

**MEMORANDUM FOR THE ESTABLISHMENT OF THE
INTERNATIONAL SCIENTIFIC COORDINATION NETWORK (GDRI)**

“Evolution, Regulation and Signaling (ERS)”

CENTRE NATIONAL DE LA RECHERCHE SCIENTIFIQUE, hereinafter referred to as **CNRS**, a public scientific and technological institution, with headquarters at 3, rue Michel Ange, 75794 Paris Cedex 16, France, represented by its **President, Mr. Alain FUCHS**,

acting in its own name and on behalf of:

- Laboratoire de physique théorique et modèles statistiques, UMR 8626, Director: Mr. Marc Mézard
- Laboratoire de physique statistique de l'ENS, UMR 8550, Director: Mr. Eric Perez
- Laboratoire de physique théorique de l'ENS, UMR 8549, Director: Mr. Costas Kounnas

AND

INSTITUT PASTEUR, a private foundation for research and public health, with headquarters at 25-28, rue du Docteur Roux, 75015 Paris, France, represented by its **Director General, Mrs. Alice DAUTRY**,

acting in its own name and on behalf of:

- Laboratoire Génétique des génomes, URA 2171, Director: Mr. Bernard Dujon

AND

UNIVERSITÉ PARIS-SUD 11, hereinafter referred to as **Université Paris 11**, a public scientific, cultural and professional institution, with headquarters at 15, rue Georges Clémenceau, Bâtiment 300, 91405 Orsay Cedex, France, represented by its **President, Mr. Guy COUARRAZE**,

acting in its own name and on behalf of:

- Laboratoire de physique théorique et modèles statistiques, UMR 8626, Director: Mr. Marc Mézard

AND

ÉCOLE NORMALE SUPÉRIEURE PARIS, hereinafter referred to as **ENS**, a public institution for higher education and research, with headquarters at 24, Rue Lhomond, 75231 Paris Cedex 05, France, represented by its **Director, Mrs. Monique CANTO-SPERBER**,

acting in its own name and on behalf of:

- Laboratoire de physique théorique de l'ENS, UMR 8549, Director: Mr. Costas Kounnas
- Laboratoire de physique statistique de l'ENS, UMR 8550, Director: Mr. Eric Perez

AND

UNIVERSITÉ PIERRE ET MARIE CURIE PARIS 6, hereinafter referred to as **UPMC**, a public scientific, cultural and professional institution, with headquarters at 4, place Jussieu, 75252 Paris Cedex 05, France, represented by its **President, Mr. Jean-Charles POMEROL**,

acting in its own name and on behalf of:

- Laboratoire de physique théorique de l'ENS, UMR 8549, Director: Mr. Costas Kounnas
- Laboratoire de physique statistique de l'ENS, UMR 8550, Director: Mr. Eric Perez

AND

UNIVERSITÉ DENIS DIDEROT PARIS 7, hereinafter referred to as **Université Paris 7**, a public scientific, cultural and professional institution, with headquarters at Présidence Bâtiment Grands Moulins, 75205 Paris Cedex 13, France, represented by its **President, Mr. Vincent BERGER**,

acting in its own name and on behalf of:

- Laboratoire de physique statistique de l'ENS, UMR 8550, Director: Mr. Eric Perez

AND

UNIVERSITY OF COPENHAGEN, a public University, with headquarters at Nørregade 10 DK-1165 Copenhagen K 118, Denmark, represented by its **Prorector, Mr. Thomas BJØRNHOLM / Rector, Mr. Ralf HEMMINGSEN**,

AND

DANISH NATIONAL RESEARCH FOUNDATION, hereinafter referred to as the **DNRF**, a public independent foundation supporting excellent frontier research within all research areas, located at Holbergsgade 14,1, DK-1057 Copenhagen, Denmark, represented by the **Chairman of the Board, Mr. Klaus BOCK**, and the **Director, Mr. Thomas SINKJÆR**,

acting in their own names and jointly on behalf of:

- Center of Models of Life, Niels Bohr Institute, Blegdamsvej 17, 2100 Copenhagen, Denmark, Head of Center: Mr. Kim Sneppen

