

INSTITUT PASTEUR COURSE - EDUCATION CENTER

Programme 2026-2027
Advanced immunology

Institut Pasteur, Paris, November 16, 2026 - January 8, 2027

Ana Cumano, Rachel Golub, Milena Hasan

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SORBONNE UNIVERSITÉ · Université Paris Cité · ENS · PSL UNIVERSITÉ PARIS · Milieu Intérieur · INSTITUT Pasteur

ADVANCED IMMUNOLOGY COURSE

2026 - 2027

MASTERS (M2) UNIVERSITE PARIS CITE ET SORBONNE UNIVERSITE

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

DIRECTORS OF THE COURSE

Ana CUMANO
Unité de Lymphocytes et Immunité
Institut Pasteur - Paris
Tel +33(0)1 45 68 82 55
Mobile : +33 (0)6 07 65 02 08
E.mail : ana.cumano@pasteur.fr

Rachel GOLUB
Unité de Lymphopoièse
Institut Pasteur - Paris
Tel +33(0)1 45 68 87 66
Mobile : +33 (0)6 24 70 46 36
E.mail : rachel.golub@pasteur.fr

HEAD OF PRACTICAL COURSES

Milena HASAN
Single Cell Biomarkers UTechS
Institut Pasteur - Paris
Tel +33(0)1 40 61 30 27
Mobile : +33(0)6 84 39 43 52
E.mail : milena.hasan@pasteur.fr

NOVEMBER 16 TO DECEMBER 4, 2026

WEEKS 1 - 3

PRACTICAL COURSES 1ST FLOOR

CLASSROOM 2 & 3 (*& 4*)

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DECEMBER 7 TO DECEMBER 18, 2026

WEEKS 4 - 5

CONFERENCES - CLASSROOM 2 & 3

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JANUARY 5, 2027

EXAM - CLASSROOM 2 & 3

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JANUARY 6 TO JANUARY 8, 2027

BIBLIOGRAPHY SEMINARS - CLASSROOM 2 & 3

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ADVANCED IMMUNOLOGY PRACTICAL COURSES

Application of cutting edge technologies in the characterization of age-dependent differences in the immune response of healthy individuals

(supported in part by "Milieu Intérieur" LabEx project)

HEAD OF PRACTICAL COURSES: Milena HASAN

See dedicated booklet for the full program of practical courses

Designed and organized by:

Laura Barrio Cano, Alice Bongers, Laurie Choux, Slobodan Culina, Stephan Fischer, Milena Hasan, Esma Karkeni, Léo Leclerc, François Le Guerroue, Catherine Lonchamp, Sébastien Mella, Marc Monot, Sandrine Schmutz, Valérie Seffer, Tatiana Traboulsi

THURSDAY 12 NOVEMBER

13:00 - 14:00 Pre Start (IT tools connections) Visio Education Center

Week 1 - Classroom 2 & 3 *(& 4)* & 1st Floor

MONDAY, NOVEMBER 16 - INTRODUCTION - PBMC THAWING AND STIMULATION

09:30 - 10:30	Reception of students & Introduction	**Administrative & Technical teams** (Centre d'Enseignement, Institut Pasteur - Paris)
10:30 - 11:00	Presentation of students	**A. Cumano, R. Golub, M. Hasan** (Institut Pasteur - Paris)
11:00 - 12:30	Introduction to Practical Courses	**M. Hasan** (Institut Pasteur - Paris)
13:15 - 13:30	PHOTO	
All		
13:30 - 14:00	Presentation of laboratory rules	**C. Lonchamp, L. Leclerc** (Institut Pasteur - Paris)
14:00 - 16:30	PBMCs thawing, leave in resting 1h, counting, immune stimulation	**S. Culina, L. Leclerc C. Lonchamp, S. Schmutz** (Institut Pasteur - Paris)
16:30 - 18:30	Staining of cells for cytometry	**S. Culina, L. Leclerc C. Lonchamp, S. Schmutz** (Institut Pasteur - Paris)

TUESDAY, NOVEMBER 17 - CELL PHENOTYPING - FLOW CYTOMETRY

All		
09:00 - 10:00	Seminar Flow cytometry	**S. Schmutz** (Institut Pasteur - Paris)
Group A+B		
10:00 - 12:00	Cytometer setup and sample acquisition	**S. Culina, S. Schmutz** (Institut Pasteur - Paris)
14:00 - 16:00	Preparation of Journal Club	
Group C+D		
10:00 - 12:00	Preparation of Journal Club	
14:00 - 16:00	Cytometer setup and sample acquisition	**S. Culina, S. Schmutz** (Institut Pasteur - Paris)
14:00 - 16:00	Preparation of Journal Club	

