Recruitment of the Director of the INRA Research Unit "Biopolymers, Interactions, Assemblies" (BIA), in Nantes, France

BIA is a large research Unit of INRA with 122 permanent members including 70 scientist and engineers, 52 technicians, as well as more than 50 PhD, post-doctoral and short terms research fellows. BIA is known for its research activities on biopolymers and biopolymers assemblies in food and non-food applications, and notably for their multi-scale structure, dynamics and interactions. Recently, its strategic project for the next four years has been peer-reviewed favourably by an international scientific panel.

The three main objectives of BIA research are: (1) the quality control of major field crops for a variety of food and non-food application in the context of sustainable agriculture and climate change; (2) the development of bio-sourced materials and functional food matrices within an eco-design framework; (3) the improvement of the "health value" of foods.

These objectives are addressed within three scientific themes:

Theme 1: Biopolymer assembly during the development of plant organs: controlling variability in relation to use properties,

Theme 2: Assemblies and properties of food matrices and bio-sourced materials,

Theme 3: Structures, key factors for healthy foods: reactivity and bio-accessibility of nutrients, micronutrients and food allergens.

For the position of the BIA director, INRA is looking for a scientist with internationally renowned expertise in the scientific themes of BIA, and in the underlying disciplines, ranging from integrative biology to soft matter physics. The applicant should have a confirmed experience in the leadership of large research groups and in the management of multidisciplinary research programs on an international level. He/she has a motivating personality able to bring people together. The Director is in charge of daily operations of the Unit and has the capability to lead the development of the Unit in the complex world of academic institutions, funding agencies, research policies and industry. One of the missions of the BIA director will be to promote the Unit and to establish new cooperation on a European level. A good knowledge of the French language will be appreciated.

The director will be appointed for a period of 3 years with a possible extension of 3 years. The gross yearly salary will be depending on the candidate experience.

Applications including curriculum vitae, publication list, concise statement of research activities as well as the names and addresses (including E-mail) of at least three references should be submitted in pdf format no later than March 15 2012 to:

Dr Jacques Gueguen (Jacques.Gueguen@nantes.inra.fr),

BIA Website:
http://www.angersnantes.inra.fr/angers_nantes_eng/unites_de_recherche_unites_experimentales/biopolymeres_interactions_assemblages_bia

Annex

Detailed information on
Research Unit “Biopolymers, Interactions, Assemblies” (BIA), in Nantes, France

Established on 1st January 2005 as the result of the merger of four units of the INRA-CEPIA division in Nantes, **the Biopolymers, Interactions and Assemblies (BIA) research Unit has a staff around 185 people, 122 of whom are permanent employees**, including 39 senior (DR) and junior (CR+ASC) scientists, 31 research (IR) and study (IE) engineers and 52 technicians. The unit also included, depending on the year, 30 to 35 doctoral candidates, 8 to 12 post-doctoral fellows, 10 to 12 non-permanent employees and 10 to 12 masters 2 students and many other students with short-term contracts (<6 months). It consists of seven inter-disciplinary teams, a national labelled analytical platform and a management and logistics team. **The unit's consolidated budget ranges from ~10 to 12 M€ per year, and from 3 to 4 M€, excluding salaries.**

It is structured around **three key finalised objectives** that target the agri-food sector:

(1) the control of the quality of major field crops for a variety of application (food and non-food) within the context of sustainable agriculture and climate change;
(2) the development of bio-sourced materials and functional food matrices within an eco-design framework;
(3) the improvement of the "health" value of foods.

The BIA scientific project endeavours to consider matter in all of its complexity by more effectively taking into account the functional existence of supramolecular biopolymer assemblies in raw materials and in transformed products using **a multiscale and pluridisciplinary approach**. This research is consistent with INRA and the CEPIA Division's priorities that emphasize more integrated research between agriculture and the food sector and to explore new possibilities in plant chemistry.

