SEVENTH FRAMEWORK PROGRAMME
THE PEOPLE PROGRAMME

Grant agreement for: Initial Training Networks

Annex I - "Description of Work"

Project acronym: CRYSTAL2PLATE

Project full title:
How does plate tectonics work:
From crystal-scale processes to mantle convection with self-consistent plates

Grant agreement no.: *215353*

Date of approval of Annex I by Commission: 18th August 2008

PART A:

A 1 List of beneficiaries and project summary

A1.1 List of Beneficiaries

Beneficiary number	Beneficiary name	Beneficiary short name	Country	Date enter project	Date exit project
1 (coordinator)	UNIVERSITE MONTPELLIER 2	UM2	France	Month1	Month48
2	UNIVERSITY OF BRISTOL	UNIVBRIS	United Kingdom	Month1	Month48
3	UNIVERSITEIT UTRECHT	UU	Netherlands	Month1	Month48
4	EIDGENOESSISCHE TECHNISCHE HOCHSCHULE ZUERICH	ETH Zurich		Month1	Month48
5	CENTRE NATIONAL DE LA RECHERCHE SCIENTIFIQUE	CNRS-FAST	France	Month1	Month48
6	UNIVERSITA DEGLI STUDI ROMA TRE	Uniroma TRE	Italy	Month1	Month48
7	CONSEJO SUPERIOR DE INVESTIGATIONS CIENTIFICAS	CSIC	Spain	Month1	Month48

List of Associated Partners

Associated partner number	Associated partner name	Associated partner short name	Country	Level of participation	Organisation status
1	Rockfield	Rockfield	United Kingdom	2	SME
2	Schlumberger	Schlumberger	France	2	Enterprise
3	Oxford Instruments HKL	HKL	Danemark	2	Enterprise
4	Total	Total	France	2	Enterprise

A1.2 Project Summary

Free keywords: multi-scale processes, physico-chemical interactions, tectonics, seismology, geochemistry, modelling, anisotropy, heterogeneity, strain localisation, subduction, rifting, PhD, postdoc, field work

Abstract:
CRYSTAL2PLATE is a coherent training and career development platform for early stage and experienced scientists in Geodynamics, Geochemistry, Petrology, Fluid Mechanics and Seismology. It involves 7 European research teams internationally recognized for their excellence in complementary fields of Earth Sciences, to which are associated 2 high-technology SME and 2 multinational companies in the oil and gas industry. It places emphasis in experience-based training through cross-disciplinary research projects that combine case studies in well-chosen target areas with new developments in seismology, geochemistry, laboratory and numerical modelling of the mantle from the cm to the global scale. These multidisciplinary projects altogether aim to answer a key question in Earth Sciences, still unsolved 40 years after the establishment of the plate tectonics theory: how mantle convection produces, and is modified by, plate tectonics. To attain this objective, we will explicitly consider interactions between physical and chemical processes as well as between crystal-scale processes and large-scale dynamics in the mantle.
CRYSTAL2PLATE will provide to 10 early-stage researchers and 2 experienced researchers: (1) state-of-the-art concepts and leading-edge techniques essential to study complex natural systems via the research projects, courses, and scientific exchanges within and beyond the network; (2) essential career-management skills via courses and practical activities aimed to develop their organisational, management, and networking skills; (3) an understanding of the impact of research results for the private sector and an insight of the enterprise world via exchanges and visits to the industrial partners; (4) new possibilities of career development via professional contacts in academia and industry.
The long-term synergy among CRYSTAL2PLATE partners, which are already leaders in their specific domains, will structure the European research and training capacities in Earth Sciences, increasing their impact and international visibility.

Part B

B.1 Description of the joint Research Training Project

B.1.1 Project Overview

Plate tectonics has been the major unifying theory in geosciences for the last 40 years. By linking the evolution of the Earth's surface to the dynamics of the deep Earth, it has provided a coherent framework to understand the formation of mountain ranges and oil-rich sedimentary basins, as well as the distribution of major catastrophic events such as volcanic eruptions and earthquakes. Yet, until recently, mantle convection and plate tectonics have been studied as independent systems. In convection studies, plates were generally considered as rigid rafts dragged along by the convecting mantle. On the other hand, "lithospheric" studies focused on the petrological evolution and on the deformation of the crust, often neglecting even the lithospheric mantle. This duality is now over. The last decade has seen a clear evolution. We now understand that plate tectonics is an essential feature of mantle convection. However, the processes allowing convection in the mantle to produce plate tectonics at the Earth's surface as well as many aspects of the interaction between the convective flow and the plates remain poorly understood.

How does plate tectonics actually work? To answer this question, the CRYSTAL2PLATE Initial Training Network (ITN) will study the interactions between lithospheric plates and the convecting mantle. The research projects will investigate: (1) how plates modify or are affected by convection, (2) the role of the preexisting structure of the plates on the deformation distribution, (3) the coupling between chemical and physical processes, in particular through partial melting, fluids percolation, and fluid-rock reactions. Linking chemical and physical processes in the mantle requires understanding the relation of crystal-scale processes to the large-scale dynamics. Crystal- and rock-scale processes, such as viscous and elastic deformation, melt transport and reactions, modify the composition, microstructure, and physical properties of mantle rocks, which are the key for interpreting geophysical observations in terms of temperature, composition, and deformation in the mantle. On the other hand, small-scale processes depend on the large-scale temperature, stress, and pressure structure in the mantle. Understanding the interactions between physical and chemical processes at various scales in the mantle is thus fundamental to comprehend its dynamics and hence the onset of plate tectonics.

The study of the coupling between the plates and the convecting mantle based on the analysis of the interactions between physical and chemical processes and between crystal-scale processes and large-scale dynamics provides a rich training ground for young scientists. It is a highly pluridisciplinary research field at the convergence between geology, geochemistry, geophysics, petrology, fluid mechanics, and mineral physics. It introduces them to the diversity of processes controlling the evolution of our planet and the challenges of unravelling this complexity through the association of techniques from different disciplines, whilst at the same time giving them an opportunity to engage in an area of research that can make a real contribution to our understanding of the processes involved in the evolution of the Earth and other telluric planets. The physical, chemical, computer modelling skills as well as the team-building, management, and mobility experience gained in CRYSTAL2PLATE will open up research careers in academia or in industry, as these skills can be applied in a variety of situations where analytical aptitude to deal with complex data sets and acquisition of accurate information are required.

B.1.2 Concept and Project Objectives

B.1.2.1. Project objectives

The primary objectives of CRYSTAL2PLATE are:

1. to advance our understanding of how mantle convection produces, and is modified by, plate tectonics by fully taking into account the interactions between physical and chemical processes as well as between crystal-scale processes and large-scale dynamics in the mantle;
2. to train 10 early-stage researchers (ESRs) and 2 experienced researchers (ERs) in state-of-the-art concepts and leading-edge research techniques that are essential to study the behaviour of complex natural systems, while providing them strong career-management skills and solid professional connections;
3. to increase the impact and international visibility of European research by structuring the research training capacities in Geodynamics via the establishment of a long-term collaboration and synergy among 7 research teams internationally recognized for their excellence in complementary fields of Earth Sciences: tectonics, mineral physics, petrology, geochemistry, seismology, and geodynamic modelling.

B.1.2.2. Research structure

The 7 research teams involved in CRYSTAL2PLATE cover the entire range of methods and scales essential for investigating the dynamics of the Earth: (1) the characterization of deformation and chemical exchanges by direct analysis of geological objects, (2) indirect seismological and geochemical probing of the mantle composition, temperatures, and deformation, and (3) numerical, theoretical, and laboratory modelling of deformation, thermal evolution, and chemical exchanges from the crystal to the convection scales.

- **Geosciences Montpellier is a University of Montpellier 2 – CNRS joint research unit** has a double expertise in: (i) the analysis of the deformation and of its effects on the physical properties at all scales by associating observations in natural rocks, experiments, seismic anisotropy measurements and modelling and (ii) the study of fluid-rock reactions in the mantle through in-situ geochemical analyses and modelling.
- The **seismology group at the Universiteit Utrecht** is involved in a wide spectrum of research activities in observational and theoretical seismology with a two-fold objective: (i) determining spatial variations in elastic anisotropy, density and major seismic discontinuities, and (ii) understanding the pertinent results in terms of temperature, mantle mineralogy and mantle evolution.
- The **Earth Sciences Department of the University of Bristol** reunites specialists in a wide range of complementary techniques in geophysics and geochemistry, ranging from seismology to high-precision measurements of volatiles and isotope ratios.
- The **Department of Earth Sciences of the Eidgenössische Technische Hochschule Zürich (ETH ZURICH)** brings together expertise in multi-scale, multi-rheological numerical modelling of lithosphere and convective mantle dynamics and in petrology, in particular, thermodynamics and fluid migration processes.

- The **Laboratoire Fluides, Automatique et Systèmes Thermiques (FAST) is a CNRS-Université Paris 6 – Université Paris Sud joint research laboratory** specialized in problems of fluid mechanics, soft matter and heat transfer, with applications in engineering as well as geophysics. Its geodynamic group is well known for its expertise in theoretical, numerical and laboratory modelling of mantle convection.
- The **Laboratory of Experimental Tectonics of the University "Roma TRE"** reunites expertise in tectonics and geodynamics and up-to-date laboratory facilities for analogue modelling of subduction processes.
- The **Instituto Andaluz de Ciencias de la Tierra is a Consejo Superior de Investigations Cientificas (CSIC) - Universidad de Granada joint research laboratory** that brings together expertise on petrology, geochemistry, and structural geology, associating observations on natural systems with thermodynamic modelling and experimental petrology studies.

Four associated industrial partners complete the network, participating in the training via **specialized courses** and **seminars/visits** that illustrate the possibilities of transfer of knowledge between academia and industry and/or the organisation/management in an SME and in large companies.

- **Total** is the worlds fourth largest publicly-traded oil and gas company.
- **Schlumberger** is the world's leading provider of technology, project management and information solutions to the oil and gas industry.
- **Oxford Instruments HKL Technology** is a high-technology SME specialized in the measurement and analysis of textures in crystalline materials.
- **Rockfield** is a high-technology SME established to provide leading-edge numerical-based simulation systems and their applications in a diverse range of industrial disciplines (basic engineering, hydrocarbon applications, foods, manufacturing, geotechnical, defence, etc).

B.1.2.3. Research concepts

CRYSTAL2PLATE will focus on three different modes of interaction in the mantle:

1. between small- and large-scale processes,
2. between physical and chemical processes at the crystal and rock-scale, and,
3. at the larger scale, between the plates and the convecting mantle.

