

Les Houches Workshop Series
"Physics at TeV Colliders" 2015
Session: 1-19 June



Introduction and Welcome
The Organisers



SESSION 2



Laboratoire d'Anncy-le-Vieux
de Physique Théorique



Laboratoire d'Anncy-le-Vieux
de Physique des Particules



The enigma of mass



dépasser les frontières



UNIVERSITÉ
SAVOIE
MONT BLANC



Conseil Général
partenaire



Liberté • Égalité • Fraternité
RÉPUBLIQUE FRANÇAISE

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

LH PHYSTEVE 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: more than 250 applications

2013: about the same as in 2011

2015: About 220, imbalance between session 1 and session 2

Aim and Format of the Workshop

Les Houches 2015 [Home](#) [Les Houches 2015](#)

Working Groups **Aim and Format of the Workshop** 

Wiki

Topics for Consideration

Programme in LH

Registration

Organising Committees

Poster PhysTeV 2015

Practical Info

Contact, Secretariat

LH PhysTeV Series

Freeman Dyson in LH

Previous Sessions

Search ...

Aim and Format

Page 1 of 3

[Aim and Format of the Workshop](#)

[WG Topics](#)

[Coordination with other Workshops](#)

[All Pages](#)

This **Workshop** is the ninth in a series whose aim is to **bring together theorists and experimentalists** working on the phenomenology of **TeV colliders**. The emphasis in this series of workshops has been on the physics at the LHC and the Tevatron. The highlight of the 2015 Les Houches Edition is to take full advantage of the data that has been collected at the LHC so far and prepare for the future runs. With this much data, following the discovery of a Higgs-like particle, one aim of this Workshop is how to best sharpen our tools and techniques in order to reconstruct the profile of this particle and possibly uncover New Physics. An equally important aim is to reassess some of the still open fundamental questions in the light of this discovery and investigate which kind of New Physics such a particle may be hinting at.

In view of the above considerations, the Workshop will devote particular attention to:

(i) Higgs physics, and how it shapes our view on the mechanism of electroweak symmetry breaking; (ii) related searches for New Physics and (iii) progress in new techniques for the calculations and simulation of Standard Model processes.

The Workshop will address issues such as **how to best exploit these data** as well as how to prepare for future LHC data, and **what is most desirable in LHC upgrades**. These activities will be conducted in close connection with the development and improvements of related theory tools, in particular of Monte-Carlo event generators.

The Workshop runs over one year, including two meetings in Les Houches in the month of June, and exchanges and collaborations before and after the meetings. The meetings in Les Houches will consist of **two sessions**:

Session I: 1-10 June 2015
with emphasis on SM-related issues

Session II: 10-19 June 2015
with emphasis on New-Physics searches

Session 2: 10-19 June 2015

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 rôle 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, also discussed here. Further hot subjects are the consequences on and from flavour physics and Dark Matter. **See a list of topics [here](#).**

Higgs: New Physics

Theory

A. Falkowski, LPT Orsay, France
C. Englert, University of Glasgow, UK

Experiment

S. Nikitenko (CMS), Imperial College London, UK

BSM: Beyond the SM

Theory

A. Delgado, Notre Dame University, USA and CERN, Switzerland
C. Delaunay, LAPTh Annecy-le-Vieux, France

Experiment

G. Brooijmans (ATLAS), Columbia University, USA

Tools and Monte-Carlos

Theory

B. Fuks, IPHC and Université de Strasbourg, France

Experiment

S. Sekmen (CMS), METU Ankara, Turkey

Les Houches Higgs Working Group

♦ Les Houches Higgs Working Group

♦ Session 1

♦ Session 2

Session 1

- Discussion on differential Higgs measurements
- Discussion on Higgs "pseudo"-cross sections
- Higgs p_T : Reweighting, uncertainties,....
- Uncertainties in ggF cross section
- Off-shell effects in Higgs studies

Session 2

List of proposed topics for session 2

- Effective field theory approach to Higgs searches at the LHC
- EFT implementation in Monte Carlo
- Fiducial Higgs cross sections at the LHC: why, how, and what can be learned
- Synergy of electroweak precision and Higgs data
- Triple gauge couplings at the LHC: how to make the analysis better and more model-independent.
- Presentation of limits from heavy Higgs searches on multi-Higgs models.
- Complementarity between non-standard Higgs searches and precision Higgs measurements
- Extra Higgs (light or heavy) searches: which decay channels are not covered?
- Scalars approximately mass-degenerate with the 125 GeV Higgs boson
- Higgs studies in the off-shell regime: on-shell and off-shell interference effects, impact on heavy Higgs signal strength measurements, EFT vs simplified models.
- Prospects for NMSSM Higgs Bosons with Run II
- "Exotic" decays of $h(125)$ - what is doable with Run II and how ?
- probing $h(125)$ CP (beyond $h \rightarrow ZZ$: fermionic h decays, $t\bar{t}H$, ...)
- Higgs and dark matter.
- Renormalization group effects in the dim 6 EFT space, impact on searches for new physics?
- status of double Higgs production searches: is there something left to do?