AND

LUDWIG-MAXIMILIANS-UNIVERSITÄT MÜNCHEN, hereinafter referred to as **LMU**, a public University, with headquarters at Geschwister-Scholl-Platz 1, 80539 Munich, Germany, represented by the **Dean of the Faculty of Physics, Mr. Axel SCHENZLE**,

acting in its own name and on behalf of:

- Arnold Sommerfeld center for theoretical physics, Statistical and biological physics, Director: Mr. Dieter Lüst

AND

ROYAL INSTITUTE OF TECHNOLOGY hereinafter referred to as **KTH**, a public technical University, with headquarters at SE-100 44 Stockholm, Sweden, represented by its **President, Mr. Peter GUDMUNDSON**,

acting in its own name and on behalf of:

- School of Computer science and communication, Department of Computational Biology, Laboratory of Computational Biological Physics, Director: Mr. Erik Aurell

AND

STICHTING VOOR FUNDAMENTEEL ONDERZOEK DER MATERIE (Foundation for Fundamental Research on Matter), hereinafter referred to as **FOM**, an autonomous foundation for Fundamental Research on Matter responsible to the physics division of the national research council NWO, with headquarters at Van Vollenhovenlaan 659, 3527 JP Utrecht, Netherlands, represented by the **Director of the Institute for atomic and molecular physics (AMOLF), Mr. Wim VAN SAARLOOS**,

acting in its own name and on behalf of:

- Instituut voor Atoom en Molecuulfysica (AMOLF, Institute for atomic and molecular physics), Amsterdam, Director: Mr. Albert Polman

AND

MAX-PLANCK-GESELLSCHAFT ZUR FÖRDERUNG DER WISSENSCHAFTEN, hereinafter referred to as **MPG**, a public institution of private law, with headquarters at Hofgartenstr. 8, 80539 Munich, Germany, represented by its President, Mr. Peter GRUSS and its Secretary General, Mr. Ludwig KRONTHALER, and by delegation of authority, **the Director of the Max Planck Institute for Dynamics and Self Organization, Göttingen, Mr. Stephan HERMINGHAUS**,

acting in its own name and on behalf of:

- Max Planck Institute for Dynamics and Self-Organization, Göttingen, Director: Mr. Stephan Herminghaus

Hereinafter referred to individually as the “Party” or collectively as the “Parties”.

PREAMBLE

The scientific interface between physics and biology is one of the most active areas of scientific research, as shown by its rapid evolution during recent years. Regulatory and signaling networks and their evolution constitute one of the themes that have attracted considerable interest and have seen major progress in recent years. The Parties constitute a selection of some of the best EU teams working on these subjects. On the one hand, the activity of the various teams is centered on physical approaches to biological systems, constituting the common ground to ensure productive discussions and mutual interactions. On the other hand, the groups have been selected for their wide variety of approaches and fruitful interactions among experiments, modeling and computational methods involved in their research activity. The added value of combining these different approaches and teams is crucial for the success of this interdisciplinary initiative. Scaling it up at the international level is a necessity in view of the highly competitive and rapidly evolving nature of the field. Meetings, schools and workshops that will be organized thanks to this Network will foster the emergence of common projects, collaborations and grants, thus allowing to further structure the French community as well as to thread new links and contacts at the international level. These goals constitute the motivation for the International scientific coordination network indicated hereafter.

It has been agreed as follows:

Article 1 – Purpose

The purpose of this Memorandum is the establishment of an International scientific coordination network, (hereinafter referred to as the “Network”), a non-incorporated means of cooperation, named **“Evolution, Regulation and signaling (ERS)”** the purpose of which is to exchange information on the following scientific theme: *Physics of the evolution of regulatory and signalling mechanisms in biological systems*, hereinafter referred to as the Network Theme.

The scientific purpose of the Network within the framework of the Theme and the activities resulting from it are stated in Annex 1.

Article 2 – Composition

The Network is composed of the laboratories or institutes or centers listed above.

The activities to be coordinated by the Network shall extend only to the scientific work inherent to the Network Theme of the laboratories/institutes/centers.

All personnel of the said laboratories or institutes contributing to the Network activities shall remain assigned to their home laboratory/institute/center and institution.

