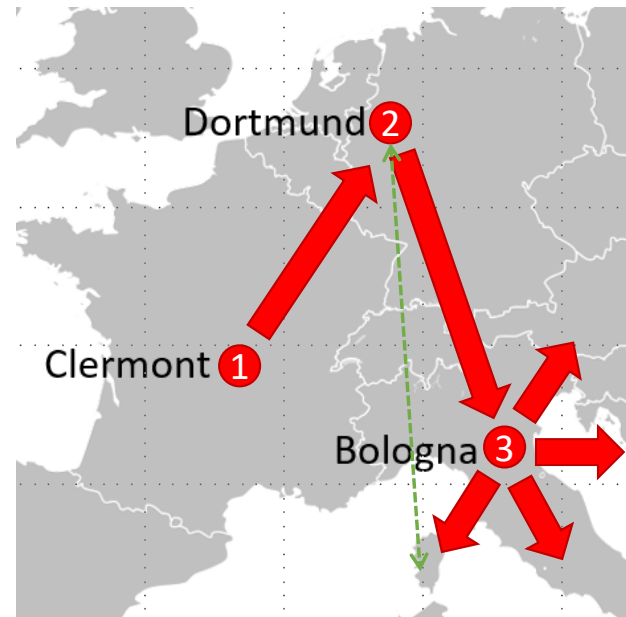# IMAPP: studying in Clermont

Stéphane Monteil, on behalf of the BCD consortium and the Clermont University pedagogical team, LPC / IN2P3 /CNRS

1) Introduction: the IMAPP travels

Mobility

Schedule:

Sem.	Location	Academic focus	Events
1 (WS)	Clermont	Particle physics and statistics	Orientation week
2 (SS)	Dortmund	Particle physics and detectors	Spring school
3 (WS)	Bologna	Particle physics and computing, introduction Master thesis	Trade fair for Master theses
4 (SS)	Any	Master thesis	Spring school, virtual industry day

S. Monteil

Studying in Clermont

IM▲PP

- Clermont used to be a rocky place up to 6000 years ago (yesterday).

© Geography and You

- Nature is much more quiet these days

Clermont behind
the dome

© Geography and You

1) Introduction: Clermont

IMAPP

- The volcanoes from the Campus

- and downtown

Studying in Clermont

- About 30,000 students

- Multidisciplinary university (from Humanities to Particle Physics)

- Laboratoire de Physique de Clermont:

  - Large Hadron Collider: ALICE, ATLAS, LHCb !

  - Neutrino and lepton Physics: SoLid, COMET

  - Observational cosmology: ZTF, LSST

  - Theory: Flavours (heavy and light)

  - Medical Physics (*e.g.* instruments, simulation, biology)

  - Environmental Physics (*e.g.* Plasmas, datation, muography)

2) Study plan in Clermont

- Particle Physics and Statistics: the compulsory courses.

Compulsory courses	Credits
IMAPP-01-01: Introduction to quantum field theory and gauge theories	6 ECTS
IMAPP-01-02: Introduction to particle physics and the experimental foundations of the Standard Model	9 ECTS
IMAPP-01-03: Programming and Data Analysis	6 ECTS
IMAPP-01-06: Statistics and artificial intelligence	6 ECTS

Studying in Clermont

2) Study plan in Clermont

- Particle Physics and Statistics: the compulsory courses.

Compulsory courses	Credits	
IMAPP-01-01: Introduction to quantum field theory and gauge theories	6 ECTS	48 hours
IMAPP-01-02: Introduction to particle physics and the experimental foundations of the Standard Model	9 ECTS	
IMAPP-01-03: Programming and Data Analysis	6 ECTS	
IMAPP-01-06: Statistics and artificial intelligence	6 ECTS	

2) Study plan in Clermont

- Particle Physics and Statistics: the compulsory courses.

