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PROJECT PARTNERS INTERACTION PLAN AND COOPERATION AGREEMENTS

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1. Introduction

1.1. Scope

The scope of this document is to summarize an agreed interaction plan between the project team at CIRiS (NTNU Samfunnsforskning AS, Trondheim, Norway) and the external project partners listed in Section 2. The document outlines the terms of reference under which the Project members and the Project Partners cooperate.

1.2. Project Overview and Main Objective

The main objective of this project is to establish an understanding of the current knowledge and to elaborate a roadmap for the future research activities required to ensure the fundamental plant biology knowledge needed for the future development and improvement of environmental control and life support technologies.

An overview of the project tasks are outlined in Figure 1. One of the first project tasks is to collect knowledge from the literature and the scientific community concerning how the physical factors on the Moon/Mars will affect higher plants growth and development through one life cycle. Trough the life cycles the plants are assumed to be provided with optimal growth conditions linked to temperature, light, pressure, water and gas supply/ composition, and the growth media are assumed to give optimal root support and make water and nutrients available for the plants. The parameters of interest are the physical factors that are different from the conditions on the Earth such as; the occurrence of **space radiation,** the effect of variations in **gravity** (including Sedimentation, Diffusion, Droplet sedimentation, Isothermal settling, Natural convection)**,** a different **magnetic field** and ultimately a **combined effect** of these factors. In the project study these factors will be studied first on various “Sub Plant-levels” and later by following the development and appearance (anatomy, morphology) of the whole plant. In parallel it is just as important to identify areas

where knowledge is missing and where further ground and space flight experiments are required. The literature study results will be reviewed midterm.

Based on the abovementioned studies and the midterm review, a synthesis of requirements for the future research activities on higher plants will be presented in a workshop. During the workshop there will be a possibility to improve and refine the assessment performed during a roundtable discussion. The refinement of the requirements shall result in the definition of major “building blocks”. The relationship between the “building blocks” will represent a group of requirements to be closed/fulfilled by specific activities, i.e. resulting in new and needed knowledge. The roadmap will define/propose the place these “building blocks” should have in a timescale.

