ADVANCED IMMUNOLOGY COURSE
2016 - 2017

Masters (M2) of Universities Paris Descartes, Pierre et Marie Curie et Diderot

PROGRAM

FROM NOVEMBER 14TH 2016 TO JANUARY 6TH 2017
ADVANCED IMMUNOLOGY COURSE
2016 - 2017

Masters (M2) des Universités Paris Descartes, Pierre et Marie Curie et Diderot

themes

- Development of the Immune System
- Molecular Basis for Antigen Recognition by B and T Lymphocytes
- Repertoire Selection and Auto-immunity
- Lymphocyte Interactions
- Immune Responses and Immunotherapy
- Innate Immune System

The course will be held:

- Teaching Center - Pavillon Louis Martin -
  28, rue du Docteur Roux
  75724 Paris Cedex 15

Practical Courses:
Teaching Center - Pavillon Louis Martin - Ground Floor

Lectures and Seminars:
- Room N° 2 - Teaching Center - Pavillon Louis Martin -

Bâtiment Social - Module 4 - Room 4
Centre d’Immunologie Humaine Bâtiment Metchnikoff
Centre d’Immunologie Humaine Bâtiment François Jacob

28, rue du Docteur Roux 75724 Paris Cedex 15
NOVEMBER 14TH TO DECEMBER 3RD 2016

Week 1-3

PRACTICAL COURSES

*************

DECEMBER 5TH TO DECEMBER 16TH 2016

Week 3-4

CONFERENCES

*************

*************

JANUARY 3RD 2017 EXAM

*************

JANUARY 4TH TO JANUARY 6TH 2017

BIBLIOGRAPHY SEMINARS
APPLICATION OF CUTTING EDGE TECHNOLOGIES IN THE CHARACTERIZATION OF AGE-DEPENDENT DIFFERENCES IN THE IMMUNE RESPONSE OF HEALTHY INDIVIDUALS
(supported in part by “Milieu Interieur“ LabEx)

DIRECTOR: MILENA HASAN

Conferences associated to the Practical Courses:

THURSDAY NOVEMBER 24

9:00 -10:00  Phylogeny of the Immune System  Stanislas POL
             (Institut Pasteur / Hôpital Cochin - Paris)

TUESDAY NOVEMBER 29

9:00-10:00  Genetic determinants of the Immune response  Lluis QUINTANA-MURCI
            (Institut Pasteur - Paris)

Designed and organized by
Murielle ALMOUSSA, Bernd JAGLA, Bruno CHARBIT, Milena HASAN,
Isabelle LEQUEUTRE, Valentina LIBRI, Sophie NOVAULT, Sandrine SCHMUTZ
Program of the Practical Work

Week 1

**Monday, November 14**

All 08:30 - 09:30 Reception of students and INTRODUCTION TO THE COURSE
     09:30 - 10:00 Presentation of students
     10:00 - 11:00 INTRODUCTION TO THE PRACTICAL WORK
     11:00 - 11:15 How to obtain approval for human samples manipulation (Estelle Mottez)
     11:30 - 12:00 Presentation of security rules
     12:15 - 13:00 lunch
     13:00 - 14:00 SEMINAR CYTOMETRY
     14:00- 18:00 Reception of blood; prepare reagents, cytometry staining

**Tuesday, November 15**

Group A+B 09:00-10:00 Set up of the cytometer
Group A+B 10:00-13:00 Sample acquisition
Group A+B 13:00-14:00 lunch
Group A+B 14:00-18:00 FlowJo data analysis
Group C+D 09:00-13:00 FlowJo data analysis
Group C+D 13:00-14:00 lunch
Group C+D 14:00-15:00 Set up of the cytometer
Group C+D 15:00-18:00 Sample acquisition

