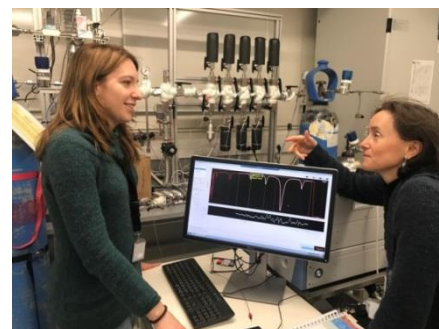


# Visiting Scientist Opportunities in the BIPM Chemistry Department (Q4 2020 and 2021)

*Developing and validating methods for the comparison of chemical and biochemical standards world-wide.*

The International Bureau of Weights and Measures (BIPM) is an international organization established by the Metre Convention, through which Member States act together on matters related to measurement science and measurement standards.

The BIPM has a number of vacancies for short-term secondments in the Chemical Metrology Department, supporting the development of methods which will be used to compare national measurement standards and measurement capabilities for: greenhouse gases; major air quality gases; organic small molecule and peptide and protein primary reference materials and calibrators.



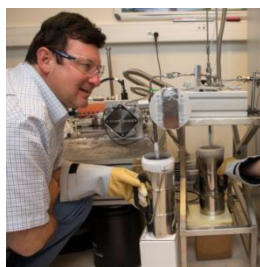
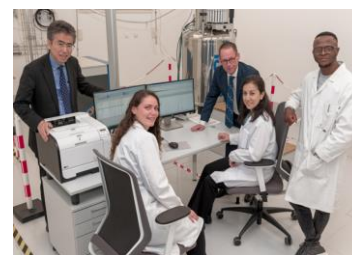
## ▪ About the Chemistry Department

The BIPM chemistry laboratory activity focuses on gas standards for air quality and global atmospheric monitoring, and primary calibrators for clinical chemistry and laboratory medicine, food analysis, environmental analysis, forensics and pharma. The BIPM coordinates key comparisons and pilot studies prioritized by the CCQM, in response to NMI needs, for:

- greenhouse and air quality gas standards including their isotope ratios, for which the uncertainty of standards is critical, to ensure the accurate long-term, global monitoring of these species, including the BIPM key comparison BIPM.QM-K1 for surface ozone and BIPM.QM-K2 for atmospheric carbon dioxide;
- the purity assessment of organic calibrators for small molecules and peptides/proteins (source of traceability for measurements of the amount of organic species in a wide range of clinical, environmental, food, forensic and drugs in sport applications) and reference data for their value assignment.

## ▪ Working on secondment at the BIPM

The BIPM offers a unique environment for a secondment. It is located in Sèvres, on the outskirts of Paris (France) and has an international staff of about 75. There is a wide range of accommodation available nearby, including furnished apartments. There is an excellent public transport network to central Paris and the international airports are in easy reach.



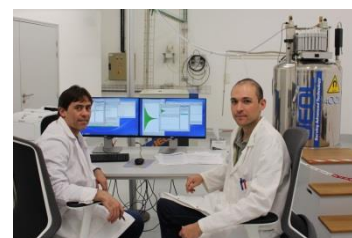
## ▪ Terms and conditions

Applications are welcome from employees of a national measurement institute, a designated institute or a relevant international organization. You would not be employed by the BIPM and would remain an employee of your institute. The BIPM will normally pay an allowance to cover your additional living expenses.

Help will be given in finding local accommodation for the duration of the secondment.

## ▪ Experience needed

The experience needed depends on the project. A good level of English (spoken and written) is essential.