The **integration of scales** is an essential feature of CRYSTAL2PLATE. It is a complex problem implying a coordinate effort and a strong background on a large number of disciplines that cannot be achieved in a single institution. Indeed, to fully characterize and investigate the coupling between interactions between chemical and physical processes at different length and time scales in the lithosphere and mantle, and, especially, to link observations and models at different scales, the research projects will closely associate:

- geological observations from the µm to the km scale of both mantle and plates deformation
- geochemical analyses and models allowing the characterization of the compositional evolution of the mantle and continental crust and lithosphere
- laboratory measurements and models of physical properties of crystals and rocks
- high-resolution seismological tomographic models and anisotropy measurements imaging the structure of the lithosphere and convective mantle

- multi-scale models of the deformation and petrological/geochemical evolution of the coupled crust, lithosphere and convective mantle

The **association of observation, experiments, and modelling at all scales** is another essential feature of CRYSTAL2PLATE. Observational and experimental constraints on the crystal and rock-scale physical and chemical processes are essential to interpret the large-scale images of the mantle structure and composition obtained by associating seismological and geochemical probing techniques. Multi-scale numerical models and laboratory models allow testing of the effect of the variations in physical properties due to small-scale physical and chemical processes on the large-scale dynamics as well as the consequences of the deep processes on the surface deformation. Model predictions are constrained by comparison with geological observations from the cm- to the km-scales and geophysical data at the tens to hundreds of km scales.

CRYSTAL2PLATE will perform a fully pluri-disciplinary and multi-scale investigation of the mantle dynamics by coordinating:

- the first-level research facilities hosted by the 7 partners:
  - the CrystalProbe, which is an unique equipment for the study of texture evolution and anisotropy in crystalline materials, and the HP-HT deformation lab at UM2
  - the CNRS-FAST and Uniroma TRE mantle dynamics modelling laboratories
  - high-performance parallel computing facilities at ETH ZURICH and UU
  - the UNIVBRIS, UM2, and CSIC analytical facilities
  - seismometers allowing for portable seismic experiments in UU and UNIVBRIS
- their effort in developing new techniques and codes to model:
  - seismological data (UNIVBRIS, UU)
  - deformation and anisotropy of physical properties at the crystal and rock scale (UM2)
  - 3D visco-elasto-plastic deformation of the lithospheric plates and convective mantle (ETH ZURICH, CNRS-FAST & Uniroma TRE)
  - chemical exchanges during fluid-rock interactions and fluid segregation and two-phase flow at both crystal and larger scales (UM2, ETH ZURICH & CSIC)

B.1.2.4. Training objectives:

CRYSTAL2PLATE is designed as a **coherent platform for training and career development** of early-stage researchers (ESR) and experienced researchers (ER), which aims to structure the collaboration in research and training between 7 leading academic centres in Solid Earth Sciences in Europe, bringing together a new combination of in-depth expertise from 6 countries. 2 high-technology SMEs specialized in programming and scientific instrumentation and 2 large companies in the oil and gas exploration field are associated to the network, allowing an opening to different aspects of the industrial world.

The network as a whole undertakes to provide a minimum of 408 person-months of Early Stage and Experienced Researchers whose appointment will be financed by the contract. Quantitative progress on this, with reference to the table contained in Part C and in conformance with relevant contractual provisions, will be regularly monitored at the consortium level.

Training objectives of CRYSTAL2PLATE are two-fold:

- to convey theoretical and practical training in state-of-the-art concepts and leading-edge techniques in Earth Sciences and connected scientific disciplines, such as physics, chemistry, programming, and material sciences, to the 12 young researchers, but also to a larger community of Europeans and overseas scientists.
- to assist the ESRs and ERs in developing their future careers in academia or industry by providing them strong organisational, presentation, team-building, networking, and management skills as well as solid professional connections.

These objectives will be attained through:

- **a personalized training program**, mutually agreed on recruitment and regularly evaluated and updated in agreement with the CRYSTAL2PLATE Supervisory Board. **Collaborative research projects** lie at the core of the training program, which for the ESRs will lead to a PhD degree. This hands-on formation will be completed by **specialized scientific courses**, as well as **seminars and short courses** aiming to **develop their communication, organisation, and management skills or to initiate them to the industrial life**.
- **short-courses and summer schools** on leading-edge research techniques specially designed for the CRYSTAL2PLATE network;
- **annual workshops** open to the international scientific community, where the ESRS and ERs will be exposed to state-of-the-art research in Geodynamics, present their results, and make contacts;
- **practical activities** aimed at helping the ESRs and ERs to develop their communication, management and networking skills like the **organisation of field trips**, the **participation of the ERs in the supervision of the ESRs research projects** in the same WP, the shared **responsibility by the maintenance of the Network webpage**, their participation to the **communication activities** of the partner institutions (open-doors days, Fête de la Science, seminars in schools) and to the **organization of the network workshops and summer schools**;
- **seminars by the industrial partners** on the transfer of knowledge between academia and industry and employment possibilities in the domains of oil exploration, scientific instrumentation, modelling and program development, as well as **visits or short internships** allowing a direct contact with the organisation/management of work in private companies of different sizes as well as interaction with people using the laboratory and modelling approaches that are part of the CRYSTAL2PLATE training for industrial applications.

B.1.3 Overall Approaches and Methodology

The Crystal2Plate ITN activity is structured in 7 work packages (WP, cf. chart in p. 18):

- 3 research-centred work packages:
  - WP1: How to create new plate boundaries, coordinated by A. Davaille (CNRS-FAST) & J.L. Bodinier (UM2)
  - WP2: Plates and convective patterns in subduction settings, coordinated by M.Kendall (UNIVBRIS) & T. Gerya (ETH Zurich)
  - WP3: Plates in mantle convection: the global story, coordinated by P. Tackley (ETH Zurich) & N. Ribe (CNRS-FAST)
- 2 training-based work packages:
  - WP4: Scientific training coordinated by J. Wookey (UNIVBRIS)
  - WP5: Personal and career development training coordinated by H. Paulssen (UU)
- a communication – results' dissemination work package (WP6) coordinated by F. Funiciello (Uniroma TRE)
- a management work package (WP7) coordinated by A. Tommasi (UM2)

B.1.3.1 Research-centred work packages and projects

The core of the CRYSTAL2PLATE ITN are **cross-disciplinary research projects** that address the fundamental question: "How mantle convection produces and is modified by plate tectonics" by combining case studies in well-chosen target areas with new developments in seismology, geochemistry, and laboratory, theoretical, and numerical modelling of the mantle from the cm- to the global scale. Each project involves at least two different disciplinary approaches and will be co-supervised by senior scientists from different institutions.

These research projects form **3 research-based work packages, which are centred on geodynamic processes** rather than on methods in order to reinforce pluridisciplinarity. The main scientific questions, research methods, and projects envisaged in these three work packages are:

WP1: How to create new plate boundaries - Coordinators: A. Davaille (CNRS-FAST) & J.L. Bodinier (UM2)

Total number of fellow months: 180

The research projects in this work package aim to gain understanding the processes leading to the creation of a new plate boundary by answering the following questions: Which processes produce localized deformation within a plate leading to formation of new plate boundaries? What is the effective plate rheology? How does it evolve? Which is the role of the lithosphere structure and of the external forcing on subduction initiation/jumps and on rifting? How does partial melting and melt transport affect the deformation of the lithosphere and favour continental break up?

ESR1. *Thermo-mechanical laboratory models of subduction*. Supervisors: C. Faccenna/F.Funiciello (Roma TRE) & A. Davaille (FAST), Coll.: J. Wookey (UNIVBRIS), G. Barruol (UM2), H. Paulssen (UU), N. Ribe (FAST)
The aim of this project is to find and test new T-dependent materials displaying localized deformation to investigate the kinematics and dynamics of the subduction process from its

initiation to maturity. Results of these models will be compared to seismological observations (ESR8, ER1), to models and observations of subduction reorganization (ESR2) and to analytical and numerical models of buoyancy-driven subduction (ER2).

ESR2. *Role of external forcing and of the preexisting structure of the lithosphere on the evolution of a subduction system*. Supervisors : P. Tackley (ETH ZURICH) & A. Davaille (FAST); Coll.: C. Faccenna (Roma TRE)
This project will associate numerical models of global plate tectonics – mantle convection and observations of natural systems to investigate the relative roles of the external forcing and of the preexisting structure of the lithospheric plates on the evolution of subduction systems. Comparison to laboratory and numerical models of free subduction (ESR1, ER2) will help to constrain the role of different physical processes on the evolution of the subduction system.

ESR3. *Observations and modelling of fluid transport and segregation processes at the mm to m-scale.* Supervisors: J.L. Bodinier /A. Tommasi (UM2) & J. Connolly (ETH ZURICH); Coll. T. Gerya (ETH ZURICH); C. Garrido (CSIC)
Chemical variations in mantle rocks show a gap between ultramafic (olivine-rich) and mafic (pyroxene-rich) compositions, which probably mark a threshold for melt segregation during porous transport in the mantle. In this project, a systematic analysis of compositions and microstructures of fertile lherzolites, layered pyroxenites, and websterites in peridotite massifs will be used to constrain and refine theoretical models of melt transport and segregation in the mantle.

ESR4. *Relations between magma transport and deformation during the erosion of the lithosphere*. Supervisors: C. Garrido (CSIC) & A. Tommasi/J.L. Bodinier (UM2) Coll. T. Gerya (ETH ZURICH); C. Faccenna (Uniroma TRE); M. Kendall (UNIVBRIS)
This project will associate structural and geochemical observations in peridotite massifs in the Alboran region and coupled geochemical-petrological and thermo-mechanical numerical models to investigate the relations between deformation and melt transport and the role of magmas in the erosion of the lithospheric mantle in extensional environments.

ESR5. *Processes and properties controlling the formation of lithosphere-scale shear zones.* Supervisors: B. Kaus/T. Gerya (ETH ZURICH) & A. Tommasi /A. Vauchez/S. Demouchy (UM2)
To investigate the processes involved in the development of lithospheric-scale shear zones, this project will associate analysis of mantle rocks deformed under lithospheric conditions, experimental data on low-temperature deformation of olivine, numerical modelling of the deformation and anisotropy, and seismic anisotropy observations.

WP 2: Plates and convective patterns in subduction settings - Coord.: M.Kendall (UNIVBRIS) & T. Gerya (ETH Zurich)

Total number of fellow months: 96

This WP focuses on the interactions between chemical and physical processes in subduction zones. The main questions are: How does water release and partial melting affect flow in the mantle wedge, its thermal structure, and the plates' deformation? Which are the major fluid transport mechanisms in the upper mantle? How do they interact with the deformation?