**Wednesday, November 16**

All 09:00-09:30 Introduction
Group A+B 09:30-13:00 Reception of blood; PBMC isolation, cell counting, freezing down of PBMC and plasma, immune stimulation of PBMC
Group A+B 14:00-16:30 run remaining samples on cytometer
Group A+B 16:30-18:00 FlowJo data analysis
     Group A+B 13:00-14:00 lunch
Group C+D 09:30-11:00 run remaining samples on cytometer
Group C+D 11:00-15:00 Reception of blood; PBMC isolation, cell counting, freezing down of PBMC and plasma, immune stimulation of PBMC
Group C+D 12:00-13:00 lunch
Group C+D 15:00-18:00 FlowJo data analysis
**Thursday, November 17**

All

09:00-12:00 finalize Flow Jo data analysis
12:00-13:00 lunch
13:00-14:30 Collection of supernatants after O/N stimulation; Freezing of supernatants and of cell pellets
14:30-18:00 Stimulation and staining of PBMC for imaging cytometry

**Friday, November 18**

All

09:00-12:00 Extraction of RNA, quantification of RNA
12:00-13:00 lunch
13:00-18:00 Reverse transcription, PCR and separation of amplified fragments on agarose gel

**Saturday, November 19**

Report writing
### Week 2

#### Monday, November 21

<table>
<thead>
<tr>
<th>Time</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>All 09:00-10:00</td>
<td><strong>SEMINAR SEQUENCING</strong></td>
</tr>
<tr>
<td>10:00-18:00</td>
<td>mRNA sequencing - library preparation</td>
</tr>
</tbody>
</table>

#### Tuesday, November 22

<table>
<thead>
<tr>
<th>Time</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group A+B 09:00-10:00</td>
<td><strong>SEMINAR ISX</strong></td>
</tr>
<tr>
<td>Group A+B 10:00-11:00</td>
<td><strong>Put in culture PBMC for Seahorse &amp; Cell Sorting</strong></td>
</tr>
<tr>
<td>Group A    11:00-13:30</td>
<td>ISX experiment</td>
</tr>
<tr>
<td>Group B    11:00-13:30</td>
<td>Prepare article for Journal Club</td>
</tr>
<tr>
<td>Group A+B  13:30-14:30</td>
<td><strong>lunch</strong></td>
</tr>
<tr>
<td>Group A    14:30-17:00</td>
<td>Prepare article for Journal Club</td>
</tr>
<tr>
<td>Group B    14:30-17:00</td>
<td>ISX experiment</td>
</tr>
<tr>
<td>Group C+D  09:00-10:00</td>
<td><strong>SEMINAR ELISA/MAGPIX</strong></td>
</tr>
<tr>
<td>Group C+D  10:00-13:00</td>
<td>MagPix</td>
</tr>
<tr>
<td>Group C+D  13:00-14:00</td>
<td><strong>lunch</strong></td>
</tr>
<tr>
<td>Group C+D  14:00-17:00</td>
<td>MagPix</td>
</tr>
</tbody>
</table>

#### Wednesday, November 23

<table>
<thead>
<tr>
<th>Time</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group A+B  09:00-10:00</td>
<td><strong>Immune stimulation of PBMC for Seahorse &amp; Cell sorting</strong></td>
</tr>
<tr>
<td>Group A+B  10:00-10:30</td>
<td><strong>SEMINAR ELISA/MAGPIX</strong></td>
</tr>
<tr>
<td>Group A+B  10:30-13:30</td>
<td>MagPix</td>
</tr>
<tr>
<td>Group A+B  13:30-14:30</td>
<td><strong>lunch</strong></td>
</tr>
<tr>
<td>Group A+B  14:30-17:30</td>
<td>MagPix</td>
</tr>
<tr>
<td>Group C+D  09:00-10:00</td>
<td><strong>SEMINAR ISX</strong></td>
</tr>
<tr>
<td>Group C+D  10:00-11:00</td>
<td><strong>Put in culture PBMC for Seahorse &amp; Cell sorting</strong></td>
</tr>
<tr>
<td>Group C    11:00-13:30</td>
<td>ISX experiment</td>
</tr>
<tr>
<td>Group D    11:00-13:30</td>
<td>Prepare article for Journal Club</td>
</tr>
<tr>
<td>Group C+D  13:30-14:30</td>
<td><strong>lunch</strong></td>
</tr>
<tr>
<td>Group D    14:30-17:00</td>
<td>ISX experiment</td>
</tr>
<tr>
<td>Group C    14:30-17:00</td>
<td>Prepare article for Journal Club</td>
</tr>
<tr>
<td>Group C+D  17:00-18:00</td>
<td><strong>SEMINAR SORTING</strong></td>
</tr>
</tbody>
</table>
### Thursday, November 24