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Index	Programme area	Name and Description of Secondment Project	Duration	Required experience of Visiting Scientist to undertake Secondment
C-1	Gas Standards and Comparisons	<b>CO<sub>2</sub> isotopes by IRIS: linearity and accuracy validation</b> To contribute to validation studies of the linearity and accuracy of the BIPM IRIS analyser with its carousel sampling system for CO <sub>2</sub> isotope ratio with $\delta^{13}\text{C}$ over the range -1‰ to -45 ‰ (vs VPDB-CO <sub>2</sub> ). The visiting scientist will optimise measurements performed by IRIS with a Delta Ray analyser on (pure) CO <sub>2</sub> samples prepared at the BIPM with the Stable Isotopes Reference Mixture generation system and compare them with values obtained by IRMS.	6-12 months preferred	<ul style="list-style-type: none"> <li>• Experience in gas analysis and in particular with infrared spectroscopy of gases</li> <li>• Previous experience of isotope ratio measurements</li> <li>• Experience with Qtegra software would be an advantage.</li> </ul>
C-2	Gas Standards and Comparisons	<b>IRMS <math>\delta^{13}\text{C}</math> and <math>\delta^{18}\text{O}</math> measurements of CO<sub>2</sub> in air standards</b> The visiting scientist will optimise and validate a sample preparation and IRMS measurement procedure on CO <sub>2</sub> in air samples. The preparation facility, developed at the BIPM, will extract CO <sub>2</sub> from air by cryogenic trapping in order to allow measurements of CO <sub>2</sub> in air isotopes by IRMS with a MAT-253+ mass spectrometer. The facility will be validated on CO <sub>2</sub> in air reference materials with $\delta^{13}\text{C}$ over the range -1 ‰ to -45 ‰ (vs VPDB-CO <sub>2</sub> ).	6-12 months preferred	<ul style="list-style-type: none"> <li>• Experience in IRMS operation and data analysis</li> <li>• Experience in gas handling and analysis</li> <li>• Experience with Isodat Script Language would be an advantage</li> <li>• Experience with cryogenic trapping would be an advantage.</li> </ul>
C-3	Gas Standards and Comparisons	<b>Carbonate reaction facility for IRMS: optimisation and validation</b> To contribute to the development of a BIPM reference method for CO <sub>2</sub> isotope ratio measurements based on carbonate standards and phosphoric acid reaction. The visiting scientist will optimise and validate IRMS reference procedure based on a carbonate reaction facility developed at the BIPM to prepare gaseous CO <sub>2</sub> from carbonate reference materials, and measurement of carbon and oxygen isotopes with a MAT-253+ mass spectrometer.	6-12 months preferred	<ul style="list-style-type: none"> <li>• Experience in IRMS operation and data analysis</li> <li>• Experience in the analysis of carbonates with IRMS</li> <li>• Experience with Isodat Script Language would be an advantage.</li> </ul>
C-4	Organic Analysis – Small Molecules	<b>qNMR: Internal standards for <sup>19</sup>F and <sup>31</sup>P qNMR</b> Contribute to the validation of qNMR methods for purity assignment applying to <sup>19</sup> F and <sup>31</sup> P NMR. Researchers will use the sample preparation facilities and the JEOL ECS-400 MHz spectrometer at the BIPM to develop and validate qNMR experimental parameters, to characterize a set of primary standards for use in <sup>19</sup> F and <sup>31</sup> P qNMR.	Minimum 3 months, preferably 6 months	<ul style="list-style-type: none"> <li>• Expertise in the theory and practice of NMR</li> <li>• Background in analytical organic chemistry</li> <li>• Experience in performing qNMR measurements.</li> </ul> <p>Practical knowledge of the operation of NMR spectrometers and the optimisation of their operating parameters is essential. Previous experience with JEOL NMR systems and the Mnova NMR software an advantage.</p>
C-5	Organic Analysis – Small Molecules	<b>qNMR: Purity assignment of drug and pesticide pure reference standards by <sup>1</sup>H and <sup>19</sup>F qNMR</b> To support the BIPM CBKT and key comparison programme, researchers will use the sample preparation facilities and the JEOL ECS-400 MHz spectrometer at the BIPM to value assign the mass fraction content of primary standards of drug and pesticide materials.	Minimum 3 months, preferably 6 months	<ul style="list-style-type: none"> <li>• Expertise in the theory and practice of NMR</li> <li>• Background in analytical organic chemistry</li> <li>• Experience in performing qNMR measurements.</li> </ul> <p>Practical knowledge of the operation of NMR spectrometers and the optimisation of their operating parameters is essential. Previous experience with JEOL NMR systems and the Mnova NMR software an advantage.</p>