Les Houches Spirit?

LES HOUCHES SPIRIT IN ACTION

- Avoid succession of formal, *normal* talks

LES HOUCHES SPIRIT IN ACTION



- Avoid succession of formal, *normal* talks





Lectures....in a very informal style

Thursday, June 11, 15

CONTINUES EVEN IN THE BAR

CONTINUES EVEN IN THE BAR



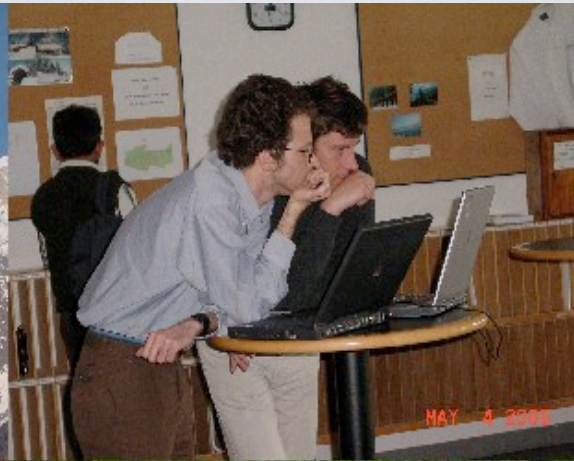


A LES HOUCHES ACCORD

IN THE MAKING IN

THE BAR





LH Accords, Discords, Proposals, Wishlists

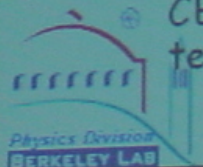
The (original) Les Houches Accords

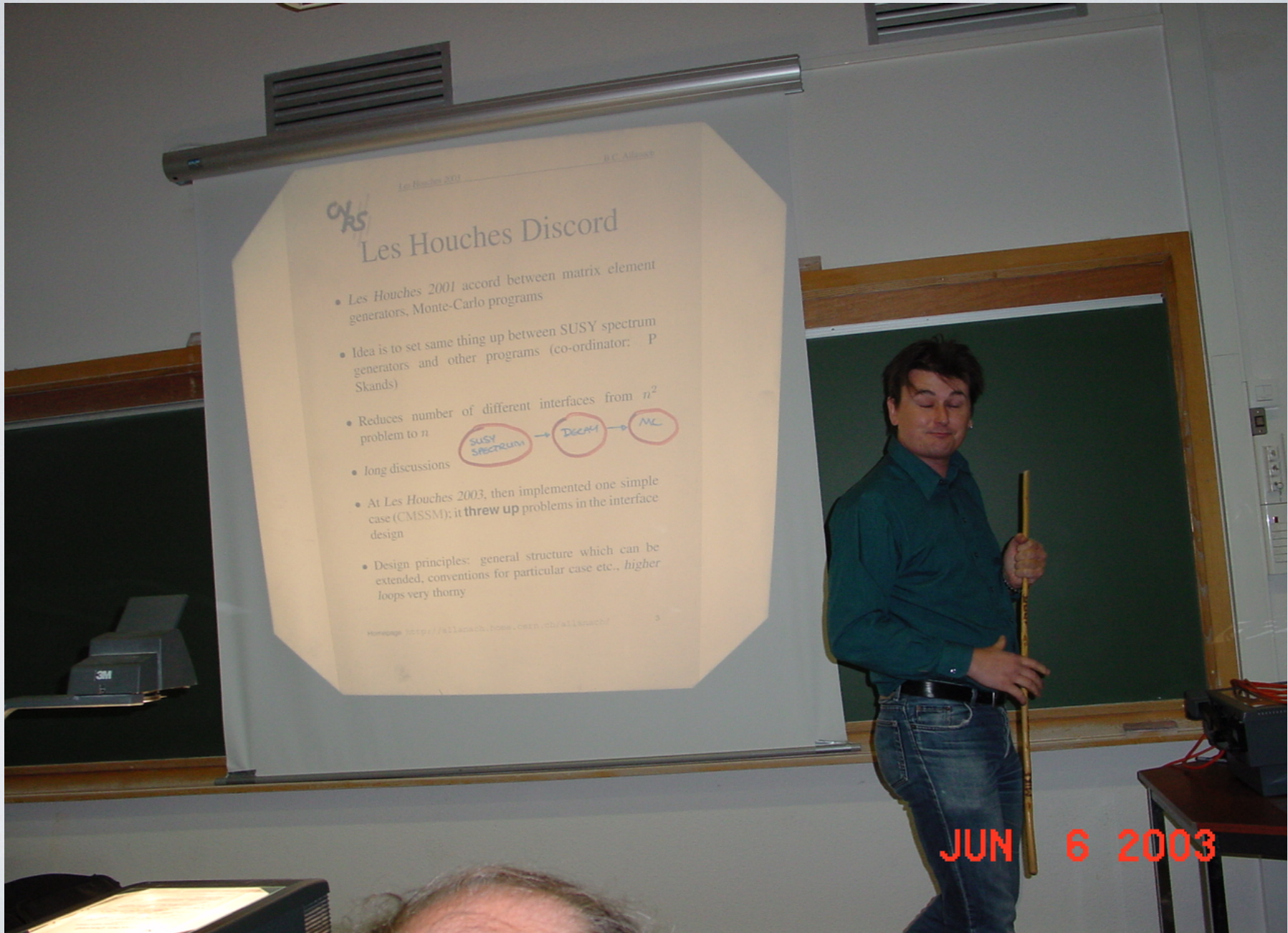
HepUP Event Record

- 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)

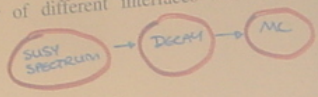
- fewer users.
- evolves PDFs ... no long lookup tables
- Includes code==maintenance
 - ⊗ To be moved to Durham, maintained by Mike Whalley
- To do:
 - ⊗ Need to allow possibility of having many PDFs in memory at one time, to facilitate use of PDFs with uncertainties.