<table>
<thead>
<tr>
<th>Time</th>
<th>Group</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>09:00</td>
<td>All</td>
<td>SEMINAR „From translational research to personalized medicine“ (Stanislas Pol)</td>
</tr>
<tr>
<td>10:00-11:00</td>
<td>Group A+B</td>
<td>SEMINAR SEAHORSE</td>
</tr>
<tr>
<td>11:00-13:30</td>
<td>Group A</td>
<td>Seahorse experiment</td>
</tr>
<tr>
<td>11:00-13:30</td>
<td>Group B</td>
<td>ISX data analysis</td>
</tr>
<tr>
<td>13:30-14:30</td>
<td>Group A+B</td>
<td>lunch</td>
</tr>
<tr>
<td>14:30-17:00</td>
<td>Group B</td>
<td>Seahorse experiment</td>
</tr>
<tr>
<td>14:30-17:00</td>
<td>Group A</td>
<td>ISX data analysis</td>
</tr>
<tr>
<td>10:00-11:00</td>
<td>Group C+D</td>
<td>Immune stimulation of PBMC for Seahorse &amp; Cell sorting</td>
</tr>
<tr>
<td>11:00-13:00</td>
<td>Group C+D</td>
<td>Staining of cells for sorting</td>
</tr>
<tr>
<td>13:00-14:00</td>
<td>Group C+D</td>
<td>lunch</td>
</tr>
<tr>
<td>14:00-16:30</td>
<td>Group C</td>
<td>Single-cell sorting</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Single-cell RT+ preamplification</td>
</tr>
<tr>
<td>14:00-16:30</td>
<td>Group D</td>
<td>report writing/prepare article for Journal Club</td>
</tr>
<tr>
<td>16:30-19:00</td>
<td>Group D</td>
<td>Single-cell sorting</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Single-cell RT+ preamplification</td>
</tr>
<tr>
<td>16:30-19:00</td>
<td>Group C</td>
<td>report writing/prepare article for Journal Club</td>
</tr>
</tbody>
</table>

### Friday, November 25

<table>
<thead>
<tr>
<th>Time</th>
<th>Group</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>09:00</td>
<td>Group A+B</td>
<td>SEMINAR SORTING</td>
</tr>
<tr>
<td>10:00-12:00</td>
<td>Group A+B</td>
<td>Staining of cells for sorting</td>
</tr>
<tr>
<td>12:00-13:00</td>
<td>Group A</td>
<td>lunch</td>
</tr>
<tr>
<td>13:00-15:30</td>
<td>Group A</td>
<td>Single-cell sorting</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Single-cell RT+ preamplification</td>
</tr>
<tr>
<td>13:00-15:30</td>
<td>Group B</td>
<td>report writing/prepare article for Journal Club</td>
</tr>
<tr>
<td>15:30-18:00</td>
<td>Group B</td>
<td>Single-cell sorting</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Single-cell RT+ preamplification</td>
</tr>
<tr>
<td>15:30-18:00</td>
<td>Group A</td>
<td>report writing/prepare article for Journal Club</td>
</tr>
<tr>
<td>10:00-11:00</td>
<td>Group C+D</td>
<td>SEMINAR SEAHORSE</td>
</tr>
<tr>
<td>11:00-13:30</td>
<td>Group C</td>
<td>Seahorse experiment</td>
</tr>
<tr>
<td>11:00-13:30</td>
<td>Group D</td>
<td>ISX data analysis</td>
</tr>
<tr>
<td>13:30-14:30</td>
<td>Group C+D</td>
<td>lunch</td>
</tr>
<tr>
<td>14:30-17:00</td>
<td>Group D</td>
<td>Seahorse experiment</td>
</tr>
<tr>
<td>14:30-17:00</td>
<td>Group C</td>
<td>ISX data analysis</td>
</tr>
</tbody>
</table>