ESR6. *Observations and models of the interactions between fluids and deformation above a subduction zone.* Supervisors: T. Gerya/J. Connolly (ETH ZURICH) & A. Tommasi (UM2),

Collaborations: J. Wookey (UNIVBRIS), G. Barruol & S. Demouchy (UM2), H. Paulssen (UU), C. Garrido (CSIC)
To unravel the effect of hydrated fluids and partial melting on the deformation, we will associate: (1) the analysis of the microstructures, mineralogy and chemistry of subduction-derived mantle xenoliths to characterize the fluid-rock interactions and their effect on the deformation in the mantle wedge and (2) coupled geochemical-petrological and thermo-mechanical numerical models of the lithosphere and mantle with an explicit description of fluid transport processes and chemical exchanges.

ESR7. *Imaging the distribution of fluids and of the deformation above the active Indonesian subduction zone*. Supervisors: J. Wookey (UNIVBRIS) & G. Barruol/A. Tommasi (UM2), Collaborations: C. Faccenna (Uniroma TRE), T. Gerya (ETH ZURICH), N. Ribe (FAST)
The ESR will associate seismological observations (seismic tomography, shear wave splitting, and receiver functions) on data from broadband seismic stations in Indonesia with multi-scale numerical models of deformation and anisotropy in a subduction setting to investigate the deformation and fluid distribution beneath this active subduction.

ER1. *Upper mantle heterogeneity and depth-dependent anisotropy in the western Mediterranean and the Gulf of California subduction zones.* Supervisors: H. Paulssen (UU) & G. Bokelmann (UM2), Collaborations: C. Faccenna (Uniroma TRE), T. Gerya (ETH ZURICH), N. Ribe (FAST)
The ER will use surface wave waveform modelling techniques, receiver functions, and anisotropy measurements to image the upper mantle seismic heterogeneity and depth-dependent anisotropy in two subduction zone settings: the western/central Mediterranean, using the existent dense network of temporary and permanent stations, and the Gulf of California, where the NARS-Baja experiment runs since 2002. These observations will be compared to numerical and laboratory models of subduction (ESR1 & ESR6).

WP3. Plates in mantle convection: the global story - Coord.: P. Tackley (ETH Zurich) & N. Ribe (CNRS-FAST)

Total number of fellow months: 132

This WP focuses on the large-scale properties of mantle convection and plate tectonics. The main questions are: How do plates influence the convective pattern? Can mantle plumes weaken cold lithospheric plates? Can we trace their whereabouts in the mantle using geochemical and seismological data?

ESR8. *Thermal convection with plate tectonics in the laboratory*. Supervisors: A Davaille (FAST), C. Faccenna (Uniroma TRE), Collaboration: P.Tackley (ETH ZURICH)
This project aims at producing in the laboratory thermal convection and plate tectonics in a self-consistent manner by using complex rheology fluids. The ESR will characterize systematically the different regimes of thermal convection (existence of plates and/or plumes, the temperature and velocity structures, time evolution) by varying the rheological properties of the fluids and boundary conditions. Numerical models will allow extending the investigation to a larger range of conditions.

ESR9. *How do mantle plumes help to thin and break up the lithosphere?* Supervisors: A. Tommasi/D. Arcay (UM2) and G. Hellfrich (UNIVBRIS), Coll.: A. Davaille (FAST), G. Barruol (UM2), C. Garrido (CSIC)
This project will associate coupled geochemical-petrological and thermo-mechanical numerical models and seismological observations in Cape Verde and Polynesia to study the role of mantle plumes in the erosion of the lithosphere. The dynamics of plumes in the convective mantle will be constrained by comparison to laboratory models of mantle plumes developed at the FAST.

ESR 10. *Geochemical probing of the mantle dynamics: Time and length scales of heterogeneity in the mantle*. Supervisors: T. Elliott (UNIVBRIS), P. Tackley (ETH ZURICH), O. Alard (UM2)
This project will use 'dynamic', U-series tracers analysis in Cape Verde lavas to investigate the importance of mantle compositional heterogeneity in plume melting. Combined with in situ geochemical analyses in peridotites, these data will bring new light on the transport processes and as well as on the scales of preservation of heterogeneity in the mantle. These results will be used to constrain coupled chemical thermo-mechanical models of convection.

ER2. *Analytical and numerical models of buoyancy-driven subduction.* Supervisors: N. Ribe (FAST), C. Faccenna (Uniroma TRE), Coll.: P. Tackley (ETH ZURICH), J. Wookey (UNIVBRIS), H. Paulssen (UU)
The fellow will carry out a combined analytical and numerical study of free (buoyancy-driven) subduction using a boundary-integral formulation to reduce the dimensionality of the problem, eliminate wall effects, and accurately track the slab-mantle interface. The work will lead to quantitative scaling laws for the time-dependence of key geophysical parameters (plate speed, trench rollback speed, slab deformation style, seismic anisotropy), which will allow to understand the physical mechanisms responsible for the different subduction modes observed in the laboratory experiments (ESR1) and inferred from seismological data (ESR7, ER1).

B.1.3.2. Detailed training program

Each ESR and ER will have a personalised training program mutually agreed on recruitment, which directly reflects his/her personal training needs and career objectives. Each ESR/ER will have an Advisory Committee (AC) composed by the two supervisors and two external members. The AC will meet at the start of each project to assist the fellow in designing his/her individual career development plan and afterwards at least once a year to discuss and evaluate the fellow's work progress, the fulfilment of the career plan, and, if necessary, advise alternative approaches. Review of the progress with the 2 supervisors every four months will allow a regular update of the training program. Progress reports and updated personal training plans will be submitted to the CRYSTAL2PLATE Supervisory Board each year.

The **core of the training program are the collaborative research projects presented above,** which will lead, for the ESRs, to a Ph.D. degree. The aim of the research projects is to ensure that both ESR and ER will develop an integrated scientific approach based on solving scientific problems rather than being primarily technique-driven. Through the publication and presentation of the scientific outcome of these projects, both ESRs and ERs will develop their communication skills, gain independence, while ensuring the dissemination of the scientific outcomes of the research developed in the network.

2 training-based work packages complete the training program:

- WP4: Scientific training coordinated by J. Wookey (UNIVBRIS)
- WP5: Personal and career development training coordinated by H. Paulssen (UU)

Work Package 4 - Scientific training is composed by:

- **Secondments and short visits** to other partner institutions are an essential aspect of the CRYSTAL2PLATE training programme that aims at instrumental/techniques versatility and promoting cross-interaction among disciplines and institutions. They are necessary for passing on specific knowledge on methods or instrument-related training, for building up the cohesion of the network, and to assure the effective participation of all senior and junior researchers in the scientific program of the network. Each ESR/ER will have at least one secondary affiliation and will visit this affiliation regularly for periods ranging from a week (for discussions and participating in training sessions) to a few months (to acquire specific training and performing experiments). These secondments will allow ESRs and ERs to experience different work environments and philosophies. Table 1 presents the main institutions and secondments of each research project.
- **Postgraduate-level specialized courses** provided by the 7 partner institutions as part of their existing postgraduate programs. These courses will grant the fellows a strong formation in the different disciplines involved in the study of the dynamics of the Solid Earth. They will be available to all fellows of the network. Each fellow will define in coordination with their Thesis Advisory Committee the courses relevant to their personal training program. In function of their Career Development Plan, ERs and ESRs will also be supported in attending specialized short-courses provided by other Institutes, Research Councils and other national agencies.
- **Short-courses and thematic summer-schools** organised by the CRYSTAL2PLATE ITN and open to 10-12 external participants from ERA countries. 4 thematic short-courses and summer-schools associating lectures given by worldwide authorities with instrument- or computer-based practicals will be offered:

  - *Short-course on "Processing seismic data "*
    This intensive short course (5 days) on seismic data processing using SAC (Seismic Analysis Code) will be organized by M.Kendall, G. Hellfrich, and J. Wookey at UNIVBRIS. It will review common data formats for archiving data and methods for converting to SAC format, including descriptions of data headers and file manipulation, present the basic processing steps (displaying data, filtering, decimation, trend removals, etc), and discuss spectral analysis, travel-time picking and seismic array methods. The final part of the course will focus on augmenting the basic capabilities of SAC with macros and stand-alone programs. Shear-wave splitting and receiver function analysis will be demonstrated using real data examples. Students will be taught how to write scripts and how to interface SAC with other programs, including input and output of SAC data and results for use with other programs such as Matlab. The format will be short lectures followed by hands-on practicals in front of the computer. It will be open to 12 external participants.

  - *Short course on "Thermodynamics: calculating phase equilibria and physical properties using PERPLE_X"*
    This 4 days course coordinated by J. Connolly (ETH ZURICH) will teach the ESRs/ERs how to construct phase diagram sections and, from these, extract physical properties from chemical and thermodynamics data. This knowledge is essential for all researchers that aim to

investigate the coupling between chemical and petrological processes and thermo-mechanical behaviour in the mantle. The course will have a theoretical introduction on thermodynamics, focussing on equations of state, and a large practical section where the fellows will learn how to use PERPLE_X, which is a free program provided by J. Connolly at ETH Zurich, for calculating and displaying phase diagrams and equilibria and estimating physical properties based on thermodynamical data. It will be open to 10 external participants.

- *Short course on "Textures and anisotropy in crystalline materials"*
  This 5 days course will be organized by UM2 with the participation of Oxford Instruments HKL. The aim is to show the relations between crystalline structure, deformation, and anisotropy of physical properties from the crystal to the aggregate and larger scales. Theoretical classes will present the origin and description of anisotropy for different properties, the processes leading to the development of textures, and the consequences of textures and anisotropy in both Earth and Materials Sciences. Practicals on measurement, representation, and analysis of textures will be performed using the Crystal Probe EBSD facilities at UM2. Another series of practical classes will deal with the measurement and calculation of anisotropic physical properties. It will be open to 11 external participants.

- *Summer school "Thermal convection in complex fluids: from laboratory to mantle dynamics"*
  This summer school will be organized in the FAST laboratory at Orsay by A. Davaille (CNRS-FAST) and F. Funniccielo/C. Faccenna (Uniroma TRE). Its goal is to introduce the ESRs to the dynamics of complex fluids: how their rheology can be understood in terms of their micro-scale physical and chemical properties, how it can influence thermal convection, and what important aspects of mantle convection can therefore be modelled using analogous fluids in the laboratory. Theoretical courses will be given on rheology, thermal convection, and theoretical fluid dynamics. A large practical section (1 week long) will be devoted to a laboratory project. Each group of 4 applicants will be given a choice of projects related to mantle convection, plumes and subduction. The practicals will involve to build and run an analogous laboratory experiment, to characterize the fluid rheology using up-do-date rheometers, to measure the different properties of the experimental flow and to interpret the experiment in terms of geodynamics. Each group will discuss their results in front of the others at the end of the school. It will be open to 10 external participants.