 - ⊗ Need access to:
 - Λ_s Λ_Q $c_{\text{threshold}}$ $b_{\text{threshold}}$ 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 2003
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.bcm.cornell.edu/allanach/>

JUN 6 2003



Les Houches Spirit





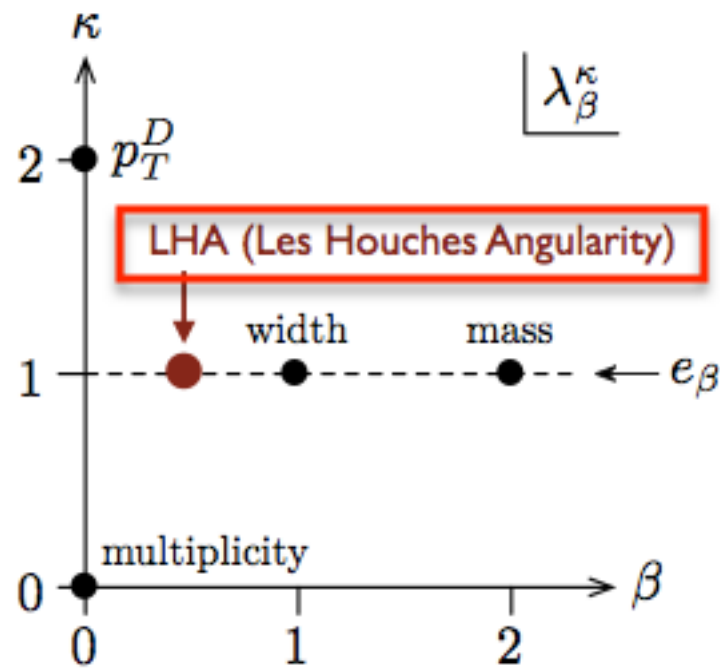
Les Houches Spirit



Thursday, June 11, 15

What is a Quark Jet?

From lunch/dinner discussions

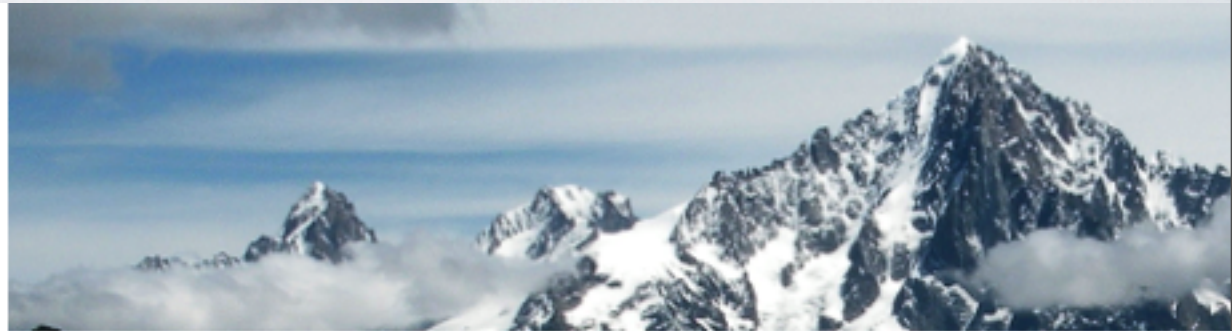


PROGRAMME

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






2015 Session

- [Home](#)
- [Topics for Consideration](#)
- [Programme in Les Houches](#)
- [Working Groups](#)
 - [Higgs](#)
 - [SM: Loops and Multilegs](#)
 - [New Physics](#)
 - [Tools and Monte-Carlos](#)
- [Conveners and Organisers \(Restricted Access\)](#)
- [Participants \(Restricted Access\)](#)
- [LH 2015 Theme](#)



Access to the wiki pages of the **2015** session.

