Visit of the Radioecology Laboratory

Chinese Institute of Radiation Protection (CIRP), Taiyuan, China

François Bréchignac

Dr Shaofei Cao, new member of the IUR Board of Council, and his Director, invited me from June 16th to 20th, 2025, to visit their Radioecology Laboratory and interact with the researchers working there. This visit was oriented to meet 3 distinct and complementary tasks (cf. see programme in annex):

1) to give an historical overview of radioecology worldwide and some strategy for its the future development, by means of a formal presentation,

2) to get an appropriate knowledge of the research carried out, and the directions taken for the future, based on various presentations by the researchers themselves of their recent achievements as well as detailed visits of their respective laboratories and facilities,

3) to provide some expert feed-back on what I heard and saw with especial view on strategy building.

I try in the following to feed-back towards the IUR Board of Council with a synthesis of my personal feelings during this visit on what I heard, what I saw and my take-away understandings.

- **A surprisingly long-standing experience in radioecology**, the laboratory started to operate in 1962, which was largely unknown to the western world of scientists (except for the one year visit to the Cadarache Radioecology Department of one senior researcher, Dr Janguo Li, in 1986). It appears that the expertise and level of research achieved is quite similar to the most advanced western radioecology teams, with a focus on Chinese specificities (environmental conditions, local biota, local agronomic plants, etc…). Researchers cover a large array of scientific areas such as fate and transport of man-made and natural radionuclides in all media, aquatic, terrestrial, marine and atmospheric, the identification of a large spectrum of bioaccumulation and transfer factors corresponding to the Chinese conditions (now published as a handbook, in Chinese), aerial transport and prediction in case of potential accidental releases, emergency planning, waste and remediation issues including an interesting programme of phytoremediation, especially on U contaminated land, understanding the potential pollution of aquifers, radiation effects and toxicity on biota and ecosystems, and advanced dosimetry, etc…

- **A group of scientists mainly characterized by its youth**, evolving from the best Chinese Universities with PhDs on various subjects and very committed to contribute to the development of radioecology worldwide, eager to bring their specific expertise. The team inhabits a whole 2-3 floors building with about 40 staff. For the time being, only a few master the English communication language good enough such as to interact with worldwide scientists and publish in international Journals. However, a strategy of promoting sabbaticals abroad has been started and is pursued to improve this weakness. Recommendation has been provided to develop more mathematical modelling activity (already present for aerial deposition indeed)

in view of supporting ecosystem approaches designed to improve ecological risk assessment beyond the level of individual organisms.

- **A set of quite advanced, sometimes unique, facilities**. Advanced controlled cultivation cabinets, with simulation of high light climate, rain and snow falls. System for aerosol generation to simulate accidental contamination of the environment, agronomic plants and ecosystems. Advanced controlled aquaria to study bioaccumulation factors in freshwater and marine organisms, and the study of aquatic ecological systems by means of microcosms (under development).

- **An ambition to evolve at international level** and participate to international efforts which promote radioecology. This international ambition is supported by opening the Radioecology laboratory to the external relevant world and institutions. The strategic move to support this ambition is already started with the IAEA having granted to Shaofei responsibility to lead its advanced international dosimetry project (IAEA CRP 41023, 2023-2027). This project is expanding the GPS collar dosimeters approach in order to reach more accurate dose measurement to which biota are exposed in contaminated territories. It is pursued by the recent election of Shaofei to sit in the new IUR Board of Council, with specific responsibility oriented towards revitalizing the international activities of the IUR Forum.

- **Development of ecosystem approaches.** There is a strong wish at CIRP to embark on this topical subject of research considered as a quite strategic new development in radioecology to be supported. Shaofei's laboratory is ready and quite close to be able to develop both experiments on microcosms and mesocosms and associated mathematical modelling efforts.

- **Protection of the environment is now an official priority of Chinese authorities** (beyond the only question of radioactivity). This a very important new information allowing to anticipate that the Chinese radioecology laboratory of CIRP at Taiyuan will be well funded during the coming decades, a feature that could usefully be profitable as well to IUR development. As a starter, Shaofei mentioned his wish to develop Chinese membership to IUR from relevant scientists spread in Chinese Universities and Institutions.

ANNEX

Draft Agenda for Radioecology Seminar

16-20 June, 2025

Date	Time	Activity	PRESENTER/PARTICIPANT
16-20 June			
1st day (16th Jun)	09:00-9:15	Welcome	Shaofei Cao CIRP
	9:15-9:30	Introductory and organizational remarks	Shaofei Cao CIRP
	9:30-12:00	Presentation	François Bréchignac IUR
		Q&A	
	12:00-13:00	Lunch Break	
	13:30-17:00	Development of Radioecology Research in China	Yaowen Han CIRP
		Discussion	
2nd day (17th Jun)	09:00-12:00	Introduction to the Radioecology Laboratory of CIRP	Fangni Du CIRP
		Q&A	
	12:00-13:00	Lunch Break	
	13:30-17:00	Visit: • Radioecology Laboratory • Atmospheric Environment Simulation Laboratory	
3rd day	09:00-12:00	Introduction to the IAEA CRP Project	Shaofei Cao CIRP
		Q&A	

(18th Jun)	12:00-13:00	Lunch Break	
	13:30-17:00	Freetime	
4th day (19th Jun)	09:00-12:00	Bioaccumulation and toxic effects of radionuclides in representative marine fish species	Fangni Du CIRP
		Q&A	
	12:00-13:00	Lunch Break	
	13:30-17:00	Freetime	
5th day (20th Jun)	09:00-12:00	Screening and research on uranium accumulator plants	Xinyan Qiao CIRP
		Q&A	
	12:00-13:00	Lunch Break	
	13:30-17:00	Q&A session and concluding remarks	Shaofei Cao CIRP