WP5 - Personal and career development training (coordinator: H. Paulssen) is composed by:

- **Personal and career-development oriented courses.** These courses include additional computer skills, project management, research proposal writing, copyright and IPR, electronic publishing, article preparation, language courses, presentational skills, ethical issues, and enterprise creation workshops. Formations on **security issues** during laboratory and field work will also be provided. This part of the training program will normally amount to 10-15 days per year. These courses and formations will be mainly held at institutional level, since the partners have a well-established offer of career-oriented courses as part of their postgraduate programs, but fellows will also have access to courses at other partner institutions.
- **Practical activities** aimed at helping the ESRs and ERs to develop their communication, management and networking skills. These activities will include: participation of the ERs in the supervision of the ESRs research projects, shared responsibility by the maintenance of the Network webpage and the animation of an e-newsletter, participation to the communication activities of the partner institutions (open-door days, Fête de la Science, seminars in schools) and to the organization of the network field trips, workshops and summer schools. In addition, ERs will be encouraged to convene, in collaboration with

senior scientists, specials sessions on the research themes of the network in international meetings.

- **Lectures on transfer of technology from academia to industry and on employment opportunities** in their activity area will be offered by the 4 associated partners. These lectures will take place during the network workshops to ensure that all fellows may attend. These lectures will allow all ESRs and ERs to get to know the functioning of two multinational companies in the oil and gas industry (Total and Schlumberger), an intermediate size industry in the scientific instrumentation field (Oxford), and a smaller company (Rockfield) specialized in the development of client-oriented simulation systems. **Visits to the Schlumberger's Clamart and to Total R&D sites** will complete the formation. In addition, if relevant to their individual career development plans, CRYSTAL2PLATE fellows may also:
  - participate to the EBSD-users workshops organized by HKL. Participation to these workshops will allow CRYSTAL2PLATE fellows to be exposed to different uses of the EBSD technique and to make contacts with researchers from both academia and industry in domains like metallurgy, microelectronics, and nuclear industry;
  - interact with staff from Rockfield using laboratory and modelling approaches similar to those involved in the CRYSTAL2PLATE training for commercial applications;
  - do short-term internships at Total, gaining a concrete experience of the work methods and environment in a large industrial company. These short-term internships will be organized individually in function of the ESR career development plan and of the associated partner interests and disponibilities.

The training program has also **activities shared by the research and training work packages**:

- **Field trips to major mantle exposures**, as the Lherz peridotite massif in the Pyrenees and the Ronda or Beni Boussera massifs in Spain and Morocco, will have a double objective. They will consist in a useful team-building exercise, which will strongly enhance the cohesion and exchanges within young and senior researchers in the network. These field trips will also allow young and senior seismologists and geodynamicists to "see and touch" real mantle rocks. ESRs and ERs, in particular those whose projects involve field work, will participate in the organization of the field trips. This exercise will significantly strengthen their organizational skills. It will also provide practical training on security issues during fieldwork.
- The **annual CRYSTAL2PLATE workshops** will be attended by all members of the network and will be open to external participants from ERA countries (15, with ca. 50% of young researchers from other institutions) to promote co-operation with other research groups in Europe. These workshops will have multiple purposes: deliver high-level scientific talks / lectures by leading specialists (from within and outside the network) and allow exchanges and discussion between ESR, ER and senior researchers within and from outside the network. These will also give the ERs and ESRs the opportunity to develop their presentational skills, since each fellow will be expected to give an oral presentation of her/his work. ERs and ESRs will be encouraged to participate actively in the organization of the workshops in order to develop their management skills. The ESRs/ERs will also fully manage a special parallel session, which will allow a free exchange of views on the network functioning. Whenever possible, the

CRYSTAL2PLATE workshops will be organized close (in time and space) to specialized meetings in geodynamics to favour the participation of the ESRs and ERs to these meetings and reduce costs. The fourth and last workshop will be a more important event, open to a larger number of external participants (20), to ensure a wide dissemination of the outcomes of CRYSTAL2PLATE research and training program in the international community.

- **External networking:** Fellows will attend at least one international conference a year to present CRYSTAL2PLATE scientific results and discuss with the wider scientific community, and to make contacts for future work opportunities. ERs will be encouraged to convene sessions in international conferences on the network research themes in collaboration with one of the senior researchers. This will allow them to develop their organizational skills and help them to get known in the Earth Sciences community. CRYSTAL2PLATE fellows will be also encouraged to interact with the european networks, such as RTN c2c, which focus on the analysis of the physico-chemical evolution of slab material during subduction using a large range of mineral physics-based approaches, EUROCORES EuroMinSci, which draws together experts on computational and experimental mineral physics applied to Earth Sciences, and the NERC - UK funded consortium "How does the Earth's crust grow at divergent plate boundaries? A unique opportunity in Afar, Ethiopia", which investigates the geophysics, petrology, geochemistry, and geodynamics of a continental rift.

Table 1: Research projects' primary institutions and secondements

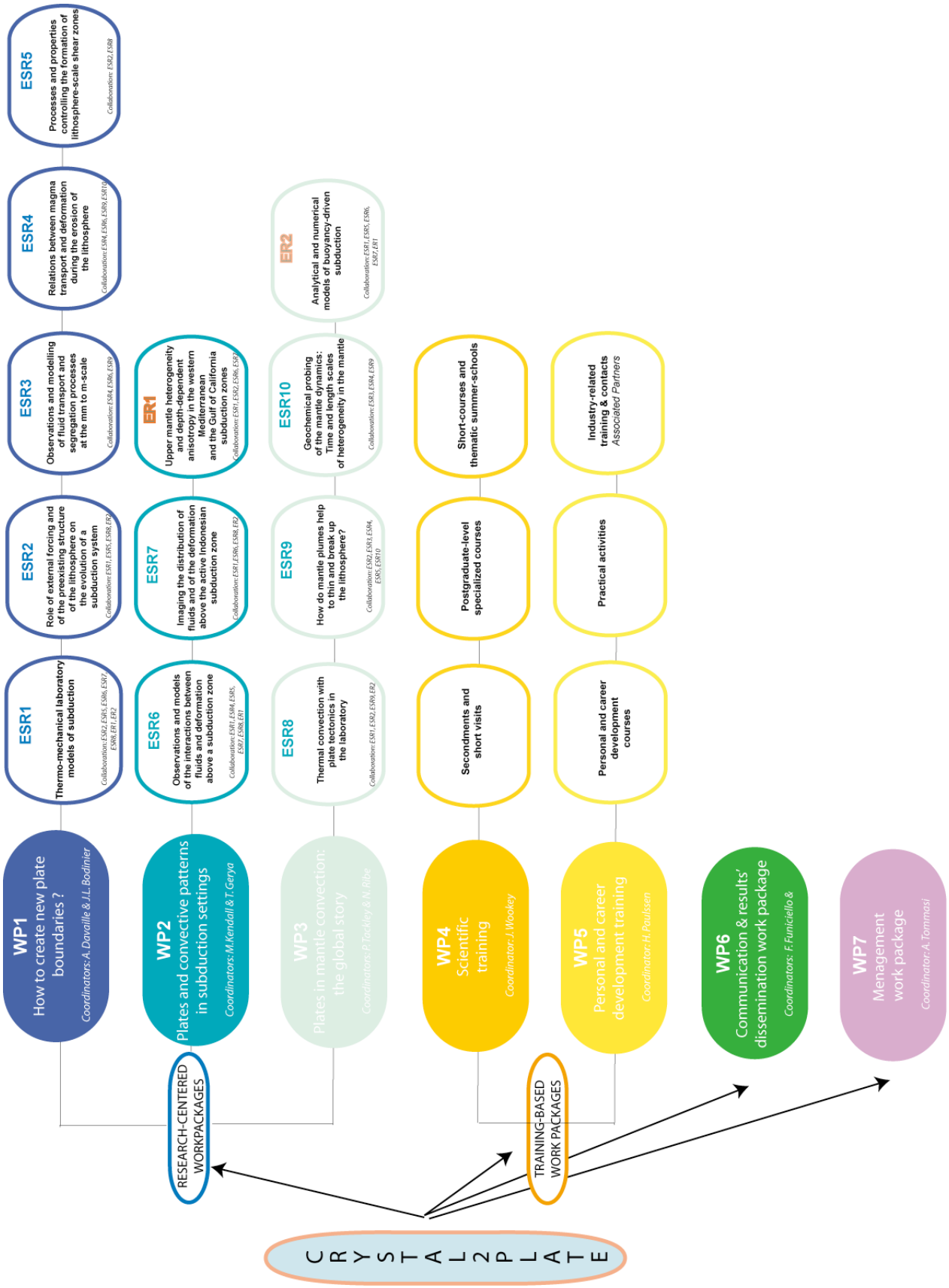
Projects	Primary host institution	Secondments
ESR1 – Initiation of subduction	Uniroma TRE	FAST, UM2
ESR2 – Lithosphere structure and subduction evolution	ETH ZURICH	FAST, Uniroma TRE
ESR3 – Melt segregation	UM2	ETH ZURICH, CSIC, UNIVBRIS
ESR4 – Erosion of the continental lithosphere	CSIC	UM2, ETH ZURICH, Uniroma TRE
ESR5 – Lithospheric-scale shear zones	ETH ZURICH	UM2, UNIVBRIS
ESR6 – Fluids & Subduction	ETH ZURICH	UM2, UNIVBRIS, UU, CSIC
ESR7 – Imaging the Indonesian subduction	UNIVBRIS	UM2, ETH ZURICH, Uniroma TRE
ESR8 – Mantle convection with self-consistent plate tectonics	FAST	Uniroma TRE, ETH ZURICH
ESR9 – Plume-lithosphere interactions	UM2	FAST, UNIVBRIS, CSIC
ESR10 – Melt transport rates	UNIVBRIS	ETH ZURICH, UM2
ER1 – Heterogeneity and anisotropy in subduction zones	UU	UM2, ETH ZURICH, Uniroma TRE
ER2- Buoyancy-driven subduction	FAST	Uniroma TRE, UNIVBRIS, UU

B.1.3.3. Comunication and management

CRYSTAL2PLATE will have an active policy of **communication and dissemination of the results** of the joint research & training programme, both during the project duration and after completion of the contract. These activities form the **Work Package 6: Communication. WP6**, which will be coordinated by F.Funiciello (Uniroma TRE) aims to:

- ensure, through a close following and mentoring by the supervisors, that the scientific results obtained in the individual research projects are presented in international meetings and published in high impact factor international journals;
- encourage the ERs to convene, with the assistance of the senior researchers, specialized sessions on the network research theme in major international meetings;
- maintain an active network website, which will be housed by the UM2 and managed by the ESRs and ERs under the supervision of a senior scientist. The CRYSTAL2PLATE website will present the network, the available positions, the publications list, but also written material on the CRYSTAL2PLATE courses, computer-programs and short presentations of the major scientific results from the different research projects. It will also display the programs of the workshops as well as the abstracts of the presentations and posters.
- coordinate the participation to events aiming to present the CRYSTAL2PLATE research to the wide public and to promote Science careers among young Europeans. Special attention will be devoted to events promoting the presence of women in scientific careers.