### Saturday, November 26

Report writing
Week 3

Monday, November 28
All  
09:00-11:00  Seahorse data analysis  
11:00-12:00  MagPix data analysis  
12:00-13:00  lunch  
13:00-17:00  RNA sequencing - data analysis (QC and blast)  

Tuesday, November 29
All  
09:00-10:00  SEMINAR „Genetic determinants of the Immune response” (Lluis Quintana Murci)  
10:00-12:00  RNA sequencing - data analysis  
12:00-13:00  lunch  

Wednesday, November 30
Group A+B  
09:00-12:30  Classical ELISA  
Group A+B  
12:30-13:30  lunch  
Group A+B  
13:30-16:30  Classical ELISA  
Group C+D  
09:00-10:00  SEMINAR BIOMARK  
Group C  
10:00-13:00  BioMark experiment  
Group D  
10:00-13:00  Report writing  
Group C+D  
13:00-14:00  lunch  
Group D  
14:00-17:00  BioMark experiment  
Group C  
14:00-17:00  Report writing  

Thursday, December 1
Group C+D  
09:00-12:30  Classical ELISA  
Group C+D  
12:30-13:30  lunch  
Group C+D  
13:30-16:30  Classical ELISA  
Group A+B  
09:00-10:00  SEMINAR BIOMARK  
Group B  
10:00-13:00  Report writing  
Group A  
10:00-13:00  BioMark experiment  
Group A+B  
13:00-14:00  lunch  
Group B  
14:00-17:00  BioMark experiment  
Group A  
14:00-17:00  Report writing
Friday, December 2
All 09:00-12:00  BioMark data analysis
12:00-13:00  lunch
Group C 13:00-13:30  present an article: Journal Club
Group D 13:30-14:00  present an article: Journal Club
Group B 14:00-14:30  present an article: Journal Club
Group A 14:30-15:00  present an article: Journal Club
15:00-17:00  Report writing
17:00  farewell party

Saturday, December 3
Finalize reports

Dead-line for submission of the reports: Sunday, December 4, at midnight
ADVANCED IMMUNOLOGY CONFERENCES

FROM MONDAY DECEMBER 5TH TO FRIDAY DECEMBER 16TH 2016

MODULE D’ECOLE DOCTORALE
ADVANCED IMMUNOLOGY -1

MONDAY DECEMBER 5

9:00 -12:00  Phylogeny of the Immune System  
Louis du PASQUIER  
(University of Bale - Switzerland)

13:30 - 16:30  Stem cells, hematopoiesis and lymphopoiesis  
Ana CUMANO  
(Institut Pasteur - Paris)

TUESDAY DECEMBER 6

9:00 - 12:00  Origin of antigen receptor diversity and recombination  
Ludovic DERIANO  
(Institut Pasteur - Paris)

13:30 - 16:30  Thymus development  
Thomas BOEHM  
(Max-Planck Institute - Freiburg - Germany)

WEDNESDAY DECEMBER 7

9:00 - 12:00  Innate lymphoid cells  
James DI SANTO  
(Institut Pasteur - Paris)

13:30 - 16:30  Lymphocyte dynamics.  
Philippe BOUSSO  
(Institut Pasteur - Paris)

THURSDAY DECEMBER 8

9:00 - 12:00  α/β T cell development and selection  
Ludger KLEIN  
(Institute for Immunology - Munich - Germany)

13:30 - 16:30  Peripheral tolerance and autoimmunity.  
Burkhard BECHER  
(University of Zurich - Switzerland)

