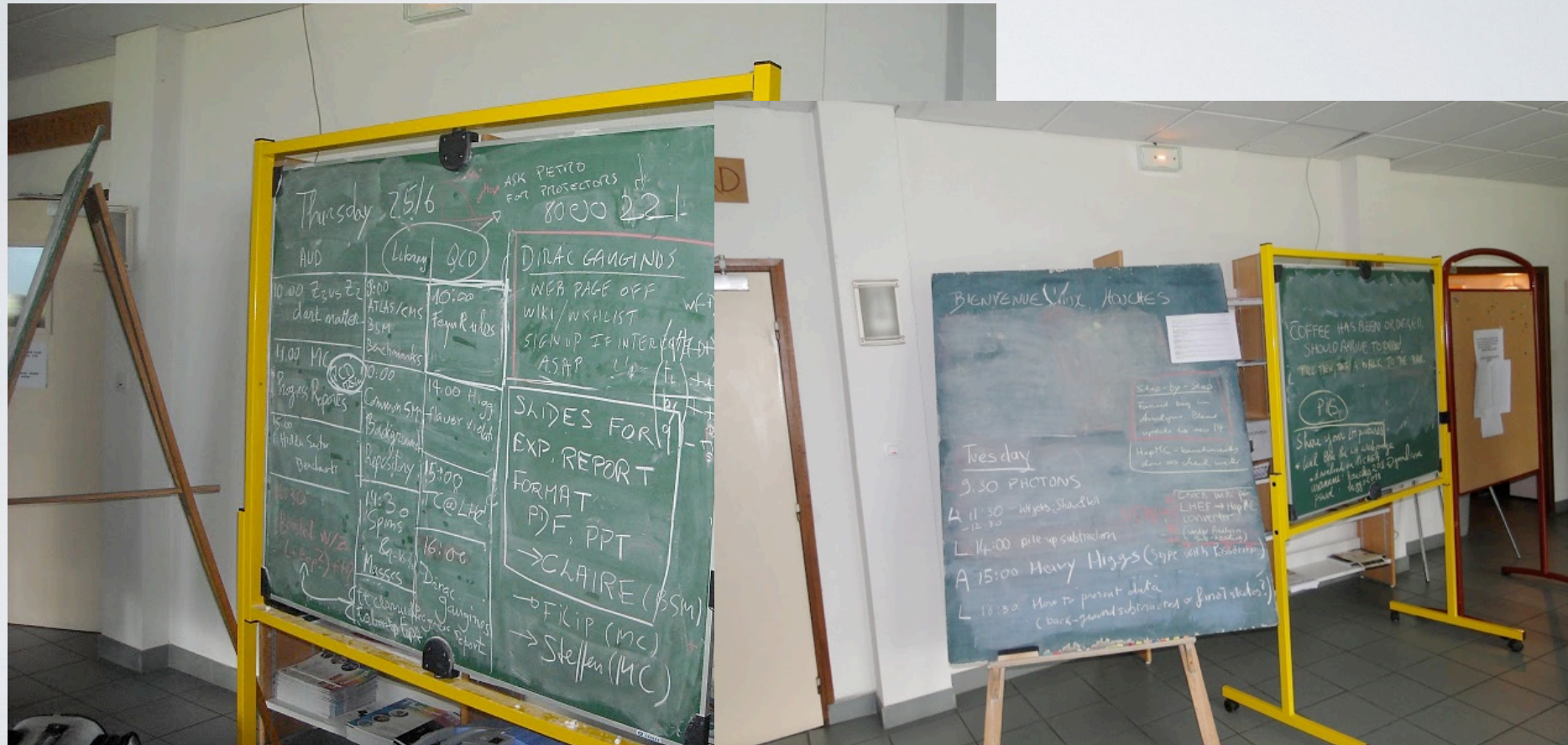
10h30-12h00	MC/tools: project meetings	MC/tools	Auditorium
14h00-18h00	Higgs: STXS in production and ideas for STXS in decays	Higgs	Auditorium

Thursday 13 June

10h00-12h00	Higgs: EFT interpretation of Higgs measurements	Higgs	Library
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PROGRAMME

Programme and Planning updated daily, **see also the board in the entrance hall, outside the auditorium**





Les Houches

- Website
- Wiki
- Contact

2013 Session

- Home
- Programme in LH
- Participants Present in LH
 - Session 1
 - Session 2
- Working Groups Pages:
 - General List of Topics
 - Higgs
 - SM: Loops and Multilegs
 - New Physics
 - Tools and Monte-Carlos
- Conveners (Restricted Access)
- Participants (Restricted Access)