Work package 7: Management, coordinated by A. Tommasi (UM2), includes all management-related activities of the CRYSTAL2PLATE ITN. These activities are described in detail in section *B.2.2.1 Organisation and management structure of CRYSTAL2PLATE.*


ESR5
Processes and properties controlling the formation of lithosphere-scale shear zones
Collaboration: ESR2, ESR8
ESR4
Relations between magma transport and deformation during the erosion of the lithosphere
Collaboration: ESR4, ESR6, ESR9, ESR10
ESR3
Observations and modelling of fluid transport and segregation processes at the mm to m-scale
Collaboration: ESR4, ESR6, ESR9
ESR2
Role of external forcing and of the preexisting structure of the lithosphere on the evolution of a subduction system
Collaboration: ESR1, ESR5, ESR8, ER2
ESR1
Thermo-mechanical laboratory models of subduction
Collaboration: ESR2, ESR5, ESR6, ESR7, ESR8, ER1, ER2
ER2
Analytical and numerical models of buoyancy-driven subduction
Collaboration: ESR1, ESR5, ESR6, ESR7, ER1
ESR10
Geochemical probing of the mantle dynamics: Time and length scales of heterogeneity in the mantle
Collaboration: ESR3, ESR4, ESR9
ER1
Upper mantle heterogeneity and depth-dependent anisotropy in the western Mediterranean and the Gulf of California subduction zones
Collaboration: ESR1, ESR2, ESR6, ESR7
ESR7
Imaging the distribution of fluids and of the deformation above the active Indonesian subduction zone
Collaboration: ESR1, ESR6, ESR8, ER2
ESR9
How do mantle plumes help to thin and break up the lithosphere?
Collaboration: ESR2, ESR3, ESR4, ESR5, ESR10
ESR6
Observations and models of the interactions between fluids and deformation above a subduction zone
Collaboration: ESR1, ESR4, ESR5, ESR7, ESR8, ER1
ESR8
Thermal convection with plate tectonics in the laboratory
Collaboration: ESR1, ESR2, ESR9, ER2
Short-courses and thematic summer-schools
Postgraduate-level specialized courses
Practical activities
Industry-related training & contacts
Associated Partners
Secondments and short visits
Personal and career development courses
WP1
How to create new plate boundaries ?
Coordinators: A. Davaille & J.L. Bodinier
WP2
Plates and convective patterns in subduction settings
Coordinators: M.Kendall & T. Gerya
WP3
Plates in mantle convection: the global story
Coordinators: P.Tackley & M. Ribe
WP4
Scientific training
Coordinator: J. Wookey
WP5
Personal and career development training
Coordinator: H. Paulssen
WP6
Communication & results' dissemination work package
Coordinators: F. Funiciello &
WP7
Menagement work package
Coordinator: A. Tommasi
RESEARCH-CENTERED WORKPACKAGES
TRAINING-BASED WORK PACKAGES
CRYSTAL2PLATE

B.2 Implementation

B.2.1 Planing of the work packages, milestones and deliverables

WP	Description	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
WP7	Kickoff meeting																								
WP7	ESR-ER recruitment				s								e												
WP1, WP2, WP3	Research projects				s	s	s	s	s	s	s	s	s						x						
WP5	Establishment of PCD plan																						t		
WP5	PCD training																		x		c	c			x t
WP4	Scientific Training								c	c 1	c	2		c	3		4								
WP6	C2P website																				n		n		n
WP6	Intra-network communication								n		n		n		n		n		n						
WP6	Workshops / Field trips																								x
WP6	Outreach activities																		p						x
WP6	Publications & conferences																								x
WP7	reviews																x								x

WP	Description	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48
WP1 WP2 WP3	Research projects						x												e	e	e	e	e x	e	e
WP5	PCD training						x																x		
WP4	Scientific Training																								x
WP6	C2P website																								
WP6	Intra-network communication		n			n			n		n		n		n		n		n		n		n		n
WP6	Workshops / Field trips																						x		
WP6	Outreach activities																							x	
WP6	Publications & conferences												x												x
WP7	C2P reviews						x																		x

s = start; e= end; x=assessment; t=evaluation of satisfaction level of trainees; c=specialized courses, 1=short course Thermodynamics; 2= short course Textures and Anisotropy; 3= short course Seismic data analysis; 4=Summer school Fluid Mechanics; n=newsletter

The 7 work packages will give rise to the following milestones and deliverables:

WP1: How to create new plate boundaries (Coordinators: A. Davaille & J.L. Bodinier)			
Task #	**Milestone description**	**Deliverable (Lead, if not coordinator)**	**Date***
WP1-1	Assessment of the effectiveness of collaboration and exchanges at the WP and network scale	Report	Month18/ Month30/ Month46
WP1-2	Understanding of how small-scale processes at plate boundaries feed into large-scale dynamics of the mantle	Session at 1st Crystal2Plate workshop	Month18
WP1-3	Caracterisation of new T-dependent materials displaying localized deformation	Report / Conf. presentation (ESR1)	Month21
WP1-4	Structural and geochemical mapping of the relations between deformation and melt transport in the Alboran peridotite massifs	Conf. presentation Article (ESR4)	Month21 Month24
WP1-5	Novel constrains on melt transport and segregation mechanisms in the shallow mantle	Report or article: database of composition& microstructures in fertile peridotites (ESR3)	Month30
WP1-6	Determination of scaling laws and parameterizations that describe the physics of lithospheric-scale shear localization	Report (ESR5)	Month30
WP1-7	Determination of flow laws or of parameterizations describing the 'effective' rheology of the lithosphere as a function of its physical state	Article (all ESRs from WP)	Month36
WP1-8	Implementation of shear localization parameterizations in larger-scale convection models and analysis of the effects on the generation of self-consistent plate tectonics	Conf. presentation Article (ESR5+ESR2)	Month37 Month42
WP1-9	Novel numerical models of melt transport and segregation in the mantle taking into account WP1-6 constraints	Conf. presentation Article (ESR3)	Month37 Month42
WP1-10	Global 3D spherical models of mantle convection with self-consistent plate tectonics, in which the intrinsic lithospheric strength is heterogeneous and evolves depending on composition and deformation history	Conf. presentation Article (ESR2)	Month37 Month42

* dates are estimations based on ESR/ER recruitment on month6

WP 2: Plates and convective patterns in subduction settings (Coord.: M.Kendall & T. Gerya)			
Task #	**Milestone description**	**Deliverable (Lead, if not coordinator)**	**Date***
WP2-1	Assessment of the effectiveness of collaboration and exchanges at the WP and network scale	Report	Month18/ Month30/ Month46
WP2-2	Novel constraints on the interactions between reactive fluid transport, partial melting, and deformation in the mantle wedge	Report or article: database of composition& microstructures in subduction peridotites (ESR6)	Month30
WP2-3	Novel tools to model the interactions between fluids percolation and partial melting and deformation in the mantle wedge and subducing plate	Report / Conf. presentation Article (ESR6)	Month 18 Month42
WP2-4	Seismic imaging of fluids/melts and anisotropy distribution above the Indonesian subduction	Conf. presentation Article (ESR7)	Month21 Month24
WP2-5	Seismic imaging of fluids/melts and anisotropy distribution above western Europe and Baja California subduction zones	Conf. presentation Article (ER1)	Month21 Month24
WP2-6	Multi-scale models of deformation and anisotropy in subduction zones	Conf. presentation Article (ESR7, ER1)	Month37 Month42

* dates are estimations based on ESR/ER recruitment on month6

WP3: Plates in mantle convection: the global story (Coord.: P. Tackley & N. Ribe)			
Task #	**Milestone description**	**Deliverable (Lead, if not coordinator)**	**Date***
WP3-1	Assessment of the effectiveness of collaboration and exchanges at the WP and network scale	Report	Month18/ Month30/ Month46
WP3-2	Caracterization of the rheology of complex fluids allowing for thermal convection with plates and building of the experimental set up for convection	Report (ESR8) / Conf. presentation	Month18
WP3-3	Geochemical constraints on melting and melt transport processes in the mantle and on the scales of preservation of heterogeneity in the mantle	Conf. presentation Article (ESR10)	Month25 Month 30
WP3-4	Estimation of the driving forces behind plate tectonics	Conf. presentation Article (ER2)	Month25 Month30
WP3-5	Novel constraints on the plates' cycle in the convective mantle by associating geochemical data, seismological observations, and numerical modelling	Conf. presentation Articles (ESR10,ER2)	Month37 Month42
WP3-6	New constraints of the role of fluids and magmas on the rifting process	Conf. presentation Article (ESR9)	Month37 Month42
WP3-7	Characterization of the different regimes of thermal convection with plates	Conf. presentation Article (ESR8)	Month37 Month42

* dates are estimations based on ESR/ER recruitment on month6

WP4: Scientific training (Coord.: J. Wookey - UNIVBRIS)			
Task #	**Milestone description**	**Deliverable (Lead, if not coordinator)**	**Date**
WP4-1	Knowledge on the state-of-the art in mantle dynamics and plate tectonics	1st Crystal2Plate workshop	Month6
		Specialized courses (UM2)	Month8/ Month20
WP4-2	Obtention of practical skills on thermodynamics modelling using PERPLEX	SC Thermodynamics Report on the external participation (ETH)	Month7
WP4-3	Acquisition of numerical modelling skills	Specialized courses (ETH and FAST)	Month9/ Month21
WP4-4	Acquisition of theoretical knowledge on texture development mechanisms and practical skills on the measurement /interpretation of textures and modelling of anisotropic physical properties	SC Textures and anisotropy: Report on the external participation (UM2)	Month10
WP4-5	Acquisition of theoretical bases on seismology and practical skills on surface waves analysis	Specialized courses (UU)	Month12
WP4-6	Obtention of practical skills on processing seismic data using SAC	SC Processing seismic data; Report on the external participation (UNIVBRIS)	Month13
WP4-7	Acquisition of laboratory fluid mechanics modelling skills	Summer-school on Thermal convection Report on the external participation (CNRS-FAST, Uniroma TRE)	Month16
WP4-8	Assessment of individual instrument-based and and group training	Questionnaire, interim report presenting the proposed solutions to solve any existing problem	Month 24
WP4-9	Assessment of the evaluation of level of satisfaction of the trainees	Questionnaire, interim report presenting the proposed solutions to solve any existing problem	Month 24
WP4-10	Final assessment of the scientific training offered	Questionnaire; Final training evaluation report	Month 48