For information purposes only, the list of the staff of the signatory Parties to the Memorandum and of external interested participants is attached to the present Memorandum.

The Scientific Committee proposes to the Parties any useful modification to this Memorandum. It proposes to the Parties the termination or renewal of this Memorandum.

Article 3 – Resources

Each Party shall undertake to make available to the members of the Network affiliated to said Party the means it deems necessary to promote their activities within the framework of the regulations of the individual Parties and in particular:

- a/ The exchange of information between Network members through the organization of conferences, seminars, colloquia, workshops, thematic schools or work meetings on said Theme.
- b/ Discussion of the setting up and running, if necessary, of joint research projects on said Theme at a later stage.
- c/ Cooperation in terms of information and scientific documentation in particular through the exchange of publications and scientific reviews on the Network Theme.
- d/ Facilitate contacts and exchanges of researchers participating in the Network on said Theme.

Article 4 – Organization

A Coordinator whose identity is given in Annex 2, shall be appointed jointly by the Parties for a four (4) year period.

The role of the Coordinator is to steer the Network activities and the Theme with the Scientific Committee, and to transmit the information submitted by the Parties to the Scientific Committee and Network members.

The Coordinator shall be assisted by a Scientific Committee. The Scientific Committee is composed of sitting representatives from member laboratories/institutes/centers, appointed by the Party (or Parties) to which the laboratory/institute/center is affiliated. The composition of the Scientific Committee selected is set forth in Annex 3.

The Scientific Committee shall meet at least once a year and as often as needed at the initiative of the Coordinator or of one third (1/3) of its members. As necessary and with the unanimous consent of the Scientific Committee members, these meetings may be held by videoconferencing. All minutes shall be distributed to the Parties.

Each Party shall transmit to the Coordinator the names of the scientists participating in the activities of the Network, for each member laboratory/institute/center affiliated to said Party. The Coordinator shall compile the list and transmit it to all the members of the Network. The Coordinator shall update the list whenever necessary.

The Coordinator shall draw up an annual scientific and financial report of the Network's activities which shall be submitted to the Parties.

Article 5 – Implementation of Network activities

The conferences (after consultation with the Network laboratories and institutes), seminars, colloquia, workshops, thematic schools or work meetings on the Network Theme are organized under the sole responsibility of the Party that takes the initiative to do so. Each Party shall fund the participation of each of its members in Network activities.

Within the framework of the exchanges referred to in Section d of Article 3 above, the relationship between the institution to which the researcher belongs and the host institution shall be strictly bilateral and their terms and conditions are not governed by this Memorandum.

The Parties shall make mention of the financial resources that they intend to allocate to their participation in Network activities for information purposes in Annex 4.

If two or more Parties intend to carry out research work jointly within the framework of the Network Theme, they shall establish the terms and conditions of said cooperation in a separate agreement

binding on the signatory Parties, particularly with regard to Intellectual Property, the ownership and the exploitation of results.

Article 6 – Duration

This Memorandum is entered into for a period of four (4) years as of 1 January 2011.

Any Party may withdraw from this Memorandum by giving six (6) months advance notice by registered letter with acknowledgement of receipt addressed to the other Parties.

Article 7 – Confidentiality

Each Party shall undertake to treat confidentially and not to reveal to third parties any information that comes to them within the framework of the coordination.

Article 8 – Disputes

It is agreed that, in the event a problem arises from the interpretation or performance of this Memorandum, or if the Parties identify new problems not covered by this Memorandum, the Parties shall enter into amicable negotiations to resolve the problems. If it is necessary, the results of these negotiations could be the subject of amendments to this Memorandum.

If no amicable settlement is reached, the appellant shall request a settlement of the dispute before an arbitrary court, which shall rule in accordance with the rules of international law.

Article 9 – Copies

Drafted in twelve (12) copies. Each Party signs one copy and returns it to CNRS. CNRS collates and archives these copies, and sends a certified copy of the signed Memorandum to each of the Parties.

Date..... Place..... Date..... Place.....

For CNRS

For Institut Pasteur

Alain FUCHS, President

Alice DAUTRY, Director General

Date..... Place.....