Compulsory courses	Credits	
IMAPP-01-01: Introduction to quantum field theory and gauge theories	6 ECTS	48 hours
IMAPP-01-02: Introduction to particle physics and the experimental foundations of the Standard Model	9 ECTS	72 hours
IMAPP-01-03: Programming and Data Analysis	6 ECTS	
IMAPP-01-06: Statistics and artificial intelligence	6 ECTS	

IM⋀PP

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IMAPP-01-06: Statistics and artificial intelligence	6 ECTS	48 hours

- Particle Physics: the compulsory courses

- IMAPP-01-01:

  - Quantum Field Theory as the grammar of the elementary particle world. You will learn the lagrangian of a fermion, of a boson (mediating the interaction), how to manipulate the Feynmann rules to write particle scattering or decay processes.

  - Gauge theories are describing the elementary interactions from requiring their lagrangian to obey fundamental symmetries. Establishing QCD as a guideline.

- IMAPP-01-02:

  - Exp. and pheno. introduction to particle physics. You'll learn the elementary content of the Universe. Also a lecture on symmetries (as an input to gauge th.)

  - Foundations of the Standard Model of particle physics (exp. and th.). Introductions to Flavours (quarks and leptons).

- Statistics and data analysis: the compulsory courses

- IMAPP-01-03 [Next week, preparatory message to follow]:

  - Programming in python by examples from high energy physics.

  - Data mining to analyse massive amounts of data.

- IMAPP-01-04:

  - Statistics: mathematical bases of statistics. Treatment of statistical collections, statistical inferences (bayesian and fequentistic). All by examples.

  - Artificial intelligence: foundations of machine learning. Supervised and unsupervised algorithms. Hands-on teaching.

- Statistics and data analysis: the compulsory courses

  - These two modules with four teaching units are each taught during a week, solely assigned in the timetable.

  - They are part of a University Diploma of Data Scientist delivered by UCA.

  - Usually popular. One additional module of 25 hours is required to obtain this diploma. You can take it in the semester break b/w Clermont and Dortmund.

  - These *technical* teaching modules are providing you with:

    - Skills useful for a continuation in exp. and / or pheno. Ph.D program.

    - Skills useful for a *e.g.* data scientist job immediately after the Master.

2) Study plan in Clermont

- Particle Physics and Statistics: the elective courses.

Elective courses	Credits	University
IMAPP-01-04: Guest lectures on various topics	3 ECTS	UCA
IMAPP-01-05: UCA seminar on particle physics	6 ECTS	UCA

We're speaking here of:

- IMAPP-01-04: pick a choice b/w:

  - Observational Cosmology (20 hours)

  - General relativity (20 hours)

- IMAPP-01-05: the LP Clermont lab. seminars (not examinable).

3) The pedagogical team

- Those in the room

- A word of introduction, and a word on their research expertise

- All your professors are active researchers in particle physics, experiment or theory.

- After the Clermont semester [September—March[

    - You will have received a training in theoretical particle physics.

    - You will have received a training in the experimental foundations of particle physics.

    - You might have received a training about gravitation and / or cosmology.

    - You will have received a training in programming and advanced data analysis, including modern tools of "AI".

    - You can have received already a first diploma of Data Scientist

    - You can have followed french lectures (offered but not compulsory).

3) Ready to go to Cargese ?

Objectives for you

- The BCD High Energy Physics (HEP) School is one of the elements pedagogical platform built among the University of Bologna (Italy), Clermont (France) and Dortmund (Germany).

- Some of you are about to enter in HEP field, some of you are already in.

- For the former, the objectives of the School is to give basic representations (aBCD) of the HEP and related fields. For the latter, this is about strengthening the views and motivate the thinking.

- The prism we have chosen is to discuss and highlight the latest results of the field, both theoretical and experimental.

Preconisations (workwise)

- The program is dense but with many room left for discussions.

- Ask questions (we might have answers ...), share your views, discuss with lecturers and other students...

- Think about Nature

Studying in Clermont

- Language: french lectures

  - University provides french lectures for foreign students (Centre Fleura)

  - They are offered by the iMAPP program.

- Culture:

  - Music: Rock / Rap city: check this:

  - Music: Jazz festival: check this:

  - Sport: Football and Rugby elite: check this:

  - Theater (scène nationale): check this:

  - International Film Festival, short movies: check this

5) Who are you?

