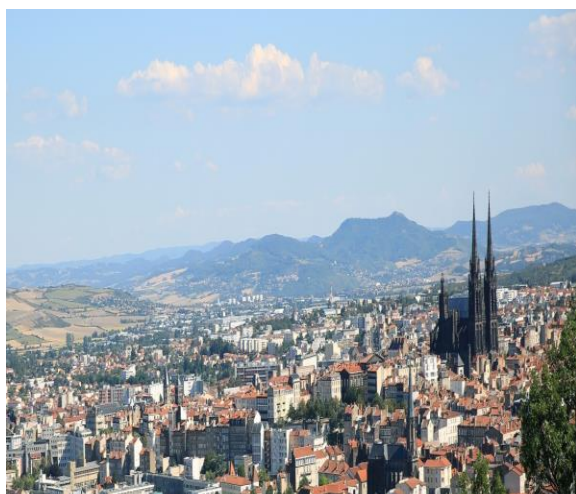


23rd June - 13th July 2019

Clermont-Ferrand and Rennes, France

SUMMER SCHOOL

Chemistry & Environmental Sciences:
Analysis, Characterisation and Remediation of
Contaminated Soils and Waters



GENERAL PRESENTATION:

The scientific topic of this summer school is based on one of the main challenges of the XXIst century, the protection of the environment and more particularly the quality of soils and water resources. In fact, soils or water resources face high anthropic pressure since more than 50 years and it is urgent to work on their preservations for a sustainable development and for the future generations. Environmental protection, which includes restoring and preserving water and soil resources, is now a priority for China. New technologies, clean processes involving chemical reactions are among the ways to be explored to repair the harmful effects on our environment. It is within this very general framework that we propose this summer school for students of Chinese and Brazilian nationality to train them in these environmental issues and new cost-effective processes for soil and water remediation.

This summer school is co-organized in Clermont-Ferrand and Rennes.

Clermont-Ferrand is a city located in the center of France. The natural environment around the city is exceptional with diversity of landscapes and the unique volcanic landscape, in particular the beauty spots of the puy de Dôme (giant among Auvergne's volcanoes). Clermont-Ferrand is also famous for its very special black stone architecture in the old city center and for its university « Université Clermont Auvergne (UCA) », a multidisciplinary university open to the world for the international cooperation and more particularly with China.

The site of Clermont-Ferrand is particularly adequate to welcome this summer school first of all because of the scientific potential which exists in the field of the chemistry of the environment and more particularly in that of the water treatment. Indeed, the Federation of Environmental Researches (FR CNRS-UCA-INRA N° 3467) and the axis "Chemistry of the Environment" of the Institute of Chemistry of Clermont-Ferrand (UMR UCA-CNRS-SIGMA Clermont N° 6296) will be the scientific structures which will supply equipment and staffs for the smooth running of this summer school. Furthermore, a strong and constant partnership exists now for more than 10 years with the Graduate School of Chemistry of Rennes (ENSCR, Rennes University) with colleagues specialists more particularly on the treatment of soils and scale up of water treatment technologies.

Rennes is both the capital of the region and a busy regional hub, and it is increasingly a destination for visitors from Europe and around the world. The vibrant university city of Rennes is an exciting venue that guarantees a successful summer school amid the Celtic Culture of Brittany Rennes. Rennes offers visitors a wealth of fantastic architecture in its old town, from medieval and Renaissance houses to majestic classical buildings. The historic center is lovely to wander around with its typical paved streets, lively squares lined with café terraces, its crêperies and shops. The 15th-century Portes Mordelaises gate, formerly the city's main entrance, is nearby to richly-decorated 19th-century building, the Saint-Pierre cathedral. From a

heritage and historical point of view, the Parlement of Brittany building is one of Rennes and Brittany's finest tourist attractions.