WP5: Personnal and career development activities (Coord.: H. Paulssen - UU)			
Task #	**Milestone description**	**Deliverable (Lead, if not coordinator)**	**Date**
WP5-1	Establishment of the personal and career development plan for each ESR and ER	PCD plan submitted to Supervisory board (ESR and ER + Advisory boards)	1 Month after recruitment
WP5-2	Assessment of the fullfilment of the PCD plan	Individual Report (ESR/ER Advisory board) Summary report	Month18/ Month30/ Month46
WP5-3	Assessment of the evaluation of level of satisfaction of the trainees	Questionnaire, interim report presenting the proposed solutions to solve any existing problem	Month22

WP6: Communication and dissemination of results (Coord.: F. Funiciello – Uniroma TRE)			
Task #	**Milestone description**	**Deliverable (Lead, if not coordinator)**	**Date**
WP6-1	Effective web-based presentation of the network and publicity of open training positions	Crystal2Plate webpage	Month2
WP6-2	Establishment of intra-network communication tools	Crystal2Plate intranet CRYSTAL2PLATE Newsletter (ER/ESR)	Month8 Bi-monthly starting in Month6
WP6-3	Establishment of outreach activities plan	Report	Month18
WP6-4	Assessment of ESR/ER participation to conferences and articles' publication	Report, including an evaluation of the effectiveness of these activities Publications/communications presentation in the Crystal2Plate webpage	Month24/ Month36/ Month48
WP6-5	Assessment of participation in outreach activities	Report Presentation of the activities in the Crystal2Plate webpage	Month23/ Month47
WP6-6	1st CRYSTAL2PLATE workshop	Report, with an evaluation of the integration of the external participants	Month6
WP6-7	2nd CRYSTAL2PLATE workshop	Report, with an evaluation of the integration of the external participants	Month18
WP6-8	3rd CRYSTAL2PLATE workshop	Report, with an evaluation of the integration of the external participants	Month30
WP6-9	Final CRYSTAL2PLATE workshop	Report, with an evaluation of the integration of the external participants	Month46

WP7: Management (Coordinator: A. Tommasi)			
Task #	**Milestone description**	**Deliverable (Lead, if not coordinator)**	**Date**
WP7-1	Start of CRYSTAL2PLATE	Kick-off meeting	Month1
WP7-2	Recruitment of ESR/ERs – start of training	Employment contracts Report on report on the recruitment strategy and of its effects in terms of equal opportunities and open competition	Month6 to Month12 Month12
WP7-3	Assessment of the effectiveness of networking, communication and decision-making between partners, between the network and the Commission and with the Industrial and/or other relevant stakeholders	Report (Enlarged SB)	Month18/ Month30/ Month46
WP7-4	Mid-term assessment of the network	Mid-term scientific, training, and financial reports	Month24
WP7-5	Final assessment of the network	Final scientific, training, and financial reports	Month48

Tentative schedule of project reviews

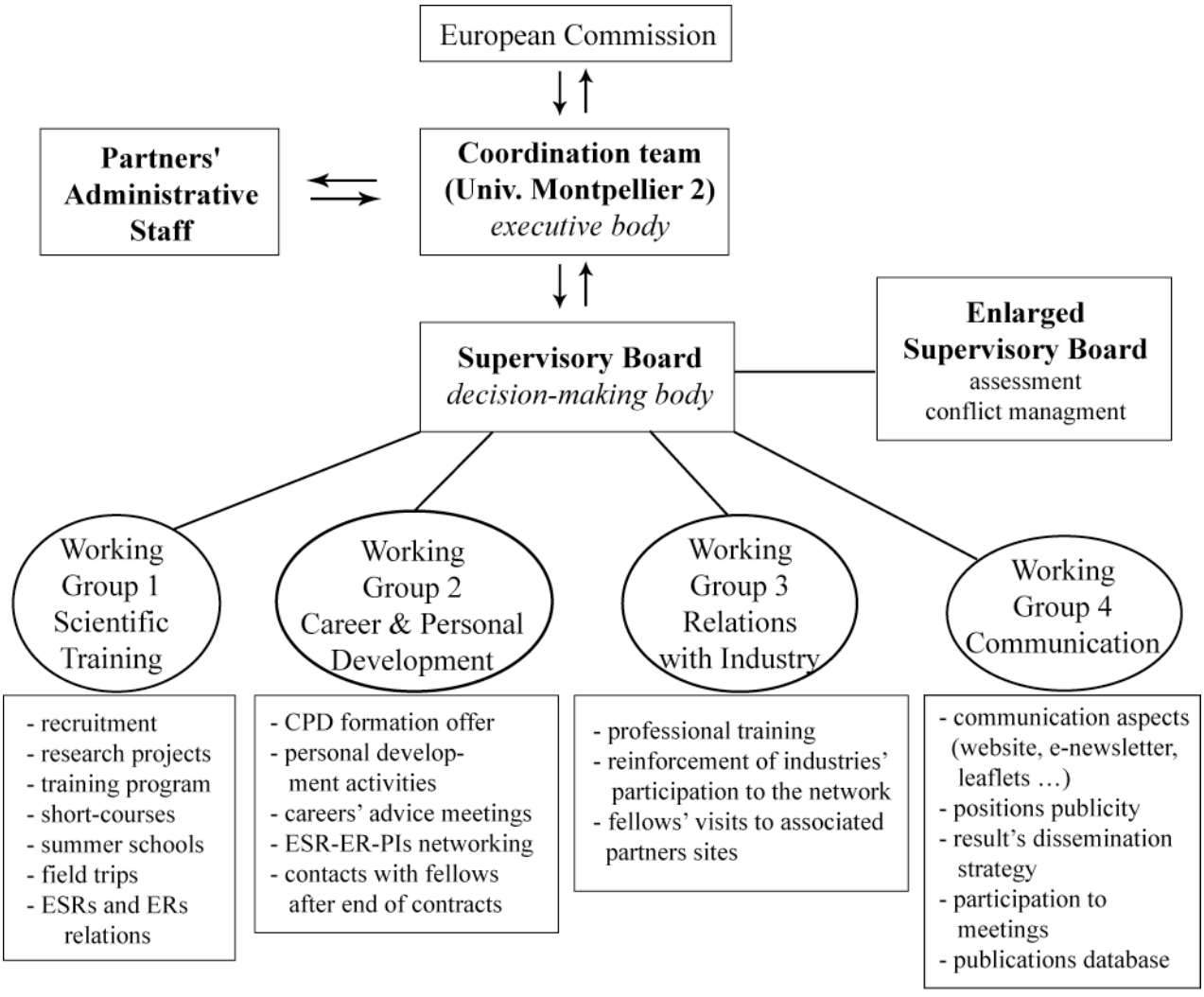
Review	**Tentative timing**	**Planned venue**	**Comments, if any**
1st project review	Month14	Montpellier	Recruitment of ESR/ER should be completed, PCD plans built, and the first courses realized
Mid-term review	Month24	Montpellier	ESR & ERs should be at mid-term on their individual projects and have reported on the advance of those to the Supervisory Board at the 2nd Crystal2Plate workshop; all short courses will have been offered
Final review	Month48	Montpellier	Final CRYSTAL2PLATE workshop programmed in month46

B.2.2 Management structure of the network and procedures

B.2.2.1 Organisation and management structure

CRYSTAL2PLATE will be **coordinated by the University of Montpellier 2** (UM2, coordinating manager: **Andréa Tommasi**) and **managed by a supervisory board.** The seven partner institutions will form a consortium. The consortium agreement will define the management and financial structure of the network, as well as the approach to be taken regarding any intellectual property that may arise from the research projects of the network.

Structure of the CRYSTAL2PLATE Initial Training Network



Coordination team (executive body):
Coordinator (A. Tommasi) + the CRYSTAL2PLATE assistant manager + EU-liaison officer at the Univ. Montpellier 2 (UM2 permanent staff)

- Relations with the EC (reports, changes in the consortium, other)
- Coordination of the consortium :
    - administration (coordination of the supervisory board, organisation of meetings, field trips, coordination of the mobility of PIs and fellows, organisation of assessments by external experts)
    - contracts' management (consortium agreement, IP contracts…)
    - financial management (EC contribution sharing, financial following of all partners network-related funding and expenses, reimbursements, workshops, summer schools and short-courses related-expenses)

Supervisory Board (decision-making body):
Composition: Scientists in charge of the 7 partner institutions + one representative of the industrial partners: Martin Dutko (Rockfield) + one representative of the ESRs and ERs (elected for 1 year representation) + the EU-liaison officer of the University of Montpellier 2[*]
The **CRYSTAL2PLATE supervisory board**, which will be chaired by the network's coordinator, will be responsible for the Consortium structure and modes of functioning:

- the implementation of the research and training program (links with WG 1 and WG 2)
- designing, among the scientists in charge from the 6 partners, **the coordinators of the 4 work groups** that will assist the coordinator in managing the practical aspects of the network activities;
- supervising the hiring procedure, ensuring equal opportunities and gender balance;
- verifying that the ESRs/ERs are given the opportunity to develop their career development plan and research in good conditions (links with WG1 and WG2);
- evaluating the progress of the ESRs/ERs scientific projects and career development plans (links with WG1 and WG2);
- ensuring good communication and exchange of best practice between teams and between senior and young researchers;
- coordinating the relations with the industrial partners (links with WG 3);
- ensuring an effective dissemination and publicity for the network scientific results and training actions (links with WG 4);
- determining the assessment procedures and proposing the necessary changes in the network fuctionning as a function of the annual assessments;
- control and validation of scientific and financial reports

The CRYSTAL2PLATE Supervisory Board will meet at least once a year.

The **enlarged Supervisory Board**, composed by the SB + 2 external experts: Yannick Ricard (Univ. Lyon 1, F) and Christine Thomas (Univ. Liverpool, UK)* will be responsible for:

- The assessment of the good practices' choices and procedures' implementation. This assessment will be coordinated by the external experts based on an electronic evaluation form that will be filled by all network participants (ESRs and ERs, senior researchers, lecturers, administrative staff)

[*] Changes to the composition of the Supervisory Board and of the Enlarged Supervisory Board, if necessary, will be defined by the Supervisory Board and submitted to the agreement of the Commission.

- **Conflicts management:** if ever necessary, a special session of the enlarged SB will be called after validation of the request by supervisory board (the validation step will use electronic videoconferencing to reduce costs).

The four working groups (see flowchart of the Structure of the ITN Crystal2Plate p.25) will be responsible for the direct management of the different activities of the network: research and scientific training (WP 1 to 4), personal and career development (WP 5), relations with industry (WP5), and communication (WP 6). These working groups will be composed by senior and junior participants from all partner institutions. ESR and ER should participate to at least one WG. They will be coordinated by 1 or 2 of the scientists in charge of the partner institutions to ensure direct communication with the Supervisory Board.