- Statistics:

  - Europe: 19

  - Asia: 10

  - Africa: 5

  - America:3

  - Oceania: 1
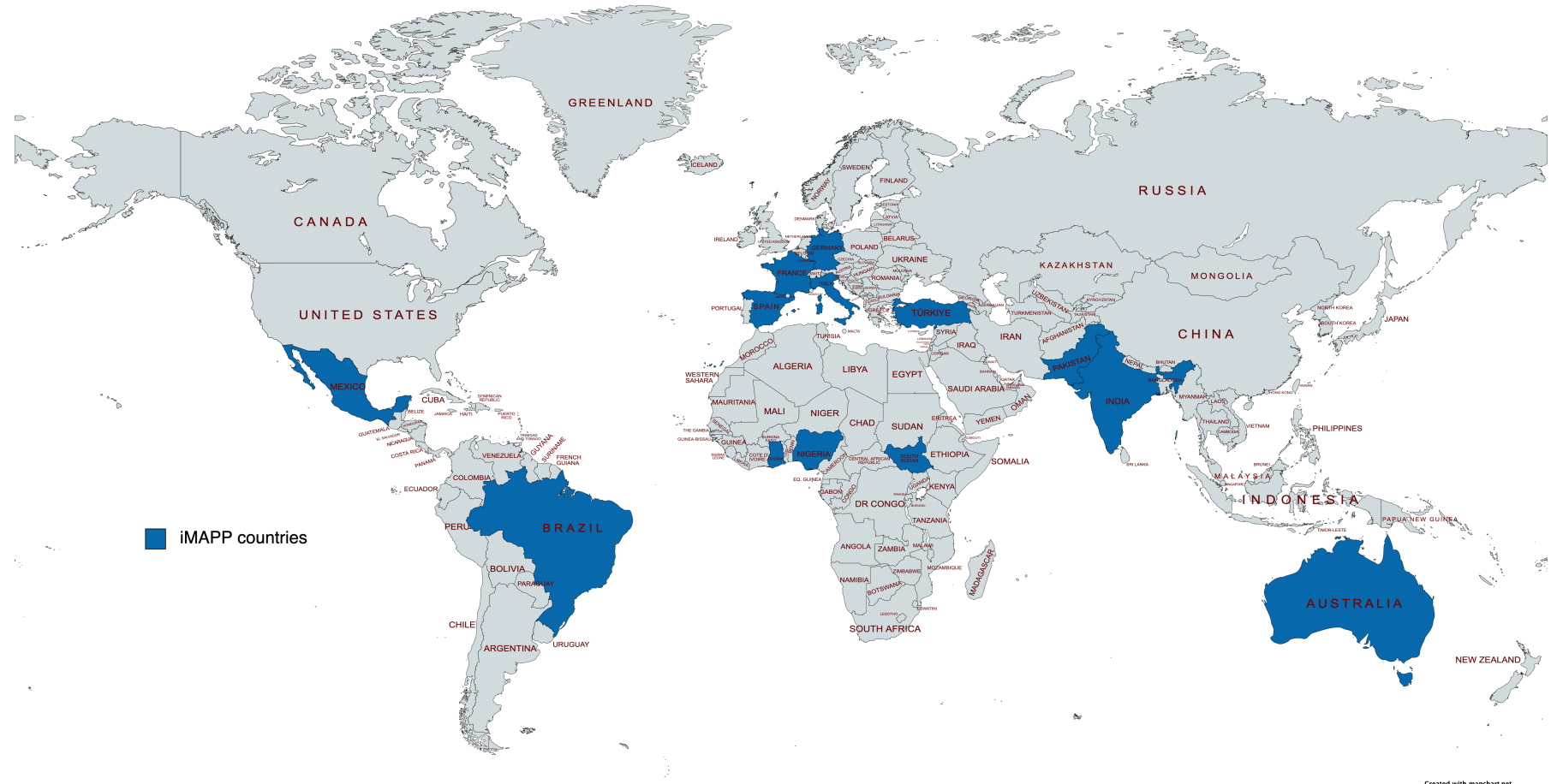
  - Antartica: 0

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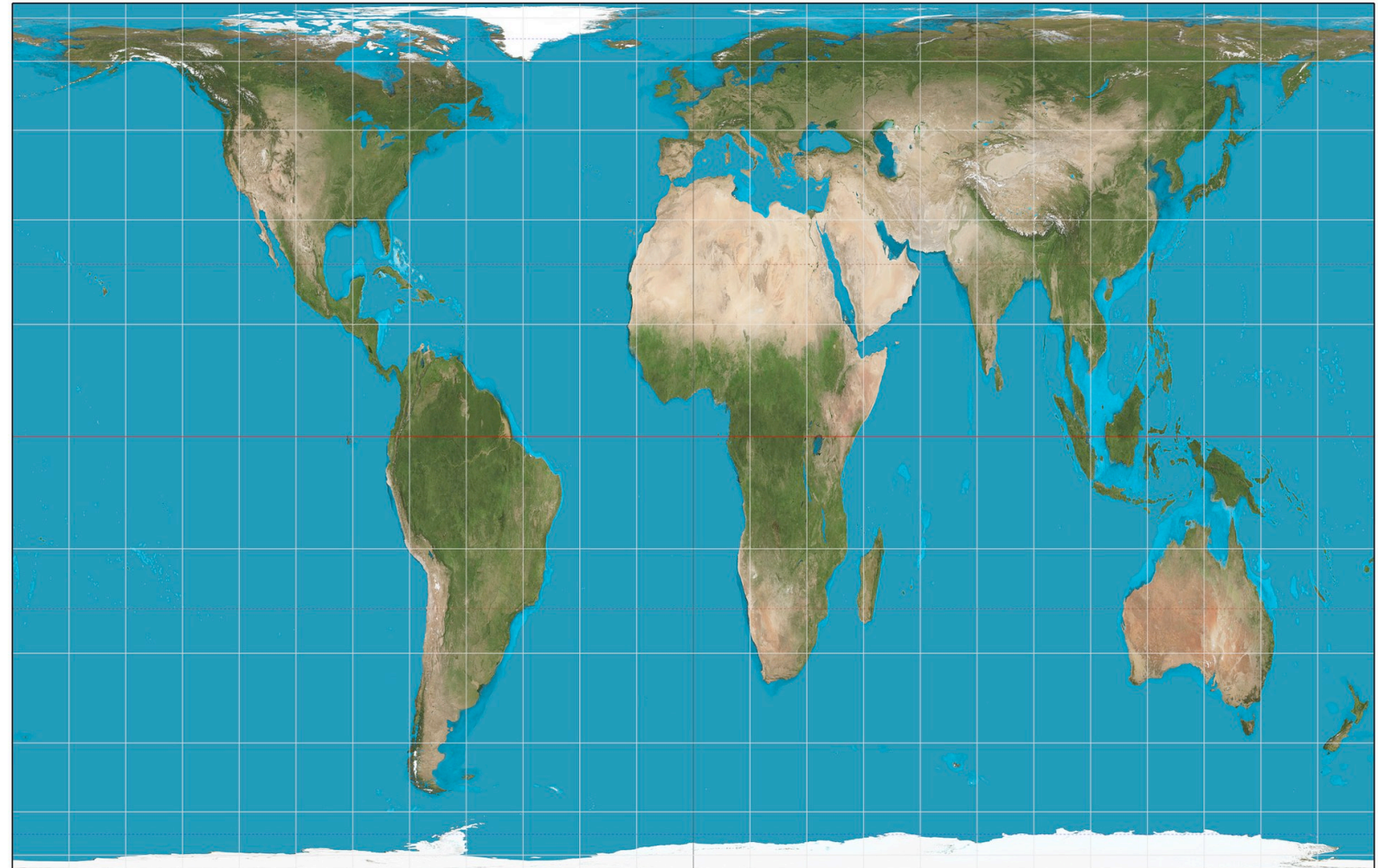
Studying in Clermont

5) Who are you?

© MapChart

- Europe: 19
- Asia: 10
- Africa: 5
- America:3
- Oceania: 1
- Antartica: 0

iMAPP countries

- We are happy to welcome you in the iMAPP program at Clermont

- This was envisioned 10 years ago and this joint degree is becoming a real and operative pedagogical and scientific system.

- We have prepared hopefully a solid training program, with balanced technical skills and fundamental knowledge.

- Hard work is needed from now on.

- We wish you a transformative and successful experience across Europe!