All

16:00 - 17:00	Collection of supernatants after O/N stimulation; Freezing of supernatants and cell pellet for RNA extraction	**L. Leclerc, C. Lonchamp** (Institut Pasteur - Paris)

WEDNESDAY, NOVEMBER 18 - FLOW CYTOMETRY AND RNA XTRACTION

All

09:00 - 10:00	Seminar imaging cytrometry MARK II	**F. Le Guerroue** (Institut Pasteur - Paris)
10:00 - 12:00	Extraction of RNA, QC using NanoDrop, keep on ice	**L. Leclerc, C. Lonchamp** **V. Seffer, T. Traboulsi** (Institut Pasteur - Paris)
13:00 - 18:00	Flow Cytrometry data analysis, FlowJo	**L. Choux** **S. Culina, S. Schmutz** (Institut Pasteur - Paris)

THURSDAY, NOVEMBER 19 - IMAGING CYTOMETRY AND CELL METABOLISM

All

09:30 - 10:00	Seminar Seahorse	**L. Barrio Cano** (Institut Pasteur - Paris)

Group A

10:00 - 13:00	Seahorse experiment	**L. Barrio Cano** (Institut Pasteur - Paris)

Group B

10:00 - 13:00	MARKII experiment (with 10:30-11:00 Intro to Bioplex200 instrument)	**E. Karkeni** **F. Le Guerroue** (Institut Pasteur - Paris)

Group C+D

10:00 - 13:00	Flow Cytometry data analysis	**L. Choux** (Institut Pasteur - Paris)

Group A+B

14:00 - 17:00	Flow Cytometry data analysis	**L. Choux** (Institut Pasteur - Paris)

Group C

14:00 - 17:00	Seahorse experiment	**L. Barrio Cano** (Institut Pasteur - Paris)

Group D

14:00 - 17:00	MARKII experiment (with 14:30-15:00 Intro to Bioplex200 instrument)	**E. Karkeni** **F. Le Guerroue** (Institut Pasteur - Paris)

FRIDAY, NOVEMBER 20 - IMAGING CYTOMETRY AND CELL METABOLISM

Group A+B

10:00 - 13:00 Preparation of Journal Club

Group C

10:00 - 13:00 MARKII experiment
(with 10:30-11:00 Intro to Bioplex200 instrument)
E. Karkeni
F. Le Guerroue
(Institut Pasteur - Paris)

Group D

10:00 - 13:00 Seahorse experiment
L. Barrio Cano
(Institut Pasteur - Paris)

Group C+D

14:00 - 17:00 Preparation of Journal Club

Group A

14:00 - 17:00 MARKII experiment
(with 14:30-15:00 Intro to Bioplex200 instrument)
E. Karkeni
F. Le Guerroue
(Institut Pasteur - Paris)

Group B

14:00 - 17:00 Seahorse experiment
L. Barrio Cano
(Institut Pasteur - Paris)

Week 1-3 - November 23 - December 4, 2026

Week 2 - Classroom 2 & 3 *(& 4)* & 1st Floor

Monday, November 23 – RNA Sequencing – Library Preparation

All

09:00 - 18:00	QC by Qubit, Library Preparation	**L. Leclerc, C. Lonchamp, M. Monot** (Institut Pasteur - Paris)

Tuesday, November 24 – Imaging Cytometry, Cell metabolism and Journal Club

09:30 - 11:50	Journal Club: Present an article - Group A, B, C & D	**L. Barrio Cano, A. Bongers S. Culina, S. Fischer M. Hasan, E. Karkeni L. Leclerc, F. Le Guerroue C. Lonchamp, S. Mella M. Monot, S. Schmutz V. Seffer, T. Traboulsi** (Institut Pasteur - Paris)
13:00 - 15:00	Seahorse data analysis	**L. Barrio Cano** (Institut Pasteur - Paris)
15:00 - 18:00	MARKII data analysis	**M. Hasan, E. Karkeni F. Le Guerroue, L. Leclerc C. Lonchamp** (Institut Pasteur - Paris)

Wednesday, November 25 - Multiplex protein profiling

All

09:00 - 09:30	SEMINAR PROTEIN PROFILING ELISA / xMAP	**E. Karkeni** (Institut Pasteur - Paris)
09:30 - 11:30	Bioplex200 experiment	**E. Karkeni, V. Seffer** (Institut Pasteur - Paris)
12:30 - 18:00	Bioplex200 experiment (+ Prism software)	**E. Karkeni, V. Seffer L. Leclerc, C. Lonchamp** (Institut Pasteur - Paris)