The Institut des Sciences Chimiques de Rennes is a joint Research Department associating the CNRS (INC et INSIS), The Université de Rennes 1, the Ecole Nationale Supérieure de Chimie de Rennes (ENSCR) and the Institut National des Sciences Appliquées de Rennes INSA de Rennes. This Institute gathers together all the academic forces in chemistry at the Rennes site. At the beginning of 2017, it brings together more than 280 permanent staff, including approximately 140 assistant-professors and professors, 60 CNRS researchers and 80 engineers and technicians, making it the biggest chemistry research lab in France. It has become an essential actor on the international chemistry scene. Research in chemistry in Rennes has undeniable expertise in the design and synthesis of molecules, crystals and materials, environmental chemistry, carrying dedicated functions or properties, using a very wide variety of tools to engineer molecules and materials.

For more than 100 years, the Ecole Nationale Supérieure de Chimie de Rennes (ENSCR) has been training generalist graduate engineers in chemistry for all companies, for careers in production and support services, from engineering to management, for industries in France, Europe and around the world. Chemical engineering graduates from the ENSCR are recognized and much sought-after on the job market, for their mastery of the ideas and the tools of their trade. They are able to run projects in complete autonomy at the national and international level.

ORGANIZING COMMITTEE:

Marcello BRIGANTE (University Clermont Auvergne, ICCF)

Khalil HANNA (Ecole Nationale Supérieure de Chimie de Rennes, ISCR)

Gilles MAILHOT (University Clermont Auvergne, ICCF)

Caroline SEZESTRE (SEMI, École Nationale Supérieure de Chimie de Rennes)

Carole TURPIN (University Clermont Auvergne, ICCF)

CONTACTS CHAIRMEN OF THE SUMMER SCHOOL (telephone and e-mail):

- Pr Gilles MAILHOT : +33 (0)6 61 63 99 20 – gilles.mailhot@uca.fr
- Pr Khalil HANNA : +33 (0)6 65 09 58 30 – khalil.hanna@ensc-rennes.fr
- Pr Marcello BRIGANTE : +33 (0)6 01 81 70 28 – marcello.brigante@uca.fr

EMERGENCY NUMBERS:

Ambulance (Samu): 15

Police: 17

Firemen: 18

PROGRAM:

Scientific program:

The Summer School "Chemistry & Environmental Sciences: Analysis, Characterization and Remediation of Contaminated Soils and Waters" will include:

- 18 h French courses
- 33 h of teaching courses
- 16.5 h of practical work
- 4 Conferences given by a highly recognized expert in the field

Scientific courses, practical work, conferences (in English language).

French courses as foreign language will be given by the centre FLEURA of the Clermont Auvergne University. These courses will give a first approach of the French language and will allow to become integrated more quickly into the culture and into the French everyday life.

Evaluation of skills acquired during the courses: project presentation + 10-15 min of oral examination and discussion

Scientific visits:

- The Institute of Chemistry of Clermont-Ferrand (ICCF) including 5 research groups.
- The monitoring center of the atmosphere situated at the top of puy-de-Dôme volcano.
- The ISCR Rennes counts on 8 research teams and more than 280 permanent employees (<https://iscr.univ-rennes1.fr/umr/?lang=en>).
- The ENSCR has about forty research scientists working within 5 research teams (<https://www.ensc-rennes.fr/en/research/>).