For Université Paris 11

Date..... Place.....

For ENS

Guy COUARRAZE, President

Date..... Place.....

For UPMC

Monique CANTO-SPERBER, Director

Date..... Place.....

For Université Paris 7

Jean-Charles POMEROL, President

Date..... Place.....

For University of Copenhagen

Vincent BERGER, President

Date..... Place.....

For DNRF

Ralf HEMMINGSEN, Rector /
Thomas BJØRNHOLM, Prorector

Klaus BOCK, Chairman of the Board
Thomas SINKJÆR, Director

Date..... Place..... Date..... Place.....
For LMU **For KTH**

Axel SCHENZLE, Dean of the Faculty of Physics **Peter GUDMUNDSON**, President

Date..... Place..... Date..... Place.....
For FOM **For MPG**

Wim VAN SAARLOOS, Director
of AMOLF

Stephan HERMINGHAUS, Director of the Max
Planck Institute for Dynamics and Self
Organization

ANNEX 1

DESCRIPTION OF THE COOPERATION

Some of the Network subjects of interest are briefly described hereafter. The list of activities organized in the next couple of years and foreseen for the rest of the four years will follow.

Regulatory processes in cell biology

The regulation of gene expression in its simplest form is akin to a switch, with the binding of a transcription factor to DNA playing the role of the relay. This lock-and-key picture is a good approximation in a number of instances. However, it has become clear in the last years, that the generic picture is more global and intricate, e.g. the rate of transcription of a gene generally depends on several transcription factors acting in cooperation, transcription factors and/or their cofactors often modify the local DNA structure and accessibility of genes is globally controlled by the state of the chromatin. This realization has completely changed the field as the need of quantitative methods has become imperative. These problems provide an instance of the benefits that quantification can bring in understanding the biology and progressing experiments.

As a first example, it is now recognized that the signals in the genome that regulate the positioning of histones and the state of the chromatin are particularly subtle. Their importance is amplified by the fact that they often exert global effects, controlling the state of extended genomic domains. Chromatin structure, nucleosome positioning and the associated genomic signals constitute an active subject of research that currently involves non-trivial statistical tools and models. Physicists are actively engaged in this subject of major Network interest.

Even at a more local scale, regulatory DNA regions that control the expression of a gene might be located kilobases away from it, especially in eukaryotes. Furthermore, binding sites for transcription factors are not necessarily strong and easily recognizable. The signal in the genome might for example be encoded in clusters of relatively weak binding sites. The kinetics of the genome exploration and the search of the binding sites by the transcription factors are also non-trivial. All these problems call for the computational tools and theoretical models that benefit from ideas borrowed from information theory and statistical physics. Several groups are working in these areas, which will constitute important subjects of activity for the Network.

Contrary to old ideas purporting the nearly exclusive role of coding regions and proteins for genetic change, the dynamics of regulatory genomic regions is nowadays thought to play a crucial role in evolution. Furthermore, the large number of genomes sequenced in the past few years has finally permitted a quantitative look at the problem of genomic evolution. Statistical physics approaches developed by members of this Network are practically useful in such comparative analyses and, furthermore, they establish enlightening connections with population evolutionary genetics that will be discussed in the sequel.

Another fascinating direction of research is provided by the possibility of synthetically constructing genomic regulatory regions. This makes accessible, at least for the simplest cases, detailed maps of the fitness landscape for the genomic locus of interest. It becomes then possible to explore the spectrum of evolutionary trajectories that the organism can take to reach the peak(s) of fitness. Synthetic biology is also represented in the Network by groups working on regulatory gates based on RNAs, which have recently emerged as ubiquitous and versatile players in regulation, both in prokaryotes and eukaryotes.

Finally, the study of properties of biological interaction networks, e.g. protein-protein or transcriptional, attracts much attention and is well present in the Network. The mapping of the networks mostly rely on experimental high-throughput techniques, yet the role of computational tools is far from negligible and some rather sophisticated algorithms have (and are still being) developed. Most research efforts focus on the quantitative characterization of the networks, both at the topological and the dynamical level, and on the evolutionary mechanisms that can lead to the emergence of their specific features, namely of robustness and connectivity. The issue of network evolvability is also a subject of interest for members of the Network, directly connected to the experimental characterization of fitness landscapes that was mentioned previously. Another connection with evolutionary dynamics is provided by genetics algorithms developed to explore the space of possible network architectures and to identify the ones most appropriate for a given function or combination of functions.