THURSDAY, NOVEMBER 26 - MULTIPLEX PROTEIN PROFILING AND RNA SEQUENCING

All

09:30 - 12:00	Bioplex200 data analysis (+ Prism software)	**E. Karkeni** **L. Leclerc, C. Lonchamp** (Institut Pasteur - Paris)
13:15 - 14:30	SEMINAR SEQUENCING + Summary of the wetlab experiment	**M. Monot** (Institut Pasteur - Paris)
14:30 - 18:00	RNA sequencing data analysis: intro	**S. Fischer, S. Mella** (Institut Pasteur - Paris)

FRIDAY, NOVEMBER 27 - SEQUENCING - DATA ANALYSIS

09:00 - 10:00	**Seminar** "The IL-23 pathway in inflammatory diseases, from basic biology to therapy and back"	**L. Rogge** (Institut Pasteur - Paris)

All

10:00 - 12:00	RNA-sequencing - data analysis	**A. Bongers** **S. Fischer, S. Mella** (Institut Pasteur - Paris)
13:30 - 17:30	RNA-sequencing - data analysis	**A. Bongers** **S. Fischer, S. Mella** (Institut Pasteur - Paris)

Week 3 - Classroom 2 & 3 *(& 4)* & 1st Floor

MONDAY, NOVEMBER 30 - SEQUENCING - DATA ANALYSIS

All

09:00 - 10:00	SEMINAR Single Cell Transcriptomics	**T. Traboulsi** (Institut Pasteur - Paris)
10:00 - 12:30	Single Cell RNA-sequencing - data analysis	**A. Bongers** **S. Fischer, S. Mella** (Institut Pasteur - Paris)
13:30 - 17:30	Single Cell RNA-sequencing - data analysis	**A. Bongers** **S. Fischer, S. Mella** (Institut Pasteur - Paris)

TUESDAY, DECEMBER 1 - SINGLE CELL SORTING AND TRANSCRIPTOMICS

All

09:00 - 10:00	SEMINAR CELL SORTING	**S. Schmutz** (Institut Pasteur - Paris)

Group A

10:00 - 11:30	Cell sorting and single cell partitioning for scRNA-Seq	**S. Schmutz, V. Seffer** **T. Traboulsi** (Institut Pasteur - Paris)

Group B

11:30 - 13:00	Cell sorting and single cell partitioning for scRNA-Seq	**S. Schmutz, V. Seffer** **T. Traboulsi** (Institut Pasteur - Paris)

Group C

14:00 - 15:30	Cell sorting and single cell partitioning for scRNA-Seq	**S. Schmutz, V. Seffer** **T. Traboulsi** (Institut Pasteur - Paris)

Group D

15:30 - 17:00	Cell sorting and single cell partitioning for scRNA-Seq	**S. Schmutz, V. Seffer** **T. Traboulsi** (Institut Pasteur - Paris)

All

10:00 - 17:00	Preparation of presentations	

WEDNESDAY, DECEMBER 2 - CONFERENCE ASSOCIATED TO THE PRACTICAL COURSES

All

09:00 -13:00 Preparation of presentations

14:00 – 15:00 **Seminar** "Mimicking human immunology in vitro: emerging role of lymphoid tissue 3D models" — **L. Chakrabarti** (Institut Pasteur - Paris)

15:00 - 17:30 Preparation of presentations

THURSDAY, DECEMBER 3 - CONFERENCE ASSOCIATED TO THE PRACTICAL COURSES

09:00 10:00 Preparation of presentations

10:00 - 11:00 **Seminar** "Genetic determinants of the Immune response" — **L. Quintana-Murci** (Institut Pasteur - Paris)

11:00 - 18:00 Preparation of presentations

hand in presentations by midnight

FRIDAY, DECEMBER 4

All

09:00 - 16:30 Presentation of the TP results (per pair) — **L. Barrio Cano, A. Bongers, L. Choux, S. Culina, S. Fischer, M. Hasan, E. Karkeni, L. Leclerc, F. Le Guerroue, C. Lonchamp, S. Mella, M. Monot, S. Schmutz, V. Seffer, T. Traboulsi** (Institut Pasteur - Paris)

17:00 Concluding remarks & Party — **L. Barrio Cano, A. Bongers, L. Choux, S. Culina, S. Fischer, M. Hasan, E. Karkeni, L. Leclerc, F. Le Guerroue, C. Lonchamp, S. Mella, M. Monot, S. Schmutz, V. Seffer, T. Traboulsi** (Institut Pasteur - Paris)