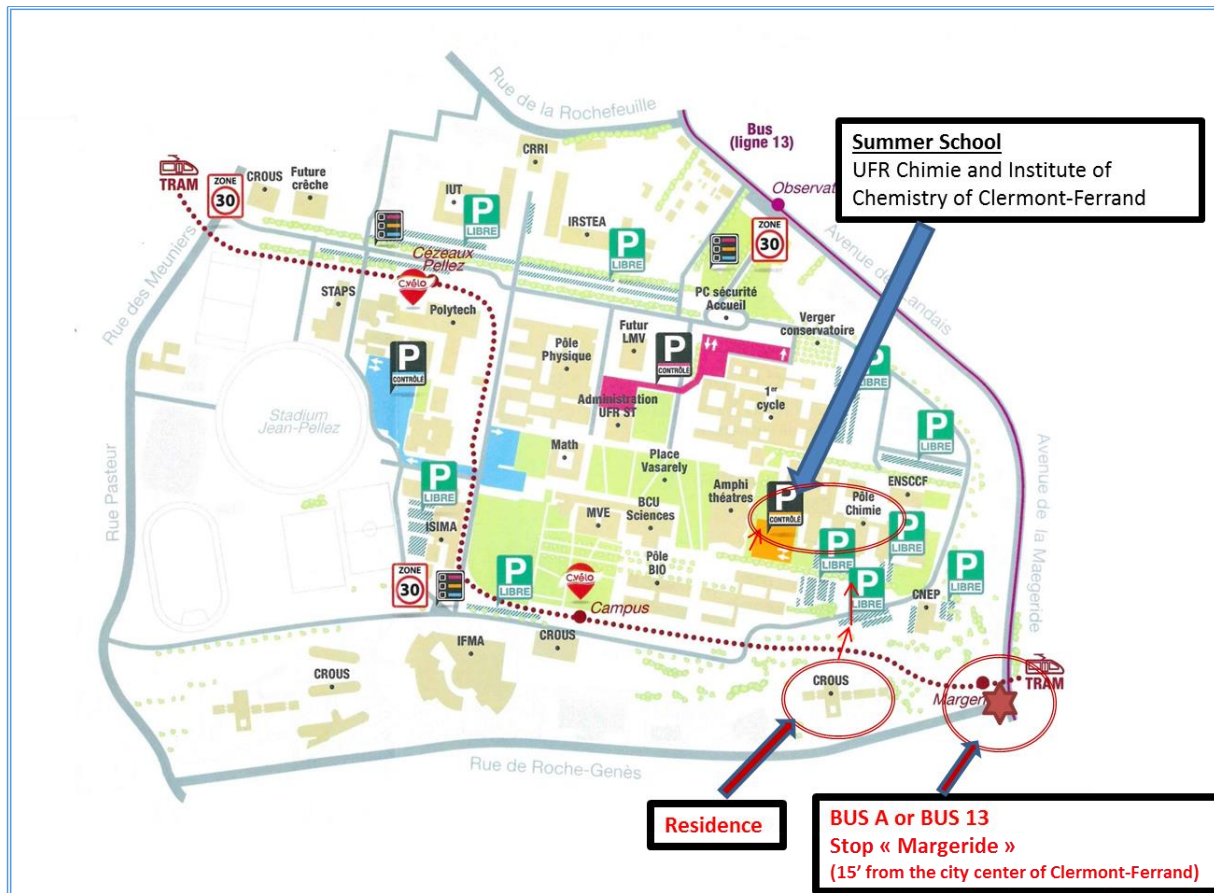
Main cultural events:

- Evening of welcome with presents and dinner offered by the University Clermont Auvergne.
- Guided tour of the city of Clermont-Ferrand,
- Guided tour of the city of Lakes in Auvergne
- Guided tour of the city of Rennes and medieval Town of Rennes
- Touristic Tour: MONT SAINT-MICHEL AND FOUGÈRES CASTLE (Brittany Region)
- Climb from the pass of Ceysat at the top of puy-de-dôme and visit of the site with the Temple of Mercury.

All these visits will be framed by professional guides in English

VENUE:

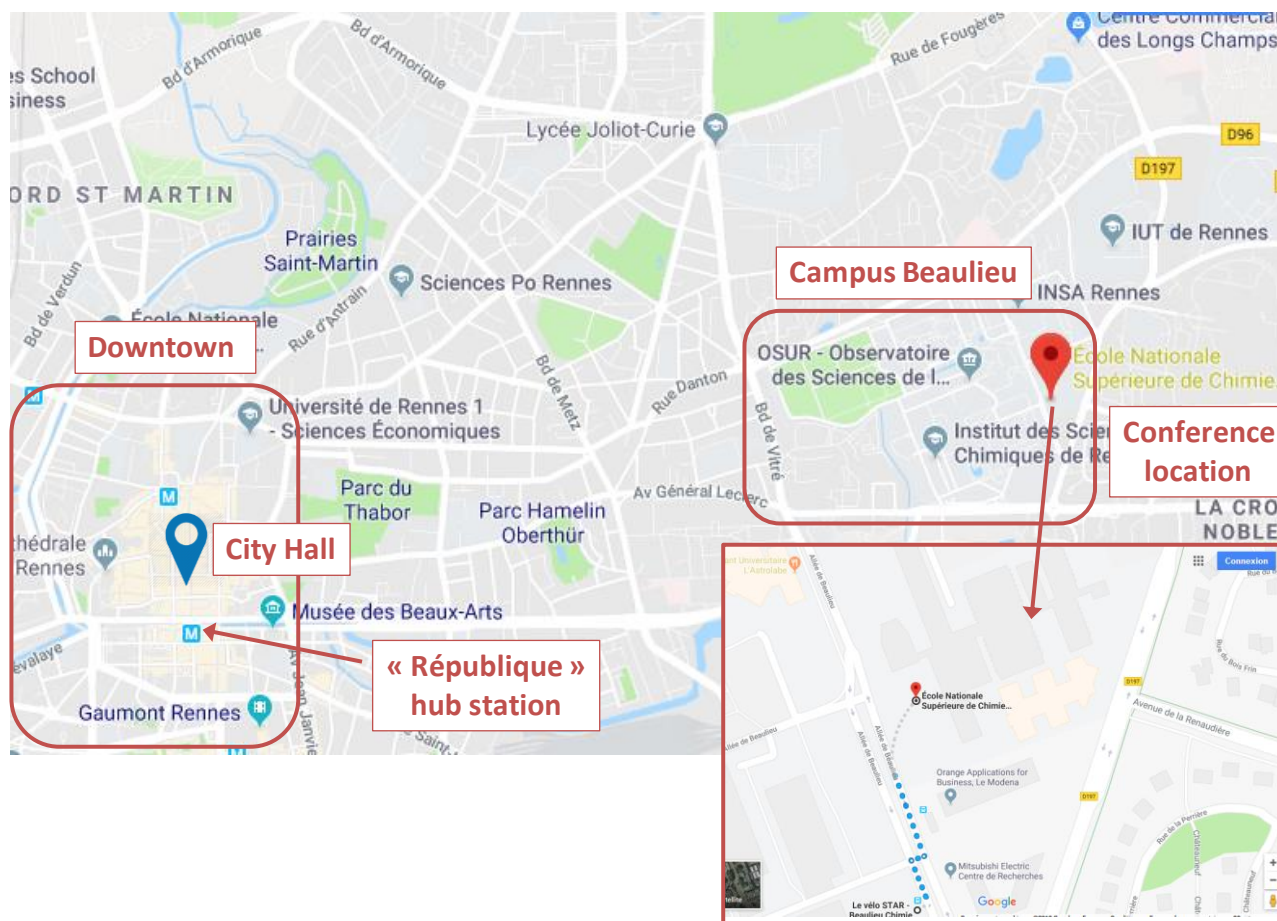
Clermont-Ferrand: Fundamental teaching and Conferences for the first two weeks will be held at the Department of Chemistry/Institute of Chemistry of Clermont-Ferrand (ICCF) of the University Clermont Auvergne. Address: 24, Avenue Blaise Pascal, Campus Universitaire des Cézeaux, 63178 Aubière Cedex. (<http://iccf.univ-bpclermont.fr/>)



Clermont-Ferrand: French courses will be held at FLEURA Centre of the University Clermont Auvergne (<http://www.qualitefle.fr/en/center/centre-fleura-universite-clermont-auvergne-87374>) near the Clermont-Ferrand city centre. Address: Centre FLEURA Université Clermont Auvergne, 34, avenue Carnot 63037 Clermont-Ferrand.