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Index	Programme area	Name and Description of Secondment Project	Duration	Required experience of Visiting Scientist to undertake Secondment
C-6	Organic Analysis – Small Molecules	<b>qNMR: Benzoic acid as a qNMR internal standard</b> Contribute to the validation of <sup>1</sup> H qNMR methods for purity assignment using benzoic acid as internal standard. Researchers will use the sample preparation facilities and the JEOL ECS-400 MHz spectrometer at the BIPM to document optimized qNMR experimental conditions and parameters for qNMR assignments using benzoic acid as the internal standard.	Minimum 3 months, preferably 6 months	<ul style="list-style-type: none"> <li>• Expertise in the theory and practice of NMR</li> <li>• Background in analytical organic chemistry</li> <li>• Experience in performing qNMR measurements.</li> </ul> Practical knowledge of the operation of NMR spectrometers and the optimisation of their operating parameters is essential. Previous experience with JEOL NMR systems and the Mnova NMR software an advantage.
C-7	Organic Analysis – Small Molecules	<b>qNMR: Peptide quantification methods</b> Researchers will use the sample preparation facilities and the JEOL ECS-400 MHz spectrometer at the BIPM to investigate and validate alternative methods to internal standard qNMR for the quantification of peptide materials. Approaches for investigation and comparison with IS qNMR include: <ul style="list-style-type: none"> <li>• external calibration</li> <li>• quantum mechanical modelling</li> <li>• via Diffusion-ordered spectroscopy (DOSY)</li> </ul>	Minimum 3 months, preferably 6 months	<ul style="list-style-type: none"> <li>• Expertise in the theory and practice of NMR</li> <li>• Background in analytical organic chemistry</li> <li>• Extensive experience in qNMR applications and the optimization of parameters for 2D pulse sequence NMR measurements</li> </ul> Previous experience with JEOL NMR systems and the Mnova NMR software an advantage.
C-8	Organic Analysis – Small Molecules	<b>LC-MS(/MS) Impurity quantification in Pesticide and Drug Materials</b> Visiting scientists are sought to develop LC-MS(/MS) methods for the quantification of related substances in pure pesticide and drug materials as part of a mass balance approach to material characterization. The outputs will be incorporated purity evaluation guidelines contributing to Knowledge Transfer and training activities.	6 months, preferably 12 months	Previous experience in one or more of the following: <ul style="list-style-type: none"> <li>• LC-MS(/MS) of small organic molecules</li> <li>• UV spectrophotometry of small organic molecules in solution</li> <li>• Performing homogeneity and stability testing.</li> </ul>
C-9	Organic Analysis – Large Molecules	<b>High resolution mass spectrometry of peptides/proteins: Parathyroid Hormone (PTH 1-84)</b> Visiting scientists are sought to develop LC-hrMS(/MS) (Orbitrap) methods to characterize PTH (1-84) material in preparation for future pure primary peptide calibrator comparisons, which will focus on future rounds of CCQM-K115	6 months, preferably 12 months	<ul style="list-style-type: none"> <li>• Experience with liquid chromatography – mass spectrometry.</li> </ul> Previous experience in one or more of the following: <ul style="list-style-type: none"> <li>• LC-MS(/MS) of peptides/proteins</li> <li>• Peptide mapping.</li> </ul> Experience in use of high resolution mass spectrometry (Orbitrap) would be an advantage.
C-10	Organic Analysis – Large Molecules	<b>Peptide impurity corrected amino acid analysis</b> Visiting scientists are sought to further develop the PICAA approach for peptide quantification based on quantifying constituent amino acids (LC-IDMS) following hydrolysis of the material (microwave-assisted vapour-phase hydrolysis) and correction for amino acids originating from impurities, to support future pure primary peptide calibrator comparisons (CCQM-K115 series)	Minimum 3 months, preferably 6 months	<ul style="list-style-type: none"> <li>• Experience with liquid chromatography – mass spectrometry.</li> </ul> Previous experience in one or more of the following: <ul style="list-style-type: none"> <li>• LC-IDMS(/MS) of peptides/proteins</li> <li>• Hydrolysis of peptides/proteins.</li> </ul>

▪ **How to apply**

Please contact the Department Director, Dr Robert Wielgosz ([rwielgos@bipm.org](mailto:rwielgos@bipm.org)) to discuss the project and confirm whether the secondment opportunity is still available. If you decide you would like to go ahead, please forward a copy of your CV so that the BIPM can confirm that the project would be suitable. The BIPM will then send a copy of a Secondment Contract which should be signed by the authorized person at your organization.

If the secondment opportunity is no longer available or the project is not suitable, the BIPM would be pleased to discuss opportunities for a secondment in the future.