It revolves around **three major research themes** that constitute the unit's strategic directions:

- ***Theme 1: Biopolymer assembly during the development of plant organs: controlling variability in relation to use properties:***

Research already undertaken in collaboration with biologists and geneticists on the understanding of biosynthesis and biopolymer assembly mechanisms (cell walls, starch grains, reserve proteins) is being pursued on seeds (wheat, Brachypodium, etc.) and fruit (tomato,

apple, etc.). This approach will be completed by in vitro model studies on the enzymatic cross-linking of biopolymers.

Since the aim of this research is to more effectively control the use of properties of plant resources, studies on the relationships between the structure and properties of plant materials will be developed. Efforts to identify key variables for the control of mechanical properties of cell walls will be supported by modelling studies. Moreover, a chemical and structural screening strategy will be developed by a high-throughput phenotyping approach to objectively identify, without “a priori” the most relevant phenotypes for further targeted mechanistic and/or structural studies.

- ***Theme 2: Assemblies and properties of food matrices and bio-sourced materials***

This research theme deals with the understanding of the assembly mechanisms of biopolymers extracted from raw agricultural material for the purpose of building food matrices and materials with controlled properties and functionalities by taking the best possible advantage of the structural specificity of biopolymers. In the case of materials, we will especially aim at the creation of controlled architectures. Concerning biomimetic materials, the principle model is that of the plant cell wall. For food matrices, the goals are to control: (i) the physical and chemical stability as well as the mechanical characteristics of the food; and (ii) the dynamics of migration processes of nutrients and micronutrients within the food and/or of release during digestion.

To promote innovative functionalities, three original experimental approaches will be developed: (i) new fractionation strategies making it possible to isolate not just biopolymers taken individually from agricultural resources, but biopolymer assemblies as well, while preserving their native structure and functionality; (ii) medium-throughput physico-chemical tools to screen the interaction capacities of biomolecules in order to generate new functional assemblies; and (iii) integration of technologies based on the nanosciences (microfluidics, micro- and nano-patterning techniques) into processes for producing biopolymer assemblies.

- ***Theme 3: Structures, key factors for healthy foods: reactivity and bioaccessibility of nutrients, micronutrients and food allergens***

The dynamics (mobility), reactivity and allergenicity of biomolecules during food itineraries, including digestion steps, will be related to molecular, supramolecular structures and macroscopic organisation in raw materials and/or in food matrices. The scientific approach will be based on the use of realistic model food systems (emulsions, foams, aqueous gels including lipid structures, etc.) but will not exclude real foods (egg, milk, cereal foods, etc.). The dynamics of molecules and structures in simulated digestive conditions is a new research area for the unit. To succeed, innovative approaches will be undertaken. A virtual masticator of solid foods will be designed by mechanical modelling of the fragmentation of solid starchy matrices during

chewing and experimental devices for simulating digestion will be set up. Data resulting from simulated in vitro digestion studies will be validated by in vivo experiments, in partnership with nutritionists and immunologists.

The scientific cohesion at the unit level is strongly related to the existing interdependency and connections between these three themes, all dealing with structures and dynamics of biopolymer assemblies.

The unit's academic output for the period 2008-2011 includes around 400 articles listed on the WOS. The unit is also involved in **many teaching programmes** (in collaboration with universities, ONIRIS, Agrocampus, Supagro, the CNAM, etc.), consistent with its scientific orientations in the food sciences, on the one hand, and in plant biology, on the other. Unit researchers are particularly involved in three specialties of the Science Master's programme, Health and Technologies: (1) Food Science and Human Nutrition (SANH – Univ. of Nantes), (2) Design, formulation and production of innovative food products (CFPP, Univ. of Angers), and (3) Integrative plant biology: genes, plants, agrosystems (co-hosted by the Universités de l'Ouest -Agrocampus).

BIA also developed many partnerships – academic and public-private (small and medium-sized businesses and international groups, government agencies). A large number of contracts witnesses these partnerships: 13 national ANR contracts (4 in coordination), 5 European programmes (2 in coordination), and some regional and private contracts.