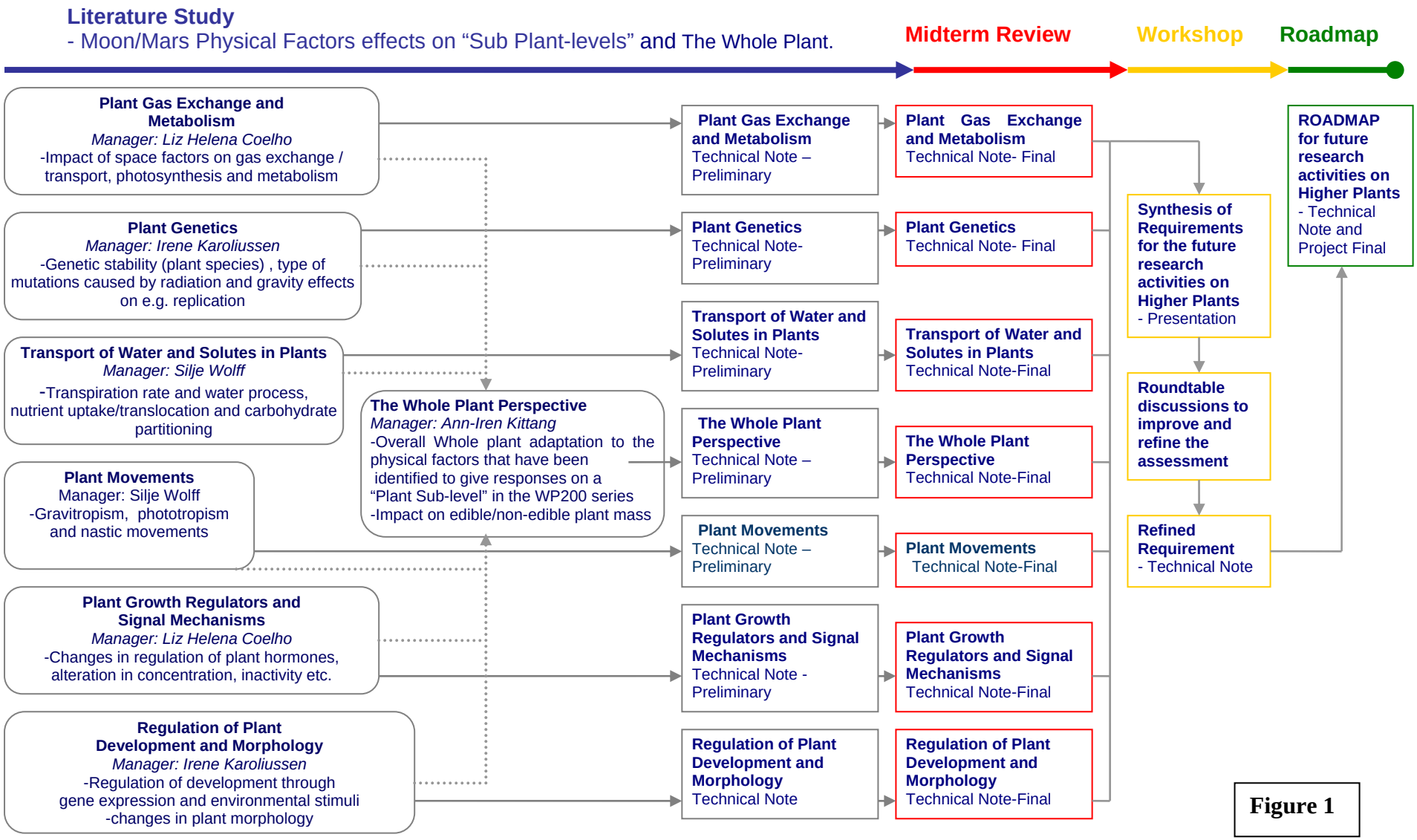

Figure 1

1.3. Project Schedule

The project started in August 2008 and is scheduled to last until the end of June 2010. The literature analyses will be performed from project start until the end of 2009, when a midterm review will take place. During spring 2010 a workshop (Tentative date: from March 24th to 26th 2010) will be organised based on the results from the midterm review. As part of the workshop a synthesis of requirements is presented. The refinement of the synthesis and a set-up of building blocks will take place shortly after and ultimately a roadmap will be delivered. For details see "Project Schedule" enclosed in Appendix 1.

2. Project Parties and Roles

There are several parties that will play an important role in this project. The project is assigned to CIRiS (Trondheim, Norway, from now on referred to as the "*Project Team*") by ESA (European Space Agency, Noordwijk, NL). The Project Team and ESA have invited five experts to join the project as external partners (from now on referred to as "*Partners*"). Contact information both for the Project Team and the Partners is presented below.

As part of the literature study several selected scientists will be interviewed. These are excluded from this internal cooperation plan and agreement.

2.1 Project member

The Project Team responsibilities and contact information for the team members are presented in Table 1.