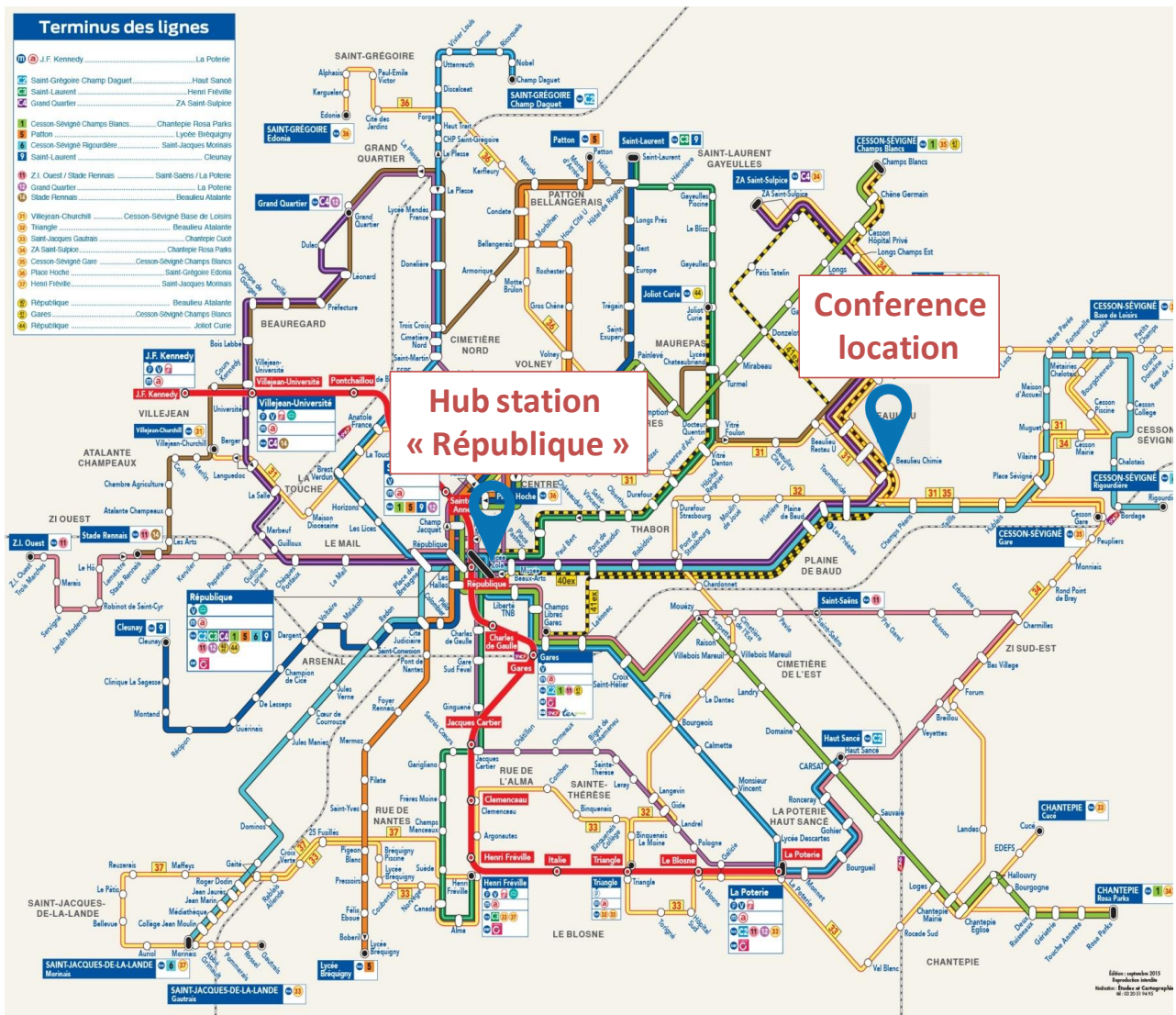
Rennes : The Summer School (see conference location at the map) will be held at the Ecole Nationale Supérieure de Chimie de Rennes (ENSCR), 11, allée de Beaulieu, 35708 Rennes France. This school is located in the scientific campus of Rennes Beaulieu, located at the East of the city.