FRIDAY DECEMBER 9

9:00 - 12:00  Heterogeneity of T helper cell subsets.  
Marc VELDHOEN  
(Babraham Institute - Cambridge - UK)

13:30 - 16:30  B cell selection and heterogeneity  
Simon FILLATREAU  
(Institut Necker Enfants Malades - Paris)

SATURDAY DECEMBER 10

9:00 - 12:00  Lymphocyte activation and Immunological Synapses  
Andrés ALCOVER  
(Institut Pasteur - Paris)
## ADVANCED IMMUNOLOGY CONFERENCES

**MODULE d’ECOLE DOCTORALE**
**ADVANCED IMMUNOLOGY- 2**

### MONDAY DECEMBER 12

| 09:00 - 12:00 | B cell memory | Thierry DEFRANCE  
|--------------|---------------|------------------  
|              |               | (Center for Infectiology Res. - Lyon) |
| 13:30 - 16:30 | γ/δ T cells : development and function. | Adrian HAYDAY  
|              |               | (Francis Crick Institute - London - UK) |

### TUESDAY DECEMBER 13

| 09:00 - 12:00 | Lymphoid tissue development. | Tom CUPEDO  
|---------------|----------------------------|------------------  
|              |                           | (Erasmus University, Rotterdam -The Netherlands) |
| 13:30 - 16:30 | Dendritic cells | Philippe PIERRE  
|               |                       | (Centre d’Immunologie Marseille - Luminy) |

### WEDNESDAY DECEMBER 14

| 09:00 - 12:00 | Vaccination: the race against infectious diseases | Frédéric TANGY  
|              |                                           | (Institut Pasteur - Paris) |
| 13:30 - 16:30 | Leukemia pathogenesis | Camille LOBRY  
|               |                             | (Institut Gustave Roussy - Villejuif ) |

### THURSDAY DECEMBER 15

| 09:00 - 12:00 | Molecular Basis of Immune-deficient diseases | Alain FISCHER  
|              |                                              | (Institut Imagine - Paris) |
| 13:30 - 16:30 | Fc receptors and allergy | Marc DAERON  
|                |                                        | (Centre d’Immunologie Marseille - Luminy) |

### FRIDAY DECEMBER 16

| 09:00 - 12:00 | Control of Disease Susceptibility | Miguel SOARES  
|               |                                    | (Gulbenkian Institute, Oeiras - Portugal) |
| 13:30 - 16:30 | Commensals, the Immune System and the Brain | Gerard EBERL  
|               |                                          | (Institut Pasteur - Paris) |
**ADVANCED IMMUNOLOGY BIBLIOGRAPHY SEMINARS**

**WEDNESDAY JANUARY 4**

9:30 - 12:30  
**SEMINAR 1**  
Antibodies in health and disease  
*Organizers:* Friederique JÖNSSON (Institut Pasteur - Paris)  
Hugo MOUQUET (Institut Pasteur - Paris)

14:00 - 17:00  
**SEMINAR 2**  
Lymphocyte Trafficking  
*Organizers:* Béatrice BREART (Institut Pasteur - Paris)  
Emmanuel DONNADIEU (Institut Cochin - Paris)

**THURSDAY JANUARY 5**

9:30 - 12:30  
**SEMINAR 3**  
Lymphocyte activation and transcriptional regulation.  
*Organizers:* Christian VOSSHENRICH (Institut Pasteur - Paris)  
Jerome DELON (Institut Cochin - Paris)

14:00 - 17:00  
**SEMINAR 4**  
T cell responses.  
*Organizers:* Corinne TANCHOT (Hôpital Necker - Paris)  
Christine BOURGEOIS (Institut Cochin - Paris)

**FRIDAY JANUARY 6**

9:30 - 12:30  
**SEMINAR 5**  
Innate immunity  
*Organizers:* Jean-Pierre LEVRAUD (Institut Pasteur - Paris)  
Molly INGERSOLL (Institut Pasteur - Paris)