Previous Session

- 2011

Help

- How to: Latex, Tables,
- Wiki Manual

Tools and Monte Carlos

A list of topics common for sessions 1 and 2

- **Data vs Theory (Tools and MC)**
 - make use of Rivet→have Rivet tutorial early in workshop
 - dressed leptons: what is the best way of making comparisons between
 - more sophisticated looks at analyses with background subtractions
 - try to constrain jet content of UE
- **Update of LHE file format**; more information also [here](#)

A list of topics for session 1

- **Schemes to systematically evaluate uncertainties in the new NLO tools**
 - which scales to vary: standard renormalisation and factorisation scales in matrix elements
 - also in showers? if so, how?
 - starting scales of shower? how about contact to resummation calculations?
 - systematic variation of underlying event simulation: eigentunes? other ideas?
 - PDF uncertainties: how to do them properly in the shower? is this important?
- **Comparison of NLO tools (continuation/extension of HiggsWG activity)**
 - testcase: Higgs boson production in gluon fusion
 - inclusive quantities: Higgs pt, y distributions, Njets etc. & uncertainties
 - testing the high-pt regime
 - testing the two jet regime with weak boson fusion cuts
- **Inclusion of ew corrections for TeV-scale processes**
 - understanding the requirements for a systematic implementation
- **Comparison of recent NLO matching/merging tools**
 - review tools & techniques
 - highlight issues through example processes
 - aim for short write-up for non-experts on matching / merging, focusing on NLO merging, ending with roadmap for where further improvement is desired / necessary / not necessary.

A list of topics for session 2

- Proposal for a new event file format (to get rid of the huge stdhep and hepmc files)
- Extending the SLHA to include cross section information (automate event-by-event weighting with higher order cross sections)
- SMS decomposition: Libraries with simplified models, the associated analyses, LHC results as well as their interpretation



WIKI

All of you have an account

start

Login

You are currently not logged in! Enter your authentication credentials below to log in. You need to have cookies enabled to log in.

Login

Username

Password

☐ Remember me

Login

Forgotten your password? Get a new one: [Set new password](#)

start

boudjema

Send new password

Please enter your user name in the form below to request a new password for your account in this wiki. A confirmation link will be sent to your registered email address.

Set new password for

Username

Set new password



Trace: • [higgs](#) • [2017](#) • [participants](#) • [2019](#) • [programme](#)

2019:programme

Media Manager

Namespaces

Media Files

Upload

Search

Choose namespace

Files in 2019



Thumbnail



Grid

Name

Date

[-] [root]

Nothing was found.

+ 2013

+ 2015

+ 2017

+ 2019

+ conveners

[-] participants

+ bsm

+ conv_or_stalks

+ higgs_s1

+ higgs_s2

+ mc_s1

+ mc_s2

+ nlm

+ organisers_files

+ wiki

Use the mailing lists

Main Hall



QCD Room



Library (Cosy)



Library (serious)



Printer Corner



MEETING AND DISCUSSION ROOMS: ALL WITH BLACKBOARD, VIDEO PROJECTORS

- Auditorium = 70 people
- QCD Room ~ 22 (25 max)
- Library ~ 15 + 15 ~ 30



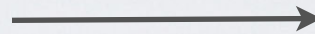
Reservation of video projectors, (slide projectors): See local organisers

JPG, FB, Philippe G, Nicolas B.

Seminar Room allocation: Reserve on the boards outside the auditorium, or on the wiki

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THE WEATHER

In a letter to DeWitt-Morette, Freeman Dyson wrote,

“As I remember it, the school was an overwhelming experience. We were sharing every waking hour with a bunch of ebullient young people ... But **the lectures were the least important part of the school. Much more memorable were the informal sessions, the meals and the walks, the daily hardships of mud and rain we all shared ...** We all lived together in a cowshed and gave lectures in a barn ... living together under primitive conditions is a wonderful way to make friends. **Bad weather makes friendships closer.”**



House & Home

Home

World

Companies

Markets

Global Economy

Lex

Comment

Arts ▾

FT Magazine ▾

Food & Drink ▾

House & Home

Style

Books ▾

Pursuits ▾

Travel ▾

Columnists

May 21, 2013 7:16 am

Country house guests now regard WiFi as more important than staff, The importance of a gizmo-friendly bathroom with WiFi



By David Tang

Should homes be redesigned to anticipate a changing world?
Excellent internet access is key

Sir David Tang, entrepreneur and founder of ICorrect, offers advice on questions about property, interiors – and modern manners for globetrotters

In view of the ever-changing internet world, should there be design elements for homes, whether newly built or not, to anticipate a changing world of living?