The Rennes city has a well-developed network of public transport: Metro and Bus (<https://www.star.fr/accueil/>). ENSCR is at two minute walk away of the bus station “Beaulieu Chimie”. This bus station is served by two bus lines (15 min from the downtown station hub called “République”):

- Line C4, direction ZA Saint Sulpice (One bus every 8 min)
- Line 40 Express, direction Clos-Courtel

A bike share service is also available.



SCIENTIFIC COURSES:

I) Spectroscopy and Photochemistry (3h)

- C1-1: Introduction to the Photochemistry – Pr Sarakha (UCA)
- C1-2: Introduction to water (photo)-chemistry and radical reactions - Pr Brigante (UCA)

II) Analytical chemistry (3h)

- C2-1: Introduction and fundamentals of separation techniques (Dr Voyard, CNRS-UCA)
- C2-2: HPLC and Ionic chromatography instrumentation - (Dr Voyard, CNRS-UCA)

III) Biological and chemical depollution processes (6h)

- C3-1: Semiconductor photocatalysis (Dr Monfort UCA)
- C3-2: Fundamental of Microbiology (Pr Besse Hoggan, CNRS UCA)
- C3-3: Biodegradation and Phytoremediation (Pr Besse Hoggan, CNRS UCA)

IV) Iron chemistry and application to the depollution processes (4.5h)

- C4-1: Water balance on Earth (resource, repartition and pollution) (Pr Mailhot, CNRS-UCA)
- C4-2: Water treatments (drinking water, wastewater) (Pr Mailhot, CNRS-UCA)
- C4-3: Iron, occurrence and water (photo)-chemistry: principles and applications (Pr Mailhot, CNRS-UCA)
- C4-4: Use of iron species in advanced oxidation processes (AOP's) Advantages, outlooks and future prospects (Pr Mailhot, CNRS-UCA)
- C4-5: Application of hypervalent iron for environmental remediation (Dr Monfort UCA)

V) Adsorption, photocatalysis and chemical Engineering (9 h)

- C5-1: Introduction (Pr Hanna, ENSCR)
- C5-2: Adsorption processes: water and gas treatment (Dr Giraudet, ENSCR)
- C5-3: Porous solids and characterization (Dr Giraudet, ENSCR)
- C5-4: Porous media and applications (Dr Giraudet, ENSCR)
- C5-5: Photocatalysis: reactors modelling and process extrapolation (Dr Assadi, ENSCR)
- C5-6: Nonthermal plasma and catalytic plasma (Dr Assadi, ENSCR)

VI) Chemical speciation in water and soils, and thermodynamic modeling (7.5h)

- C6-1- Introduction to (geo)chemical speciation modelling (Pr Hanna and Dr Marsac, Geosciences Rennes)
- C6-2- (Geo)Chemical speciation modelling with PHREEQC (Dr Marsac, Geosciences Rennes)
- C6-3- Practical exercices Part 1 (Dr Marsac, Geosciences Rennes)
- C6-4- Practical exercices Part 2 (Dr Marsac, Geosciences Rennes)
- C6-5- pH-E_H predominance diagrams with Phreeplot (Dr Marsac, Geosciences Rennes)

PRACTICAL WORK:

- 1) Use of Fenton and photo-Fenton reaction for pollutants removal in water
- 2) Analysis of involving species using spectroscopic tools
- 3) Involvement of reactive species and degradation pathways
- 4) Adsorption and redox reactions: implications and applications (2x1h30, Dr Giraudet and Pr Hanna)
- 5) Nonthermal plasma, Catalytic plasma and photocatalysis (1h30, Dr Assadi)

TIMETABLE:

Day-month	8h30-10:00	10:15-11:45	14:00-15:30	15:45-17:15
<i>Saturday 22 June</i>	Welcome by Gilles Mailhot : Arrival in France and Bus to Clermont-Ferrand			
<i>Sunday 23 June</i>	Free time	Free time	Visit of Clermont-Ferrand city center (17h-19h)	Opening dinner at the restaurant
<i>Monday 24 June</i>	Opening Ceremony and Summer School presentation		French Courses	French Courses
<i>Tuesday 25 June</i>	C1-1	C1-2	French Courses	French Courses
<i>Wednesday 26 June</i>	C2-1	C2-2	French Courses	French Courses
<i>Thursday 27 June</i>	C3-1	C4-1	C3-2	C4-2
<i>Friday 28 June</i>	C4-3	C4-4	CONF1	C3-3
<i>Saturday 29 June</i>	Visit of the puy de dôme station + CONF2			
<i>Sunday 30 June</i>	Visit of Auvergne's Lakes			
<i>Monday 1 July</i>	French Courses	French Courses	French Courses	French Courses
<i>Tuesday 2 July</i>	Practical work (8h30-11:30) 1-2-3		Practical work (14-17) 1-2-3	
<i>Wednesday 3 July</i>	Practical work (8h30-11:30) 1-2-3		CONF3	C4-5
<i>Thursday 4 July</i>	French Courses	French Courses	Revision and Closing discussion	Gala Dinner (19h)
<i>Friday 5 July</i>	Oral evaluation	Oral evaluation	Departure to Rennes	
<i>Saturday 6 July</i>	Arrival to RENNES			
<i>Sunday 7 July</i>	Touristic Tour: MONT SAINT-MICHEL AND FOUGÈRES CASTLE			
<i>Monday 8 July</i>	C5-1	C5-2	Practical work 4	Practical work 4
<i>Tuesday 9 July</i>	C5-3	C5-4	Tour of the city of Rennes + Dinner	
<i>Wednesday 10 July</i>	C5-5	C5-6	Practical work 5	C6-1
<i>Thursday 11 July</i>	C6-2	C6-3	C6-4	C6-5
<i>Friday 12 July</i>	CONF4	Written and/or oral evaluation KH/RM	Visit of the medieval town of Rennes + Summer school closing Dinner	
<i>Saturday 13 July</i>	Departure to Paris (Montparnasse)			

LIST OF TEACHERS (alphabetic order):

Dr Aymen ASSADI, École Nationale Supérieure de Chimie de Rennes, France

Pr Pascale BESSE-HOGGAN, University Clermont Auvergne, CNRS, France

Dr Angelica BIANCO, University Clermont Auvergne, LaMP, France

Pr Marcello BRIGANTE, University Clermont Auvergne, France

Dr Sylvain GIRAUDET, École Nationale Supérieure de Chimie de Rennes, France

Pr Khalil HANNA, Ecole Nationale Supérieure de Chimie de Rennes, France

Pr Gilles MAILHOT, University Clermont Auvergne, CNRS, France

Dr Rémi MARSAC, Géosciences Rennes, France

Dr Olivier MONFORT, University Clermont Auvergne, France

Pr Mohamed SARAHA, University Clermont Auvergne, France

Dr Guillaume VOYARD, University Clermont Auvergne, CNRS, France

CONFERENCES:

1) Pr. Vanessa PREVOT, CNRS University Clermont-Auvergne (France), *vanessa.prevot@uca.fr*
"Clay based materials for environmental remediation"

2) Dr. Angelica BIANCO, CNRS University Clermont-Auvergne (France) LaMP, *A.Bianco@opgc.fr*
"Atmospheric pollution"

3) Pr. Pascale BESSE-HOGGAN, University Clermont-Auvergne (France), *pascale.besse@uca.fr*
"(Micro)Biological remediation of water and soils"

4) Pr Dominique Wolbert, École Nationale Supérieure de Chimie de Rennes, France,
dominique.wolbert@ensc-rennes.fr
"Modeling competitive effects of natural organic matters in water treatments".