14:00 - 17:00  
**SEMINAR 6**  
Molecular basis of B cell differentiation.  
*Organizers:* Paulo VIEIRA (Institut Pasteur - Paris)  
Isabelle ANDRÉ-SCHMUTZ (Institut Imagine - Paris)

17:30  
**PARTY**
**ADVANCED IMMUNOLOGY COURSE 2016-2017**

**EXAM**

<table>
<thead>
<tr>
<th>Test</th>
<th>Points</th>
<th>M2 Immunologie Approfondie</th>
</tr>
</thead>
<tbody>
<tr>
<td>Written test 3 subjects</td>
<td>100</td>
<td>UE Spécialisation 12 ECTS</td>
</tr>
<tr>
<td>Practical Laboratory Work (TP)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bibliography seminars</td>
<td>50</td>
<td>UE Analyse Scientifique 6 ECTS</td>
</tr>
</tbody>
</table>

**Practical Laboratory work (TP) is evaluated as follows:**
1. Daily evaluation by the TP Supervisor judging the student’s investment, the quality of work provided, participation to discussions, etc.
2. A report written by each « binome », which is sent to the TP Supervisor as pdf file, by e-mail. Dead line: Sunday, December 4, 2016 midnight.
3. Written test the day of the exam.

**Written test: January 3rd, 2017.** Three written questions,
- Subjects 1 and 2 consist on two independent series of questions related to data extracted from two published articles.
- Subject 3: Written test concerning the TP: 10-20 questions regarding the practical work.

**Bibliography seminars:** January 4- 6th, 2017. Each student is evaluated individually according to an evaluation grid, by the supervisors of each seminar. The work carried out in common by each group is also evaluated. Guidelines are included in the program.
Bibliography seminars  (UE Analyse Scientifique (BMC551-I-A) Guidelines)

The goal of these seminars is to improve the student’s ability to analyze the scientific literature and to present it to an audience. Each student should try to capture and present the essential elements of each article, underlining the scientific question asked, the experimental approaches used, the results obtained and the main conclusions outlined. The students should then discuss what they think are the stronger and weaker points in a didactic and constructive manner. Finally, the scientific, therapeutic or technological advancements may be discussed.

Preparation

- Articles are chosen by the seminar advisors and are available as pdf files at the Pasteur Immunology Course web page. (http://webcampus.pasteur.fr/display.jsp?id=c_13813) via the intranet.
- The students chose a seminar theme, three to four students per seminar. It is recommended to choose a seminar subject non related with the subject of your Master thesis.
- Reading:
  - All the students of a given seminar should read all the articles proposed for that seminar. It is recommended to start reading the articles enough ahead of time, so there is time to do some bibliography concerning the subject, and to discuss with the other students of the group, as well as with the seminar advisors.
  - It is important that the students contact the seminar advisors to ask questions about the different articles provided, and about the modalities for the presentation. Advisor’s contact addresses are available on the course program.
- Presentation:

The students present the seminars in English.

A “power-point” presentation of 20 min (approx) + 10 min of questions

- An introduction on the subject helping to place the articles in the general context of the literature is prepared by each group and presented by one or several students.
- Each student presents one article.
- The experimental approaches used in each article should be understood and briefly commented. Some techniques might be new and key for the results and should be highlighted during the presentation.
- The results should be clearly described. Although the whole article should be thoroughly read and understood, it is often important not to describe all the figures during its presentation, or to present them in a different order. This helps the understanding.
- A critical analysis of the results and the conclusions has to be done. The student may discuss the results in a different manner than the article, and get to different conclusions if he (she) finds that appropriate.
- A general conclusion should be drawn underscoring the general interest of the work, it is importance for the knowledge in the field, as well as the putative scientific, therapeutic or technical breakthroughs.
- A particular effort should be done to make a didactic presentation and to stimulate discussion.
- Bibliography seminars are meant to stimulate discussion between the students. Therefore, attendance to all the seminars is mandatory. Questions and comments from other students mostly reinforce the understanding of the presentation and the whole quality of the bibliography seminars series. Increased discussion generally increases the marks given to the students. Be participative!