Biological Signaling

One of the distinctive capabilities of living organisms is to sense and adapt continuously to the environment. Throughout evolution, sophisticated mechanisms to sense the surrounding world and transduce the resulting cues to the interior of the cell have emerged. The challenge for the cell is to extract reliable information out of a signal that is usually noisy for a number of reasons. A non-exhaustive list ranges from noise in the external signal to the stochastic nature of binding/unbinding to receptors and the effect of internal noise arising from the limited number of molecules within the signaling pathway. The latter is a very popular subject of research, which is well represented in this GDRE and connects also to the regulatory processes described previously. The issue is to understand limitations and possibilities stemming from the stochastic nature of the molecular processes that constitute the building blocks of the information processing cellular machinery.

Signaling pathways that control the chemotaxis of cells towards high concentrations of attractants have the notable advantage that their biological function is well defined and quantified. The chemotaxis networks for model organisms, *E. coli* for prokaryotes and *D. discoideum* for eukaryotes, constitute a subject of interest for a number of groups within this Network. As for the amoeba *D. discoideum*, most attention is currently focusing on the mechanisms allowing the cell to get polarized and differentially segregate molecular species to the front or the rear of the cell. Conversely, molecular players for *E. coli* chemotaxis are well characterized and FRET experiments are providing crucial information on their molecular interactions. Moreover, those data are furnishing quantitative constraints and tests for theoretical models of the pathway. Evolutionary forces shaping the bacterial chemotaxis network are currently assayed by sampling the adaptation of the network to the surrounding environment. Interactions, e.g. by quorum sensing, among individuals in bacterial colonies and their collective swarming are also thoroughly investigated. These problems, as well as others such as cellular aging, strongly benefit of novel single-cell microscopy and microfluidic tools, largely developed and employed by many groups of the Network. These experimental developments constitute a methodological central theme in the Network, which will be the object of thematic workshops.

One of the most impressive signaling pathways controls lymphocyte activation in response to antigens. This is crucial for a proper response of the immune system and displays a remarkable combination of speed, sensitivity and discrimination. The major challenge is to identify few antigenic molecules within a sea (often thousands of times more numerous) of self-molecules that might differ by just a single aminoacid. Massive efforts concentrate on trying to elucidate the key properties of the networks responsible for this impressive *tour de force*. The capability to avoid responding to self-molecules emerges during the maturation phase, when negative selection operates upon lymphocytes strongly responding to self. This negative selection and the ensuing constraints are also quite relevant for the diversity of the antibody repertoire, which is yet another recent subject of great interest and active contribution for members of this Network.

Evolutionary and Population Genetics

The field of evolutionary and population genetics is undergoing major changes due to the advent of high-throughput techniques of genotyping, re-sequencing and phenotyping, e.g. Single Nucleotide Polymorphisms (SNP) mapping efforts. Haplotype reconstruction, recombination hot-spot mapping, ancestry inference, selective and demographic inference, all present computational and statistical challenges that could benefit from the injection of methods from other fields and foster the development of novel ideas and approaches. Fruitful interactions are facilitated by the peculiar status of the field in biology, traditionally featuring a stronger role of theory and models. These were the motivations for a three-month program organized a couple of years ago at the KITP (UCSB, Santa Barbara). A number of physicists, including a number of participants in this Network, attended the program; collaborations, joint works and publications have followed.

One of the major challenges is to go beyond neutral dynamics. The latter provides for a general classical framework, of importance both for its rich statistical dynamics and for a benchmark to efficiently identify genomic loci affected by other mechanisms such as natural selection, demography and migrations. However, experimental data currently produced require a detailed discrimination among these evolutionary scenarios and typically call for multiple-loci genomic methods and analysis of quantitative traits. This is where the contribution of groups of this Network will concentrate. The role of the structure will be to thread links among researchers in this nascent subject and to provide timely meetings to identify relevant problems in the field. In that respect, we plan to organize a workshop on viral evolution, which is naturally coupled to public-health issues.