- *WG 1 Research and Scientific training*: A. Davaille (CNRS-FAST) & J. Wookey (UNIVBRIS)
- *WG2 Personal and career development*: H. Paulssen (UU)
- *WG3 Relations with industry*: A. Tommasi (UM2) & M. Kendall (UNIVBRIS)
- *WG4 Communication*: F. Funiciello (Uniroma TRE) & A. Tommasi (UM2)

ESRs and ERs will have one **elected representative in the Supervisory board** and will participate to at least one of the four Working Groups. In addition to regular exchanges through the network website (intranet) and the e-newsletter, they have **a special session** at least once a year during the network workshop. This session will be fully managed by the ESRs/ERs. It will allow them to freely exchange views on the network functioning and to make propositions to the supervisory board via their representative.

CRYSTAL2PLATE will also encourage **personal contacts and networking between administrative staff** from the 7 partner institutions, since the administrative staff plays an essential role in the practical aspects that rule the everyday life of the network and a good communication between the partners at all levels is essential for the network implementation.

B.2.2.2 Financial Management

In accordance with EU rules, funds will be initially issued to the University of Montpellier 2. Student allowances, including Living, Mobility, Travel, and Career Exploratory allowances, as well as the contribution to participating expenses (Category A to D allowances) will be redistributed to the 7 partner institutions according to the ESRs/ERs recruitment plan. The contribution to the research/training/transfer of knowledge programme expenses (Category E) will also be dispatched to the host laboratory. All expenses related to the scientific projects, training, as well as travel and living expenses during the visits to the secondment institutions or for the participation in the network activities and scientific meetings will therefore be covered by the main host institution of the fellow.

The coordinating institution (UM2) will centrally manage the contributions for organisation of workshops and events (Category F) and for the management activities (Category G).

Decisions concerning possible re-adjustments of the network initial budget will be taken collegially by the Supervisory Board.

All these provisions will be included in the consortium agreement.

B.2.2.3 Recruitment procedures

To ensure a **competitive international recruitment and to promote equal opportunities**, in agreement with the Code of Conduct for the recruitment of researchers (http://ec.europa.eu/euraxess), we will advertise the fellowships through a wide range of appropriate communication channels:

- the CRYSTAL2PLATE Initial Training network and the partner institutions web sites;
- national and European institutional web sites, such as the pan-European Researcher's Mobility Portal: http://ec.europa.eu/euraxess;
- specialized sites like http://www.earthworks-jobs.com ;
- international journals and conferences;
- specialized mailing lists.

Advertisements will be posted at least three months before the recruitment date. They will give a clear description of the research projects, the knowledge and competencies required, the network structure, as well as information on the recruitment process and the selection criteria. The coordinator, assisted by the CRYSTAL2PLATE project officer, will coordinate the recruitment process. The candidates will submit their CV, a letter of application indicating the selected project(s) and the motivation of their choice, two letters of reference (describing the candidates' learning, research, and communication skills, independence, and motivation), and academic credentials (mark sheets and degree statements) through an online application facility hosted at the CRYSTAL2PLATE website. At the end of the deadline, all eligible applications (in conformity to EU-rules) will be sent to the supervisors of the projects selected by the student. The supervisors will review the applications and invite the best candidates for a personal interview. After the interviews, the supervisors will recommend to the CRYSTAL2PLATE supervisory board the most suitable applications.

The Supervisory Board will oversee the recruitment process and critically assess the applicants, ensuring that best practise is applied. It will be especially attentive to gender issues, being largely composed by women (50%) and that fellows come from a wide variety of member states. In the event of disagreement amongst the Supervisory Board members and project supervisors, advice from the external experts of Enlarged Supervisory Board will be sought.

After the selection process, all short-listed applicants will be informed about the strengths and weaknesses of their applications in order to help reinforcing their profiles for future job applications. If no satisfactory candidates are found for a given project, we will re-advertise the position regularly until it is filled.

B.2.2.4. Tutoring and evaluation

Each ESR/ER will have **an Advisory Committee (AC)** composed by the two supervisors, and two members selected among the CRYSTAL2PLATE senior scientists. This committee will help the fellow to **design and write up his individual career development plan**. All career development plans will be available to the supervisory board. The AC will meet once a year to discuss and evaluate the fellow's work progress, the fulfilment of the career plan, and, if necessary, advise alternative approaches.

Following the first year of research training, the **ITN fellows will report and defend their work progress to the CRYSTAL2PLATE Supervisory Board**, who will decide whether the candidate is eligible to continue in the programme or not, taking into account the

recommendations of the AC. Close tutoring and monitoring will guarantee a highly qualified and sensible follow-up of the ITN fellows' work progress and career plan development. At the end of the contract, the AC will also meet with the fellow to evaluate the training, discuss his/her future plans/perspectives, and help in his/her integration in the professional world.

B.2.2.5. Assistance on practical issues concerning working and living in another European country

A local tutor, which may be the supervisor or a young permanent researcher of the group, will be designed for each ESR/ER to help him with all installation and administrative procedures. In addition, all 7 partner institutions have an officer, which works in close relation with the local ERA-MORE mobility centres to assist the research fellows in all matters relating to their installation in another European country, both in their professional and daily life, including information on legal issues, social security, health and taxes, housing, everyday life as well as family support.

B.2.3 Planing of conferences, short-courses, and summer schools

The description of the workshops, short-courses and summer schools are presented in section B.2.1.2 Detailled Training Program (p.17-19).

Event	Date (indicative) & duration	Coordinator	Location	Participants	External participants * days
1st Crystal2Plate workshop	Month6 4 days	A. Tommasi	To be defined	All Crystal2Plate + 15 external participants	15*4 = 60
SC1 Thermodynamics	Month7 4 days	J. Connolly	Zurich	Crystal2Plate & c2c ESR/ERs + 10 external participants	10*4= 40
SC2 Processing seismic data	Month8 5 days	M. Kendall J. Wookey G. Helffrich	UNIVBRIS	Crystal2Plate ESR/ERs + 12 external participants	12*5=60
SC3 Textures & anisotropy	Month10 5days	A. Tommasi D. Mainprice	UM2	Crystal2Plate ESR/ERs + 11 external participants	11*5=55
SS Thermal convection	Month16 7 days	A. Davaille F. Funiciello C. Faccenna	CNRS-FAST	Crystal2Plate ESR/ERs + 10 external participants	10*7=70
2nd Crystal2Plate workshop	Month18 4 days	A. Tommasi F. Funiciello	To be defined	All Crystal2Plate + 15 external participants	15*4=60
3rd Crystal2Plate workshop	Month30 4 days	A. Tommasi F. Funiciello	To be defined	All Crystal2Plate + 15 external participants	15*4=60
Final Crystal2Plate workshop	Month46 4 days	A. Tommasi F. Funiciello	To be defined	All Crystal2Plate + 20 external participants	20*4=80

B.3 Impact

B.3.1 Indicators of Progress

To allow the European Commission to assess progress with respect to the research, training, and management activities as well as the impact of those, the CRYSTAL2PLATE ITN will provide the following indicators of progress in its periodic, mid-term review and final reports.

B.3.1.1 Research Activities

- A description of the progress of the research activities at the scale of the individual research projects, of the research-centred work packages, and of the network. The main results, but also the possible problems will be presented and the nature and justification for any necessary adjustement to the original work plan will be given. We will also report on the cross-interaction among disciplines and between academic and industrial partners.
- Highlights of the scientific achievements and recognitions, such as innovative developments, scientific breakthroughs, publications, and awards. A detailed list of the individual and joint publications by the network participants that are directly related to the work undertaken within CRYSTAL2PLATE will be presented, together with the relevant citation data.
- A report on specialists exchanges among network teams and on the visits of senior researchers from in- and outside the network

B.3.1.2 Training Activities

- A description of the progress of the training at the individual level, participant teams, and network levels: follow up of all Individual Career Developement Plans, mentoring and tutoring activities in each institution, general report on the progress of the 2 training-centred work packages.
- A report on the rate of recruitment of ESR/ER for each participant and for the network as a whole (ratio person-months filled/offered) and of the time and duration of each individual appointment. Any adjustment to the original research work plan and/or timetable (as refereed to table A3.1 of part C) will be described and justified.
- A report on the short visits/secondments undertaken or organised by each ESR and ER within the network
- A report on the participation of ESRs ane ERs in the network training events and meetings and to international conferences.
- An evaluation of the level of satisfaction of the trainees
- Highlights on more particularly innovative developments (novel concepts, approaches, methods and / or products) and on wider societal components of the project, such as public outreach activities

B.3.1.3 Management and impact

- An evaluation of the effectiveness of networking, communication and decision-making between partners (at all levels: coordinator, team leaders, project supervisors, ESRs and ERs), between the network and the Commission, and with the Industrial and/or other relevant stakeholders.

- A report on the recruitment strategy and of its effects in terms of equal opportunities (including gender balance) and open competition at international level.
- A report on the participation of external participants to the network "training events and conferences" open to external participants and an evaluation of their integration in the training programme.
- A description of the nature and justification for adjustments, if any, to the original training plan and/or timetable.
- A description of the measures for the dissemination of project results and an evaluation of their effectiveness.

B.3.2 Dissemination and Impact

B.3.2.1. Impact on training and research capacities of the partners and on European research

Deciphering the dynamics of the Earth requires multi-skilled workforce familiar with many different techniques and disciplines: geology, geochemistry, physics, chemistry and mineralogy, fluid mechanics, and numerical modelling. Scientists with a **pluridisciplinary expertise are needed to trigger off new directions of research**, which in turn will create new added value for the scientific community.

By bringing together 7 leading groups from complementary domains in EU Earth Sciences, **CRYSTAL2PLATE will bring significant advances on our understanding of a key question in Earth Sciences**, still unsolved 40 years after the establishment of the plate tectonics theory: **how mantle convection produces, and is modified by, plate tectonics**. The multidisciplinarity of CRYSTAL2PLATE research group will allow, for the first time, to explicitly consider the interactions between physical and chemical processes as well as between crystal-scale processes and large-scale dynamics in the mantle. Major expected scientific breakthroughs are:

- an improved understanding of how small-scale processes at plate boundaries feed into large-scale dynamics of the mantle, coming from a combination of approaches spanning all scales;
- an understanding of the 'effective' rheology of the lithosphere as a function of its physical state, arising from the coupling of observations on natural systems and multiscale modelling;
- a dramatic improvement in our understanding of fluids transport above subduction zones and in how it interacts with deformation of the solid mantle, stemming from coupled analysis of 3-D seismic velocity structure with anisotropy, the chemistry and deformation of xenoliths and peridotite massifs, and numerical modelling;
- a better understanding of the role of fluids and magmas on both the subduction and rifting processes, coming from the association of observations on natural systems, seismic anisotropy and tomography data, and multiscale modelling;
- an improved comprehension of the role of the pre-existing structure of the lithosphere on the creation of new extensional or compressional plate boundaries (rifting and subduction), arising from the combination of observations on natural systems and modelling spanning

all scales from the crystal to the plates and seismological observations;

- a dramatic improvement on our understanding of how plates influence the convective pattern and of the driving forces behind plate tectonics, arising from the association of modelling, seismological and geochemical data , and observations on natural systems;
- novel constraints on the plates' cycle in the convective mantle by associating geochemical data, seismological observations, and numerical modelling.