Weeks 4 & 5 - DECEMBER 7- 18, 2026

Week 4 & 5 - Classroom 2 & 3

MONDAY, DECEMBER 7

09:00 - 12:00 Phylogeny of the Immune System — **L. du Pasquier** (University of Basel - Switzerland)

13:30 - 16:30 Hematopoiesis — **A. Cumano** (Institut Pasteur - Paris)

TUESDAY, DECEMBER 8

09:00 - 12:00 Origin of antigen receptor diversity and recombination — **L. Deriano** (Institut Pasteur - Paris)

13:30 - 16:30 Dendritic cells — **P. Guermonprez** (Institut Pasteur - Paris)

WEDNESDAY, DECEMBER 9

09:30 - 12:00 Human Immunology — **P. Brodin** (Karolinska Institute - Sweden)

13:30 - 16:30 α/β T cell development and selection — **L. Klein** (Institute for Immunology - Munich - Germany)

THURSDAY, DECEMBER 10

9:00 - 12:00 Thymus development — **G. Anderson** (University of Birmingham - UK)

13:30 - 16:30 Immune response and vaccination strategies to Plasmodium — **R. Amino** (Institut Pasteur - Paris)

FRIDAY, DECEMBER 11

09:00 - 12:00 Heterogeneity of T helper cell subsets — **M. Veldhoen** (Institute of Molecular Medicine - Lisbon - Portugal)

13:30 - 16:30 Innate lymphoid cells — **J. Neves** (King's College - UK)

MONDAY, DECEMBER 14

09:00 - 12:00 Peripheral tolerance and autoimmunity. **B. Becher**
University of Zurich - Switzerland)

13:30 - 16:30 γ /δ T cells : development and function **B. Silva Santos**
(Institute of Molecular Medicine – Lisbon - Portuga)

TUESDAY, DECEMBER 15

09:00 - 12:00 Lymphoid tissue development **S. Luther**
(University of Lausanne - Switzerland)

13:30 - 16:30 Lymphocyte activation and Immunological synapses **C. Hivroz**
(Institut Curie - Paris)

WEDNESDAY, DECEMBER 16

09:00 - 12:00 Commensals, the Immune System and the Brain **G. Eberl**
(Institut Pasteur - Paris)

13:30 - 16:30 Lymphoma pathogenesis **R. Küppers**
(University of Duisburg - Essen - Germany)

THURSDAY, DECEMBER 17

09:00 - 12.00 Genetic basis of Immune Pathologies **V. Beziat**
(Institut Imagine - Paris)

13:30 - 16:30 Effector functions of antibodies **M. Daeron**
(Centre d'Immunologie - Marseille - Luminy)

FRIDAY, DECEMBER 18

09:00 - 12:00 Neuroimmunology **A. Deczkowska**
(Institut Pasteur - Paris)

13:30 - 16:30 B cell memory **D. Calado**
(Francis Crick Institute - London – UK)

Week 6 - JANUARY 5 - 8, 2027

Week 6- Classroom 2 & 3

TUESDAY, JANUARY 5 - CLASSROOM 2 & 3

09:00 - 13:00 **EXAM**

BIBLIOGRAPHY SEMINARS

WEDNESDAY, JANUARY 6

09:30 - 12:30 **SEMINAR 1**: Innate immunity

D. Cerina (INSERM - Paris)
M. Rousseau (INSERM - Paris)

14:00 - 17:00 **SEMINAR 2**: Lymphocyte Trafficking

E. Donnadieu (Institut Cochin - Paris)
L. Dupré (Toulouse University)

THURSDAY, JANUARY 7

09:30 - 12:30 **SEMINAR 3**: Molecular basis of B cell differentiation

S. Mancini (Université Rennes)
R. Haddad (CEA - Paris)

14:00 - 17:00 **SEMINAR 4**: T cell responses

C. Grandjean (Institut Pasteur - Paris)
N. Serafini (Institut Pasteur - Paris)

FRIDAY, JANUARY 8

09:30 - 12:30 **SEMINAR 5**: Lymphocyte activation and transcriptional regulation

E. Bianchi (Institut Pasteur - Paris)
V. di Bartolo (Institut Pasteur - Paris)

14:00 - 17:00 **SEMINAR 6**: Antibodies in health and disease

F. Jönsson (Institut Pasteur - Paris)
H. Mouquet (Institut Pasteur - Paris)