1-Year Post-Doctoral Research Fellowship in Systems Engineering applied to Advanced Drug Delivery Systems

The [laboratory of Design Science, Optimization, and Production of Grenoble (G-SCOP)](#) is a multidisciplinary research laboratory on engineering design, production systems, and optimization in Grenoble, France. The postdoctoral research fellow will join a team of researchers in human-systems integrated design.

[Becton Dickinson (BD)](#) is one of the largest global medical technology companies in the world and is advancing the world of health by improving medical discovery, diagnostics and the delivery of care. [BD Medical - Pharmaceutical Systems](#) is a global leader in supplying the pharmaceutical industry with innovative, high-quality, clinically-proven and customized pre-fillable parenteral drug delivery systems. Our offering includes an extensive portfolio of pre-fillable syringes, self-injection systems, safety and shielding solutions. Our products are designed to protect, package and deliver drug therapies and to maximize healthcare worker and patient safety.

Mission: The post-doctoral research fellowship will research to elaborate a systems engineering framework that will support the Advanced Drug Delivery Systems (ADDS) division of Becton Dickinson (BD) in its willingness to deploy systems engineering processes, methods, and tools for improving the quality of R&D activities in future new product development projects. The main mission of the candidate will be to parsimoniously integrate various methodological engineering design elements into a systems engineering (SE) framework (process, method, modelling method, modelling software) tailored to BD ADDS R&D context (organisation, portfolio, position in the supply chain, etc.) that will harmonize design practices across all ADDS R&D teams in Pont De Claix (FR), Dun Laoghaire (IR) and Franklin Lakes (US).

What the candidate will do?

❖ *MUST-DO:*
- Integrate hands-on practices of the Design Thinking toolbox as « How-To » practical guidelines into the SE framework for methodologically operationalizing a participative user-centric and cross-functional definition of the operational view of the system architecture (i.e., problem statement, stakeholders, services and constraints, external interfaces, operating modes, operational scenarios, […], up to the system requirements).
- Integrate methodological best practices of agility into R&D processes to facilitate the integration of target customers into some strategic decisions and activities such as specification and trade-off analysis.
- Integrate recent research results in the design of modular systems to reuse COTS and inject some flexibility to quickly satisfy volatile customer requirements.
- Re-think some of the R&D processes (i.e., activities, roles, deliverables, and validation of deliverables), especially for specification and architecture activities, to engage representatives of all internal stakeholders (not only R&D but also marketing, operations, regulatory, quality and medical safety/clinical functions…), as well as external stakeholders (targeted end-users, health care practitioners, potential pharmaceutical customers…) in a cross-functional and participative – not to say challenging – New Product Development (NPD) process. Make sure that the concerned R&D processes are aligned with the Global Product Delivery System Enterprise Standard of BD.
- Implement all methodological elements in a Model-Based Systems Engineering (MBSE) modelling environment that relies upon a standardised modelling language. The

implementation and continuous improvement of the systems engineering framework will reuse historical data of past NPD projects of drug delivery systems.

- ❖ *NICE-TO-DO:*
  - Integrate safety analysis (FMECA) with the architecture activities in the MBSE framework.
  - Embed the tasks related to regulatory compliance in the systems engineering framework with limited extra work for R&D engineers.
  - Articulate the systems engineering framework with the knowledge management solution SYNAPSE for methodologically capturing and reusing design rationales.

How the candidate will do it?

- The post-doctoral research fellow is on a 1-year research contract with a strong desire to join BD ADDS for a full-time position as a Methods & Tools Support Engineer.
- The candidate will be supervised by one or two BD senior R&D engineer who is familiar with the systems engineering approach and will have direct access to subject-matter experts.
- All materials, especially a laptop and MBSE software licences will be provided to the candidate.
- Annual gross salary = 36 300 € (2750 € gross monthly salary, that is, approximately 2090 € net monthly salary, plus 10% or approximately 3 300 € at the end of the contract).

Where the candidate will be?

The post-doctoral mission being highly dependent on up-to-date academic knowledge of systems engineering and a deep understanding of the BD ADDS R&D environment, the candidate will work part-time in the Grenoble INP/G-SCOP Research Lab and BD ADDS division as follows:

- During the first 5 months, the candidate will spend 80% of his time (4 days a week) at Grenoble INP/G-SCOP Research Lab under the supervision of Romain Pinquié and Pierre Chevrier to review the literature and integrate state-of-the-art engineering design practices in a first version Model-Based-Systems Engineering (MBSE) framework applied to drug delivery systems. One day a week, the candidate will work at BD ADDS in Pont De Claix to get familiar with the R&D context (organisation, portfolio, customers, standards, etc.). In this phase, it is crucial to concentrate on research for bringing fresh ideas.
- During the next 4 months, the candidate will spend 50% of his time (2,5 days a week) at Grenoble INP/G-SCOP Research Lab under the supervision of Romain Pinquié and Pierre Chevrier to continuously improve the MBSE framework on drug delivery systems and to integrate nice-to-have features – i.e., integration of safety analyses, the embedding of regulatory compliance, and articulation with the knowledge management solution SYNAPSE – in the framework. For the rest of the week, the candidate will work at BDD ADDS in Pont De Claix to discuss and validate the implementation of these new features with the Core Team Members and R&D managers. In this phase, it is important to keep a balanced activity between research and operation to evaluate and improve the framework while considering secondary topics that require being on the 'battlefield'.
- Finally, during the last 3 months, the candidate will spend 80 % of his time (4 days a week) at BD ADDS in Pont De Claix to i) work out a change management plan with the R&D managers for progressively deploying the systems engineering framework; ii) documenting (« How-To » methodological guidelines, templates, examples, etc.); iii) start involving, training and coaching systems engineering practitioners; and iv) measure the impact of the new SE framework on the R&D operational excellence.

Who the candidate will be?

The candidate will…

- Be graduated with a PhD in Systems Engineering or Engineering Design with extensive knowledge in systems architecture / conceptual design.
- Show intellectual curiosity for design methods (model-based systems engineering, requirements engineering, functional analysis, systems engineering, design thinking, agility, six sigma, etc.) and supporting tools.
- Be proficient in Model-Based Systems Engineering modelling languages and environments.
- Have strong written and oral communication skills – in English (French is a plus) – to collect and consolidate systems engineering needs across all BD ADDS teams before delivering training and coaching systems engineering practitioners in the R&D centres in France, Ireland and the United States.

For an informal discussion about the post please contact: Professor Romain Pinquié, romain.pinquie@grenoble-inp.fr

To make an application, send your CV + PhD thesis and/or publications to romain.pinquie@grenoble-inp.fr and pierre.chevrier@grenoble-inp.fr

Applications closing date: 1 June 2022

Interview: July and August 2022

Expected starting date : October/November 2022