Although the proposed research and training are focused on the dynamics of the solid Earth, the outcomes of CRYSTAL2PLATE will largely exceed the domain of solid Earth Sciences, resulting in:

- development of new numerical codes for modelling complex bi-phase systems, in which physical properties depend on composition as well as pressure and temperature conditions, with applications in a large number of problems implying fluids transport, such as pollutants dispersion, oil migration…
- a dramatic improvement on our understanding of the evolution of textures (crystallographic orientations) and of texture-dependent anisotropic properties. This knowledge is essential to predict the effect of forming processes on the engineering properties of the resulting metallic or ceramic pieces and to optimize the combination of thermal and mechanical processes used in industrial applications.
- a better understanding of the thermal transfers and of the development of instabilities (folding, necking, gravitational) in complex fluids. These poorly-known phenomena have important consequences in large number of processing techniques in the chemical and food industries.

CRYSTAL2PLATE will also open opportunities to academic groups, which are essentially involved on fundamental research, to develop **collaborations with industrial partners** from a large variety of domains. Scientific outcomes of CRYSTAL2PLATE projects will have indirect applications in the oil industry. Indeed, a better understanding of the processes controlling the development of new plate boundaries, in particular during continental rifting process, is an essential point to comprehend the evolution of continental margins and hence the formation and maturation of sedimentary basins. In addition, CRYSTAL2PLATE projects will result in **technical and methodological developments with a large range of industrial applications**, as for instance:

- in scientific instrumentation - the development of innovative methods for texture characterization during in situ experiments using the new Crystal Probe
- in oil exploration and geomechanics - the development of the seismic and thermo-mechanical modelling techniques
- in the food and chemical industry – a better understanding of materials with complex rheologies

By structuring the collaboration between 7 major European Earth Sciences research centres, CRYSTAL2PLATE will reinforce the structure of Earth Sciences research in Europe by decreasing its fragmentation, avoiding duplication of effort, and identifying gaps in research programs. Opening CRYSTAL2PLATE conferences and short-courses to external participants will, in addition to giving best networking possibilities to the ESRs and ERs, allow new collaborations with others European Institutions to be developed. The structuring effect will thus expand beyond the partner organisations, by including researchers recruited from Earth Sciences

and Physics formations around Europe. Ongoing networking of early-stage, experienced, and senior researchers on completion of this project will ensure that CRYSTAL2PLATE will have long-lasting effect in European Earth Sciences.

B.3.2.2. Impact on ESR and ERs career prospects

The study of the coupling between the plates and the convecting mantle based on the analysis of the interactions between physical and chemical processes and between crystal-scale processes and large-scale dynamics as proposed by the CRYSTAL2PLATE ITN provides a rich training ground for young scientists. It is a **highly pluridisciplinary research field** at the convergence between geology, geochemistry, geophysics, petrology, fluid mechanics, and mineral physics. It introduces them to the diversity of processes controlling the evolution of our planet and the challenges of unravelling this complexity through the association of techniques from different disciplines, whilst at the same time giving them an opportunity to engage in an area of research that can make a real contribution to improving our understanding of the functioning of our planet. Indeed fundamental understanding of the processes involved in the formation and evolution of plate tectonics has strong implications for both the present-day dynamics (earthquakes and volcanism) and for the early Earth and other planets evolution.

The physical, chemical, computer modelling as well as the strong team-building, organization, management, and networking skills as well as the mobility experience gained in CRYSTAL2PLATE will open up research **careers in academia or in industry**, as their training can be applied in a variety of situations where **analytical aptitude to deal with complex data sets and acquisition of accurate information** are required.

The need for highly trained scientists with this expertise is particularly high in **academic research** in geodynamics, but also in economic geology, external geodynamics, applied geophysics, and geochemistry. It is also important in **industry** for jobs involving **geophysics** (oil and mineral exploration, risk evaluation), **scientific instrumentation, and program designing**. The interaction with the associated partners that are leading companies in these domains will ensure the necessary knowledge and contacts. Despite the fundamental nature of the proposed research projects, the study of the deep Earth has often been the driving force behind the **development of novel analytical techniques and equipment**. For instance, the Crystal Probe in Montpellier is one of two prototypes systems installed in the world for in situ crystallographic during high temperature experiments. The deep knowledge gained through their research projects on subjects like heat and mass transfer, instabilities in fluids with complex rheologies will open opportunities in **mechanical and chemical engineering** (food, glass, or polymers processing). Their international experience and management skills will also entitle them for **project officer positions** in **academia, regional and national governments, and industry**.

The career and personal development formation (courses, practical activities, and tutoring) will give ESRs and ERs all **skills to be successful in their future search for employment positions**: CV redaction, interview techniques, proposal writing, organisation and career-planning skills. In addition, the collaborative work in the frame of CRYSTAL2PLATE will create strong links between the fellows and senior researchers that will be maintained alive for a long time after the end of the contract. Such a solid **network of professional relations** is an essential tool for a successful professional career.

B.3.2.3. Dissemination of the results

Through its Work Package 7: Communication, CRYSTAL2PLATE will have an active policy of **communication and dissemination of the results** of the joint research & training programme, both during the project duration and after completion of the contract. This WP will be coordinated by the working group 4. It will:

- ensure, through a close following and mentoring by the supervisors, that the scientific results obtained in the individual research projects are presented in international meetings and published in high impact factor international journals. Each ESR and ER will publish at least one article presenting the results of his/her research project in a high impact factor international journal. ESRs and ERs will also participate to at least one international meeting per year, present their results oraly or as posters.
- encourage the ERs to convene, with the assistance of the senior researchers, specialized sessions on the network research theme in major international meetings, like the AGU and EGU,
- maintain an active network website, which will be housed by the UM2 and managed by the ESRs and ERs under the supervision of a senior scientist. The CRYSTAL2PLATE website will present the network, the available positions, the publication list, but also written material on the CRYSTAL2PLATE courses, computer-programs and short presentations of the major scientific results from the different research projects. It will also display the programs of the workshops as well as the abstracts of the presentations and posters.
- participate to events aiming to present the European Science and Research to the wide public.

The **annual CRYSTAL2PLATE workshops** will be open to external participants from ERA countries (15, with ca. 50% of young researchers from other institutions) to promote co-operation amongst other research institutes in Europe. These workshops will have a double purpose: deliver high-level scientific talks / lectures by leading specialists (from within and outside the network) and allow exchanges and discussion between all early-stage and senior participants of the network. Each fellow will be expected to give an oral presentation of her/his work. For the wider dissemination of the results, the programs of the workshops as well as the abstracts of the presentations and posters will be made publicly available on-line at the CRYSTAL2PLATE web-site. Whenever possible, the CRYSTAL2PLATE workshops will be organized close (in time and space) to specialized meetings in geodynamics to allow cross-interaction between the 2 meetings. The fourth and last workshop will be a more important event, open to a larger number of external participants (24), to ensure a wide dissemination of the outcomes of CRYSTAL2PLATE research and training program in the international community.

B4. Ethical Issues

CRYSTAL2PLATE does not raise any ethical issues.

B5. Gender aspects

CRYSTAL2PLATE will actively promote a balanced participation of women and men in the

research and training activities. The first action on this direction is the formation of a Supervisory Board composed by 50% women, which are also the scientists-in-charge in 3 of the 7 partners.

The CRYSTAL2PLATE Supervisory Board will therefore be be especially attentive to gender issues. It will have an active policy to promote gender equality by:

- searching to achieve a good gender balance in the recruitment, although the main recruitment criteria will be scientific excellence;
- surveying the positions and needs of the women staff at all levels from PIs to ESR;
- promoting women participation and leadership in the CRYSTAL2PLATE committees and working groups;
- implementing, if desired by the female ESRs/ERs, an individual tutoring by one of the female PIs. This action will be facilitated by the presence, among the PIs of the 7 partners, of female researchers at various stages of their researcher careers, from young ERs recently recruited in a permanent position to more experienced senior researchers.

PART C: Overall Indicative Project Deliverables

Project Number 1	215353	Project Acronym 2	CRYSTAL2PLATE

ONE FORM PER PROJECT

	Initial Training 0-5 years						Visiting Scientists						Total	Events	
	Early-Stage researchers			**Experienced researchers**			**Visiting scientists (<10)**			**Visiting scientists (>10)**					
	Months	Researchers	% Fixed amount contract (B)	Months	Researchers	% Fixed amount contract (B)	Months	Researchers	% Fixed amount contract (B)	Months	Researchers	% Fixed amount contract (B)	Months	Researcher event days	Number of events
UM2	72	2	0%	0	0	0%	0	0	0%	0	0	0%	72	315	5
UNIVBRIS	72	2	0%	0	0	0%	0	0	0%	0	0	0%	72	60	1
UU	0	0	0%	24	1	0%	0	0	0%	0	0	0%	24	0	0
ETH Zurich	108	3	0%	0	0	0%	0	0	0%	0	0	0%	108	40	1
Uniroma TRE	36	1	0%	0	0	0%	0	0	0%	0	0	0%	36	0	0
CNRS-FAST	36	1	0%	24	1	0%	0	0	0%	0	0	0%	60	70	1
CSIC	36	1	0%	0	0	0%	0	0	0%	0	0	0%	36	0	0
Overall Total	360	10	0%	48	2	0%	0	0	0%	0	0	0%	408	485	8

PART D: Overall Maximum Community Contribution

Project Number [1]	215353	Project Acronym [2]	CRYSTAL2PLATE

ONE FORM PER PROJECT

The project is lab based ☒

	Monthly living and mobility allowance (A)	Travel allowance (B)	Career exploratory allowance (C)	Contribution to the participation expenses of eligible researchers (D)	Contribution to the research/ training/ transfer of knowledge programme expenses (E)	Contribution to the organisation of international conferences, workshops and events (F)	Management activities (including audit certification) (G)	Contribution to overheads (H)	Total
Year 1	358,633.34	12,000	24,000	53,400	53,400	64,500	44,500.00	56,352.00	666,785.34
Year 2	575,887.50	12,000	0	86,400	86,400	39,000	44,500.00	79,967.00	924,154.50
Year 3	485,931.00	10,000	0	76,200	76,200	18,000	44,500.00	66,630.00	777,461.00
Year 4	180,561.16	0	0	28,800	28,800	24,000	43,100.00	26,466.00	331,727.16
Total	1,601,013.00	34,000	24,000	244,800	244,800	145,500	176,600.00	229,415.00	2,700,128.00