I would concentrate on the bathroom and make it larger and soften it with pieces of furniture and dispense with, as much as possible, all the hard surfaces like marble floors or tiling walls. The reason is because, increasingly, people are going to spend

EDITOR

VIDEO



Jane Ov
Flower S
anniver

MOST P

NETWORK & COMPUTING

- what we used to say
- don't expect your usual internet connection speed when 40 people are on skype and others on youtube,

share ?????



Networks

1. EDUROAM

2. WIFI ACCESS

look at the folder in your pigeon hole, credentials to use this network are given..



- **Restaurant:**

- Lunch: 12.30 sharp, coffee (free) after lunch at the bar (below the restaurant)
- Dinner: 19.30. Try and Enjoy the local wines to make new friends. A jar of wine per table is part of the deal. More you pay.

- **Bar** open after dinner. Count how much you drink, alcohol, beer included, not free
- **Coffee and tea breaks:** please wash your cups. Soda not free (1 euro), write your name on the list, settle bill before departure. (Espresso free). No food or drinks in the auditorium/library/..
- **Lunch boxes:** order the night before. If you plan to skip lunch let us know

- Today 19.00 Welcome Drink
 - The Centre Restaurant/Cafeteria
- Monday June 17 Workshop Dinner

OUTDOOR ACTIVITY

Don't get lost

A man in a grey t-shirt and cargo pants stands next to a wooden signpost in a forest. The signpost has several directional signs with arrows and distances. The background is a dense forest of evergreen trees.

Don't get lost

OUTDOOR ACTIVITY



- Climbing, hiking, walks, maps: Jean-Philippe G
 - weather permitting, Sunday is a “rest” day.
- Cycling

Mountain Bikes

There are 5 mountain bikes, first come, first served. The keys are on a board by the Secretariat. Write your name and indicate the bike number and the time you are reserving for.

The bikes are kept in the shed (building 951) by the restaurant, see intranet=wiki participants

- Please inform at least one of the organisers, let them know where you are going, fill **the book in the hall**, give approximate time of when you'll be back

- It's a good idea to write

down your mobile phone number



Follow the guide



SECRETARIAT IN THE CENTRE

- Secretariat: fees, accommodation issues

Open from 8.45-12.30 & 13.30-17.30 (closed week end)

- Please pay your fees (non FP support)
- FP (those working in the French system): please leave the *attestation* in my pigeon hole
- All non FP will have to contact the Les Houches secretariat and pay the fees directly to them starting from 2pm today
- Ticket (pass) for the Chamonix Valley (buses and train): ask Secretariat

EMERGENCY NUMBERS




- Fawzi : +33 6 87 82 87 83
- Jean-Philippe: +33 6 52 77 49 50
- Philippe + 33 6 77 78 05 98
- Emanuele +33 7 68 22 86 21
- In case of emergency contact the caretaker, Alpens, Apt 3, +33 6 78 98 52 40. On WE replaced by agents from a security firm, same tel. number

Session 1

▪ **Your seat on the bus**

- Update the list only if you are no longer taking the bus. Deadline for updates is Friday 7 June. List for Session 1 is [here](#)
- For Monday 10th the car driver's telephone number is [to be updated]. The bus company is TransDev.
- If you are registered to take the bus but at the last minute will not be able to take the bus (plane late,..), please call Philippe (Gras) on his mobile at CERN: +41 75 411 1971.

▪ **Lodging Plan**

-  [Download the lodging plan for session 1](#). This gives your room and chalet (Name/Chalet/Room Number).
- A map of the Centre will be very handy, especially to locate your chalet. You may save/print  [the leaflet](#) before you come to Les Houches.
- You will also need the **pin code** to enter the buildings/chalets in Les Houches and access your room,  [see here](#). Please make a note of the pin code and save it on your phone address book.

▪ **Emergency Numbers**

- Fawzi: +33 6 87 82 87 83 (on WhatsApp also)
- Jean-Philippe: +33 6 52 77 49 50
- Emanuele: +33 7 68 22 86 21 (Fr) or +41 7 62 78 14 49 (CH)
- Nicolas: +33 6 32 92 43 38
- In case of a serious problem, contact the caretaker, Daniel SECHAUD, Alpens, Apartment 9, 3rd floor, Tel. +33 6 78 98 52 40

▪ **Bulletins**

-  [Bulletin No 1. 4 June 2019](#)
- 1st Sunday of Session 1 Bulletin: Programme/Outing for Sunday *
- 18 June Bulletin : A few important things before you leave **

 [contact the organisers present in session 1](#)

 [Email all the participants of session 1](#) (present in LH)

In Memoriam

**Denis Perret-Gallix
James Stirling**

Maurice ORLIAC

HAVE A NICE WORKSHOP!!