Thursday 11 June

09h00-09h15	General Intro and Welcome	Organisers	Auditorium
09h15-12h30	Working Group Summaries		Auditorium
09h15-09h45	BSM Higgs Theory	 Christoph (Englert) and Adam (Falkowski)	
09h45-10h15	BSM Higgs Experimental	 Alexandre (Nikitenko)	
10h15-10h45	Coffee Break		Lounge in Main Building
10h45-11h45	BSM Theory	 Antonio (Delgado)	
11h45-12h15	BSM Experimental	 Gustaaf (Brooijmans)	
12h15-12h45	BSM Tools	 Sezen (Sekmen)	

10h00-10h30	Coffee Break	Lounge in Main Building
-------------	--------------	-------------------------

12h45-14h30	Lunch, Coffee, Sport, ...	LH Restaurant
-------------	---------------------------	---------------

14h30-16h00	General Discussion & Task Assignment, Round Table	All	Auditorium
-------------	---	-----	------------

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 data and theory
 - 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 implementation



09.06.2009

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

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



Media Manager



Namespaces

Media Files

Upload

Search

Choose namespace

Files in 2015:participants

Thumbnails Rows Name Date

- [-] [root]
- [-] 2013
- [-] 2015
 - [-] material_files
 - [-] organisers
 - [-] working_groups
 - [-] participants
 - [-] printer
 - [-] talks
 - [-] bsm_session2
 - [-] higgs_session1
 - [-] higgs_session2
 - [-] mc_session1
 - [-] mc_session2
 - [-] rc_jets_session1
 - [-] talks_organisers
- [-] wiki



[entrance_...](#)

2015/05/21
17:31
7 KB

MEETING AND DISCUSSION ROOMS: ALL WITH BLACKBOARD, VIDEO PROJECTORS

- Auditorium =70 people
- QCD Room~15 (20 max)
- Library~25-30



Reservation of video projectors, (slide projectors): See local organisers
Björn H. Diego G., Nicolas B., Pietro S., FB.,

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

Networks

1. EDUROAM

2. WIFI ACCESS

look at the folder in your pigeon hole, credentials to use this network are given. 2 accounts per user.

House & Home

Home	World	Companies	Markets	Global Economy	Lex	Commentary		
Arts ▾	FT Magazine ▾	Food & Drink ▾	House & Home	Style	Books ▾	Pursuits ▾	Travel ▾	Columnists

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,



- **No LONGER!**

FOOD & DRINK(S)



- **Restaurant:**

- Lunch: 12.30 (exception today 12.45??) **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 and soda included, not free. Pay for each beer/soda in the bar**

- **Jacassière:** **Coffee and tea breaks:** please wash your cups. **Soda not free**, write your name on the list, settle bill before departure. (Espresso free)

- **Lunch boxes:** order the night before. If you plan to skip lunch let us know

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

OUTDOOR ACTIVITIES

Don't get lost



OUTDOOR ACTIVITY



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

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



THE WEATHER



Thursday, June 11, 15

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.**”

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
- Björn: + 33 6 14 06 39 38
- Diego: +33 6 45 45 59 75
- In case of emergency contact the caretaker, Jean Francois Aubrun, Alpens, Apt 3, +33 6 78 98 52 40.
- On WE replaced by agents form a security firm, same tel. number

Important Information for the 2015 Participants


Some information for those attending the Workshop in Les Houches will be posted here.

- **Bulletins** with important information (in case you emptied your mailbox!)
 - **6 May 2015 Network and Wifi Connection:** Please Read and Set Up BEFORE you come to Les Houches: [go here](#)
 - **24 April 2015 Use of Wiki, Conference Bus:** [go here](#)
- **Book your seat on the Workshop Bus** (CERN \longleftrightarrow Les Houches): [go here](#)
- **Pin Codes to enter the buildings/chalets in Les Houches and access your rooms** [go here](#)
- **Mountain Bikes** [cycle here](#)
- **Share your pictures.**  [Picasa, upload](#). Use the following
 - - username: leshouches13
 - - pswd: Higgs2013

Session 1

- **Lodging Plan**  [Download](#)
- **29th May Bulletin** [here](#)
- **6th June Bulletin: Programme/Outing for Sunday** [here](#)
- **9th June Bulletin : A few important things before you leave** [here](#)

Session 2

- **Lodging Plan**  [Download](#)
- **8th June Bulletin** [here](#)

HAVE A NICE WORKSHOP!!