

Technology & Capacities Assessment

We help you run your life sciences R&D programs better, faster, cheaper and safer

Bio-Modeling Systems Predictive Integrative Biology

Company details	
Date	November 28, 2008
Organisation Name	BIO-MODELING SYSTEMS OR BMSYSTEMS
Principal Contact	<p>Manuel GEA CO-founder & CEO BIO-MODELING SYSTEMS 26 rue saint Lambert 75015 PARIS FRANCE Mail: manuel.gea@bmsystems.net</p> <p>Tel : +33683061272</p> <p>Web Site www.bmsystems.net</p>
Core team	<ul style="list-style-type: none"> – Dr. François Iris (PhD): founder & CSO, Head of the integrative biology team – Manuel Gea: Co-founder, CEO & VP R&D information Systems – Gerard Dine (MD, PhD): Co-founder & Chief Medical Officer. – Paul-Henri Lampe: Co-founder & Systems Integration Director – Pablo Santamaria: Co-founder & I.T. & On-line Information Systems Director.
Organisational Information	<p>Corporate Profile:</p> <ul style="list-style-type: none"> – Bio-Modeling Systems or BMSystems S.A.S. Predictive Integrative Biology company – Date of incorporation: 2004, registered in Paris, – Number of employees: 7 and more than 100 professionals working on BMSystems programs – Independent Private Company, 100% owned by its founders (no search for external investors). – “Young innovative Company” status since 2005. – Member of BIO (Biotechnology Industry Organization USA) – For more information: www.bmsystems.net <p>BMSystems network partners (non-confidential extract)</p> <ul style="list-style-type: none"> – CEA Fontenay-aux Roses. Department of prion and atypical infections research (SEPIA) – Pherecydes-Pharma: Antibacterial agents Biodefense & biosecurity spin-off – ARD (Agro-industries Research & Development) leading Industrial Biotech Research Company in the industrial biotech world-class cluster in France. – IBT (Troyes Institute of Biotechnologies). Technological transfer institute. – Educational contributions: ESPCI, ENSP, ISTM, INSERM

Technology and Capacities details

Description of Technology

The CADI™ (Computer Assisted Deductive Integration) models are detailed maps of inter-cellular and/or intra-cellular mechanisms associated with a biological status. They can describe the dynamics of a pathological process and/or the mechanisms that characterise a pathological status vs. control.

- The mechanisms of life being integrative non-linear processes, they require specific approaches to be correctly represented. CADI™ models belong to the non-mathematical holistic and heuristic class of models.
- CADI™ models describe the mechanisms that cause the disease & not only the consequences. Due to this specificity, CADI™ models have led to novel, patentable discoveries in highly competitive applications.
- CADI™ know-how and tools are independent of the “application/pathological domains”.
- CADI™ models are not “mathematical” models nor “automatic” simulation tools. But, CADI™ models are the most efficient step to define the contexts and the parameters required to build local pertinent mathematical models

Technologies and Know-how.

Computer-Assisted Deductive Integration (CADI™) proprietary methodologies and tools:

- **CADI Search** (data acquisition & mining);
- **CADI Architect** (data organisation & structuring);
- **CADI Fiber-N** (integrative engine);
- **CADI View** (model representation & visualisation).
- **TAPE & AB-ACCUS**: patents transferred to our spin-off Pherecydes-Pharma
- **New therapeutic strategies for psychiatric diseases** and pre-clinical evaluation platform. Patent filed with CEA (Sept 10, 2008)
- **Pertinent biomarkers expertise**: Publication of the reference book. Biological Modeling in the Discovery and Validation of Cognitive Dysfunctions Biomarkers. In “**Biomarkers for Psychiatric Disorders**” (ISBN: 978-0-387-79250-7). C.W. Turck Ed. SpringerVerlag. Berlin. F. Iris author of the integrative biology chapter(2008)

Applications Markets

Our markets

- **Pharma – Biotech**: BMSystems improves success-rate in the pharma R&D market through the direct exploitation of its experimentally validated predictive models. BMSystems is particularly active in the field of neuro-degenerative diseases (Creutzfeld-Jakob, Alzheimer) and psychiatric disorders and cancer.
- **Energy - Chemicals - environment**: The company currently applies its know-how to « white & yellow biotech » (transition from fossil carbon to plants carbon) via the modeling of bio-reactions that could improve the efficiencies of processes using micro-organisms (bacteria, yeast, fungi,)

CADI™: operational answer to address key R&D challenges.

- Disease understanding / redefinition. New therapeutic strategies, new associations of existing molecules,
- Identification/selection of pertinent predictive biomarkers, R&D programs evaluation,
- Drug (re)positioning /(re)profiling/ rescue, predictive efficacy and safety profiles,
- Proposition of new bio-production processes through micro-organisms' modifications, ...

And, as consequence, running life sciences R&D processes better, faster, cheaper and safer.