***Table 1**. The Project Team responsibilities and contact information.*

Team member	**Responsibilities in Project**	**Contact information**
Knut Fossum	Head of CIRiS. Personnel administration and contract matters.	**Email**: Knut.Fossum@bio.ntnu.no **Phone**: +4773590163 **Address**: Plant Biocentre, NTNU, Dragvoll Allè 38, Trondheim, Norway.
Ann-Iren Kittang	Project Manager, Coordination of : Whole Plant Perspective Review Process /synthesis of requirement , Refinement of requirements, Roadmap	**Email**: Ann-Iren.Kittang@bio.ntnu.no **Phone:** +4773590172 **Address**: Plant Biocentre, NTNU, Dragvoll Allè 38, Trondheim, Norway.
Silje Wolff	Transport of Water, Nutrients and Carbohydrates in Plants, Plant Movements	**Email**: wolf@bio.ntnu.no **Phone**: +4773590170 **Address**: Plant Biocentre, NTNU, Dragvoll Allè 38, Trondheim, Norway.
Irene Karoliussen	Plant Genetics, Regulation of Plant Development and Morphology	**Email**: irenekar@bio.ntnu.no **Phone**:+4773590168 **Address**: Plant Biocentre, NTNU, Dragvoll Allè 38, Trondheim, Norway.
Liz Helena Coelho	Plant Growth Regulators and Signal Mechanisms, Plant Gas Exchange and Metabolism	**Email:** liz.coelho@bio.ntnu.no **Phone**: + 47 452 36 087 **Address**: Plant Biocentre, NTNU, Dragvoll Allè 38, Trondheim, Norway.
Gjert Aanes	Database development, Technical Support	**Email:** gjert.aanes@bio.ntnu.no **Phone**: +4773590187 **Address**: Plant Biocentre, NTNU, Dragvoll Allè 38, Trondheim, Norway.
Tor-Henning Iversen	Senior Advisor	**Email:** Tor-Henning.Iversen @bio.ntnu.no **Phone:** +4773596087 **Address**: Plant Biocentre, NTNU, Dragvoll Allè 38, Trondheim, Norway.

2.2 Partners

The project Partners invited by ESA and the Project Team to participate in the project are listed in Table 2.

Table 2. *The project Partner list and contact information.*

Partner Name	**Contact Information**
Enno Brinckmann	**Email**: ebrinckmann@pachypodium-namaquanum.de **Phone**: +49(0)491-971 1797 **Address:** Eschenweg 16, D-26789 Leer, Germany
Mike Dixon	**Email**: mdixon@ces.uoguelph.ca **Phone**: +1 519 824 4196 **Address**: CES Research Facility Department of Environmental Biology University of Guelph E.C. Bovey 1213, Ontario, Canada
Claude-Gilles Dussap	**Email**: c-gilles.dussap@univ-bpclermont.fr **Phone**: +33-(0)4 73 40 7501 **Address**: Laboratoire de Génie Chimique et Biochimique (LGCB) Université Blaise Pascal-Polytech'Clermont-Ferrand 24 Avenue des Landais / BP 206 63174 - Aubière Cédex, France
Dominique Van der Straeten	**Email**:dominique.vanderstraeten @ugent.be **Phone**: +32 9 2645185 **Address**: Ghent University Department of Physiology Unit Plant Hormone Signaling & Bio-imaging Ledeganckstraat 35 B-9000 Gent Belgium
Raymond Wheeler	**Email**: raymond.m.wheeler@nasa.gov **Phone**: +1 321 861 2950 **Address**: NASA Biological Sciences Office, John F. Kennedy Space Center, Florida 32899 USA

3. Partners contribution to the project

The Partners' contribution to the project will depend on what phase the project is in and the availability of the individual Partner. Below is defined 3 phases: 1) Literature study phase, 2) Midterm review and 3) Workshop. In Table 3 an overview of the individual partners agreed contributions are listed

3.1 Literature Study Phase

It is important that the Project Team and the Partners meet (preferably face-to-face) as early as possible for an extensive discussion of the project. After the first meeting a bi-monthly teleconference will be set up between the Project team and the Partners.

3.2 Midterm Review

The literature study is divided into six "Plant Sub-level" categories and the "Plant Whole" level. The results from each of the seven areas will be presented in seven technical notes which will be made available to the Partners and ESA for review. Which Partner that will review which technical note is shown in Table 3.

Each of the Partners should give comments to the technical notes individually in writing and a personal teleconference will be set up to discuss in detail the comments given if needed.

3.3 Workshop

The Project Team will organise a workshop where the synthesis of requirements for the future research activities on higher plants will be presented based on literature study and the Partners' contributions during the Midterm Review. During the workshop a roundtable discussion will give the Partners the opportunity to improve and refine the assessment. Minutes of Meeting will be prepared by the Project Team, and the Partners will be given the opportunity to review and comment the Minutes of Meeting. The workshop will take place either at ESTEC (Noordwijk, NL) or Trondheim (N).