Activities supported by the Network

For the first two years, the following activities are in the process of being organized:

June 2011: The Network will contribute to the organization of the International Conference *Physics and Biological Systems*, to be held at Université Paris-Sud 11, Orsay on June 11-14 (see the web site of the Conference at <http://lptms.u-psud.fr/workshop/physbio2011/>).

December 2011: A workshop on evolutionary population genetics will be organized in Paris by A. Walczak, member of this Network, and M. Desai (Harvard Univ.). The workshop will last for two days and will feature a dozen talks on the subjects mentioned above. Most participants will be from Europe, with two-three invited speakers from the US. We are in the process of contacting interested participants.

May 2012: The Network will contribute to the organization of a meeting on the Physics of Cancer, to be held at the Center for Cancer Research (IRCC) in Turin (Italy). The meeting will be sponsored mostly by the IRCC and the Network will contribute to cover part of the costs.

Fall 2012: A workshop on single-cell methods for biological aging will be organized in Strasbourg at the Institut de Génétique et de Biologie Moléculaire et Cellulaire (IGBMC) by G. Charvin.

During the four years of the Network, the following types of activities are foreseen.

General meetings will serve to convene the members of the Network and to present the most recent results obtained by the various groups. We shall pay particular attention to the choice of the location, so as to favor informal discussions, interactions and the emergence of new ideas and collaborations. We shall of course invite scientists outside the Network who have obtained results that look particularly relevant to the activities of the affiliated groups. In particular, biologists and scientists from other disciplines will be systematically invited to attend the meetings and other activities of the Network.

Specific workshops will have the goal of gathering sub-ensembles of groups (and possibly external contributors) interested in a particular issue of interest to the Network. The activity will typically feature a one-day activity, with a couple of more formal contributions, meant to introduce the subject, followed by informal interventions. This scheme will permit to stimulate the discussion leaving time and space, though, to the confrontation among the participants and the emergence of novel ideas.

International conferences will be the occasion to have a worldwide view of the state-of-the-art in the subjects of the Network. Conferences will of course require external funding so as to cover the additional costs of international invitees. The idea will then be to search for additional sources of funding, namely by local institutions and European agencies. The Network will provide a first contribution that, although limited, is by experience quite important in starting up the search for additional funds. Two members, Erik Aurell and Ulrich Gerland, have already expressed interest in organizing an activity (either general meeting or international conference) along the lines just described.

Winter and summer schools. Members of the scientific committee have organized and/or have been contacted in the past few years to organize summer and winter schools. A notable example is the summer school organized in 2009 in Bad Honnef by one of the members of this Network (U. Gerland). The school was a major success and an excellent scientific occasion for Ph.D. students and postdocs. We shall be particularly receptive about these possibilities and one school will most likely be organized during the four years of the Network, either in France (e.g. at IHP, Cargèse or Les Houches) or abroad. Students and post-docs of groups affiliated to the Network will then have the possibility to attend the school and partial cover of their expenses will be considered. Partial support will also be considered for students attending schools that are particularly relevant to the Network.

Support for the set-up of collaborative grants. A major reason for the International label is that it will permit groups to meet, know better each other and get to apply together for some collaborative grants, namely at the European level. This is not the case at the moment and, since the critical mass is reached or about to be reached, the sense of several colleagues in the field is that some action should be taken. We shall work to favor the emergence of these collaborative actions and we shall consider the possibility of some support for their set-up.

Information spreading and diffusion. We shall prepare an e-mail list and a web site that will permit to announce specific activities of the Network and post other relevant information, such as offers of Ph.D.'s, Post-Docs, workshops and conferences. We shall make specific efforts to maintain the site updated so that it will represent a useful tool for the groups of the Network and of the entire community.

Administration

Administrative tasks will be ensured by the staff of the URA 2171, "Génétique des Génomes", as well as by Mme C. Adjutor, the administrative assistant of the coordinator's group *Physics of Biological Systems*, at the Institut Pasteur.