Value Proposition

<p>The benefits of our technology</p>	<p>CADI models are the “first-in-class” answers to explain the non-linear mechanisms of diseases and thus reveal pertinent biomarkers, therapeutic targets & therapeutic approaches.</p> <p>In 2003, we demonstrated the power of our approach through the publication, with INSERM unit 553, in Nucleic Acids Research, of the first ever successful, independently validated model of a complex human disease (hRas-dependent cancer progression).</p> <p>The CADI™ proprietary modelling approach is the most efficient synergic process linking organic non-linear integration (Brain intelligence) and in-silico data processing power (collecting, structuring and manipulating data) to build validated biological interaction maps. CADI™, based on “negative selection” analytical processes, was invented in 2002 by Dr. François Iris, founder, Chairman and CSO of the company.</p> <p>Our validated production (4 peer-reviewed publications, 2 patents under international examination, 1 patent application with CEA, 1 financed spin off company, 2 novel bacterial strains under construction, etc.) is a proof that we have clear competitive advantages.</p>
<p>Competition environment and competitive advantages of our technology</p>	<p>There are numerous companies active in the field of systems biology. They all implement traditional “positive selection” procedures (annotation, text mining, mathematical & statistical techniques, etc.). To date, the leading actors in the “traditional” field (that we abandoned in 2001) are The Institute for Systems Biology in Seattle; Entelos, leading company in mathematical modelling, and ARIADNE Pathway Studio in data compilation and pathways design. All of them use approaches that implicitly assume that “information” can be regarded as thrust-worthy and that life is a Cartesian process, thereby failing to use the integrative, non-linear & context-dependent reality of living mechanisms.</p> <p>In 2001, we were the first company that harnessed in its analytical approaches the integrative & non-linear nature of living processes to build detailed maps of both inter-cellular and intra-cellular mechanisms associated with a biological status. To date, we remain the only entity that has proven capable of not only consistently producing biologically valid models of complex human diseases, from cancer to neurological disorders and resistance to therapy, but also to derive from these models directly usable and pertinent industrial solutions, from new therapeutic approaches to novel technologies with immediate applications in the pharmaceutical, the chemical & the cosmetics industries as well as in defense.</p>
<p>Supporting evidence for value proposition</p>	<p>Our productions and their industrial applications (non-confidential & fully documented only):</p> <ul style="list-style-type: none"> – 7 CADI™ models in 5 major medical areas, – 2 publications in “cancer” with INSERM unit 553, – 2 book chapters (bio-informatics & neurobiology), – 2 invited publications (in peer-reviewed pharmacology & medicine international journals [pending]), – 1 publication pending in “neurodegenerative diseases” with CEA Life Sciences, – 1 patent in “psychiatric disorders therapies” with CEA Life Sciences, – 2 patents in “infectious diseases”, – 1 operational spin-off in Biodefense/Biosecurity (infectious threats), – 2 technological platforms (pre-clinical evaluation for psychotrop candidates & industrial biotech engineering), – 2 bacterial strains under development, – as well as undisclosed contractual research programs with pharma and chemical companies.

	<p>To give some idea of scale:</p> <ul style="list-style-type: none"> – The model of h-Ras-dependent cancer progression (2002-2003) took 5 months to build and the entire project (independent biological validations & testing of prospective therapeutic approach included) was completed within 14 months (2 modelling rounds). – The initial model of Creutzfeldt-Jakob disease pathogenesis and progression (2005-2008) took 7 months to build and the entire project (in vivo biological validation, in vivo results exploitation in other domains & patenting process included) was completed within 32 months (3 modelling rounds). – The initial model leading to the development of the TAPE technology (2006) took 1 month to build and the technology was developed & industrialised within a period of 6 months (1 modelling round). – The model describing in details the genetic & metabolic engineering required for the high-efficiency industrial bio-production of succinate via a novel pathway (discovered by BMSystems; 2008) took 2 months to build. Validation took 3 months. Construction of the bacterial strain is now nearing completion (less than 12 months in total). – Etc.
<p>Business model and collaboration frameworks</p>	<p>Our synergic activities:</p> <ul style="list-style-type: none"> – We create new knowledge from raw information through the construction of CADI™ models and, – We generate real business from this new knowledge through its innovative business strategies. <p>Our business model:</p> <ul style="list-style-type: none"> – BMSystems is a research-based biotech company that creates CADI™ models to generate businesses with immediate applications through contractual or collaborative research programs. – We have a flexible business model that, depending on the program, covers most possible alternatives. – BMSystems does not sell its technologies nor access to its technologies, but collaborates with its clients, under contractual frameworks adapted to suite the client's requirements, for a single aim: success. – BMSystems, thanks to its collaborative strategy, can address with limited marketing costs, all the markets (biomedical, chemistry, energy, environment, etc...) where its CADI™ models have proven to generate strong competitive advantages for its partners & clients.