Table 3. *The project Partner availability and agreed contribution to the project.*

Partner Name	**1 Day Meeting in January 2009**	**Bi-monthly telecon during Literature Study (Jan-Oct 2009)**	**Midterm review Oct-Dec 2009**	**Workshop 2-3 days March 2010**
Enno Brinckmann	Available in person	Available	Agreed to review all the 7 techincal notes on: - Plant genetics - Plant growth regulators/signal mechanisms - Regulation of plant development and morphology - Transport of water and solutes in plants - Plant movements - Plant gas exchanges and metabolism - The whole plant perspective	Available in person
Mike Dixon	Available via teleconference	Available	Review of the 7 techincal notes on: - Plant genetics - Plant growth regulators/signal mechanisms - Regulation of plant development and morphology - Transport of water and solutes in plants - Plant movements - Plant gas exchanges and metabolism - The whole plant perspective	Available in person
Claude-Gilles Dussap	Available via teleconference	Available	Review of the 7 techincal notes on: - Plant genetics - Plant growth regulators/signal mechanisms - Regulation of plant development and morphology - Transport of water and solutes in plants - Plant movements - Plant gas exchanges and metabolism - The whole plant perspective	Available in person
Dominique Van der Straeten	Available via teleconference.	Avaiable	Agreed to review the technica note on -Plant growth regulators/signal mechanisms The technical note on Plants movements will be sent as a reference document.	Available via teleconference
Raymond Wheeler	Available via teleconference.	Available	Agreed to review 6 of the techincal notes on: - Plant growth regulators/signal mechanisms - Regulation of plant development and morphology - Transport of water and solutes in plants - Plant Movements - Plant gas exchanges and metabolism - The plants global perspective	Available in person

4. Technical Notes

The technical notes written by the Project Team to be reviewed by the Partners/ESA in the Midterm Review shall be concise and not be longer than 15 pages for each technical note. The technical notes shall contain overview figures or tables.

5. Confidentiality

Since some of the information during the telecommunications and the workshop will be regarded as confidential for strategic reasons, ESA (via the Project Team) will provide a confidentiality agreement which the Partners are asked to sign. This will not be applicable to the Partners that are already a MELiSSA partner or have signed other relevant agreements with ESA.

6. Travels

The cost and hours of the travelling can be reduced by choosing a central location or by combining the project meetings with a conference or another meeting where several Partners are planning to participate (e.g. one of the MELiSSA meetings). The LiRHiPliSMe project has allocated a budget to contribute to (in case of combination with other meetings) or cover the Partners' travel expenses when participating in the 1 day Face-to-Face meeting and/or the 2-3 days workshop.

7. Publication of results

The results of the study will be presented at conferences and published in journals. All the Partners will be acknowledged. If any of the Partners are invited to contribute to the article, they will be invited as co-authors.

APPENDIX 1 Project Schedule

Task Name	Start	Finish
CiRIS_LiRHiPliSMe_Schedule_12Nov2008	**28.07.08**	**30.06.10**
Literature studies	**28.07.08**	**30.09.09**
Literature review	28.07.08	30.09.09
Face-to-Face meeting	26.01.09	26.01.09
Bi-monthly teleconference	05.01.09	30.09.09
Midterm review of literature study reports	**01.10.09**	**14.12.09**
Delivery of preliminary literature study reports	01.10.09	01.10.09
Review of reports by advisory/evaluation board	02.10.09	01.12.09
Update of reports	02.12.09	14.12.09
Delivery of final literature study reports	14.12.09	14.12.09
Synthesis of requirements	**15.12.09**	**14.05.10**
Synthesis of requirements development	15.12.09	23.03.10
Workshop - presentation of requirments	24.03.10	26.03.10
Refinement process of requirements	26.03.10	14.05.10
Roadmap development	**17.05.10**	**30.06.10**
Roadmap development	17.05.10	28.06.10
Delivery of roadmap	30.06.10	30.06.10