ANNEX 2
COORDINATOR OF THE NETWORK AS OF JANUARY 1, 2011

The signatory Parties to the Memorandum for the establishment of the International scientific coordination network (Network) entitled “**Evolution, Regulation and signaling**” hereby appoint **Mr. Massimo Vergassola** (Laboratoire Génétique des génomes, URA 2171), as Coordinator of the Network as of January 1, 2011 for a period of four (4) years.

ANNEX 3
SCIENTIFIC COMMITTEE OF THE NETWORK AS OF JANUARY 1, 2011

- Massimo Vergassola, Laboratoire Génétique des génomes – URA 2171, Paris (Institut Pasteur)
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- Olivier Martin, Laboratoire de physique théorique et modèles statistiques – UMR 8626, Orsay (CNRS, Université Paris 11)
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- Vincent Hakim, Laboratoire de physique statistique de l'ENS – UMR 8550, Paris (CNRS, ENS, UPMC, Université Paris 7)
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- Aleksandra Walczak, Laboratoire de physique théorique de l'ENS – UMR 8549, Paris (CNRS, ENS, UPMC)
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- Erik Aurell, School of Computer science and communication, Department of Computational Biology, Stockholm (KTH)
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- Oskar Hallatschek, Institute for Dynamics and Self Organization, MPI for Dynamics and Self Organization, Göttingen (MPG)
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- Mogens Høgh Jensen, Center of Models of Life, Niels Bohr Institute, Copenhagen (University of Copenhagen, DNRF)
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- Ulrich Gerland, Arnold Sommerfeld center for theoretical physics, Statistical and biological physics, München (LMU)
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- Pieter Rein ten Wolde, Instituut voor Atoom en Molecuulfysica, AMOLF (FOM)
tenwolde@amolf.nl

ANNEX 4
Network PROJECTED BUDGET FOR 2011

Country	Resources	Amount (€)
France		
A) CNRS	a) Supplementary resources from CNRS (Office of European Affairs)	15 000
	b) Laboratory budget – UMR 8549	0
	– UMR 8550	0
	– UMR 8626	0
	Sub-total for CNRS	15 000
B) Institut Pasteur	a) Laboratory budget – URA 2171	0
	b) Supplementary resources from Unit Physics of Biological Systems Institut Pasteur	2 500
	Sub-total for Institut Pasteur	2 500
C) UPMC	a) Laboratory budget – UMR 8549	0
	– UMR 8550	0
	b) Supplementary resources from UPMC	0
	Sub-total for UPMC	0
D) Université Paris 7	a) Laboratory budget – UMR 8550	0
	b) Supplementary resources from Université Paris 7	0
	Sub-total for Université Paris 7	0
D) Université Paris 11	a) Laboratory budget – UMR 8626	2 000
	b) Supplementary resources from Université Paris 11	2 000
	Sub-total for Université Paris 11	4 000
E) ENS	a) Laboratory budget – UMR 8549	0
	– UMR 8550	0
	b) Supplementary resources from ENS	0
	Sub-total for ENS	0
	Total for France	21 500
Denmark		
A) University of Copenhagen	a) Center budget	0
	b) Supplementary resources from University of Copenhagen	0
	Sub-total for University of Copenhagen	0
B) DNRF	a) Center budget	2 500
	b) Supplementary resources from DNRF	0
	Sub-total for DNRF	2 500
	Total for Denmark	2 500
Germany		
A) LMU	a) Center budget	0
	b) Supplementary resources from LMU	2 500
	Sub-total for LMU	2 500
B) MPI for Dynamics and Self Organization	a) Institute budget (Hallatschek's group)	1000
	b) Supplementary resources from MPG
	Sub-total for MPI for Dynamics and Self Organization	1 000
	Total for Germany
Sweden		
KTH	a) Laboratory of Computational Biological Physics external funding/contract	7 500

Country	Resources	Amount (€)
	b) Supplementary resources from KTH	0
	Sub-total for KTH	7 500
The Netherlands		
FOM	a) Laboratories ten Wolde, Sander, Shimizu,	6 000
	b) Supplementary resources from FOM	...
	Sub-total for FOM	6 000
	TOTAL	...