LabEx

Diversités biologiques et culturelles : origines, évolution, interactions, devenir

Biological and Cultural Diversities: Origins, Evolution, Interactions, Future

Appels à projets pour l'année 2018

Liste des appels à projets pour l'année 2018

BCDiv financera (ou co-financera) :

- 4 bourses post-doctorales (contrats de 12 mois)
- 8 stages de Master 2 (5 mois de gratifications par stage) inscrits au budget 2018
- Des missions d'inventaires de la biodiversité ou de la diversité culturelle passée ou présente (montant maximal de l'allocation totale pour 2018 : 50 k€)

Cadrage scientifique général

BCDiv explore trois systèmes connectés :

- La diversité biologique et culturelle de l'homme ainsi que les comportements des sociétés humaines envers la biodiversité.
- Les patrons de la diversité biologique, de l'organe aux communautés et aux écosystèmes, ainsi que les processus de naissance et de régulation naturelle de cette diversité.
- La diversité et la complexité des interactions entre les systèmes biologiques et socio-culturels (co-évolution ; co-développement ; sensibilité et résilience des systèmes ; modélisation).

BCDiv explore ces domaines sur la durée de l'histoire de la Planète, à différentes échelles de temps, des origines protérozoïques de la biodiversité aux grandes crises de diversité paléontologique, ainsi que de la diversification originelle des cultures à l'impact de la néolithisation ou de l'industrialisation.

Le travail collaboratif est organisé en 8 programmes de recherche (*working package*, WP) :

Tâche 1 (WP1) : Inventaires et suivis, signification et usages de la biodiversité

Tâche 2 (WP2) : Taxonomie intégrative et systématique phylogénétique

Tâche 3 (WP3) : Biologie et évolution de l'Homme

Tâche 4 (WP4) : Pratiques et représentations liées à la biodiversité

Tâche 5 (WP5) : Fonctions, adaptations, des organes aux communautés

Tâche 6 (WP6) : Scénarios de biodiversité, modélisation, prédiction

Tâche 7 (WP7) : Sciences de la conservation

Tâche 8 (WP8) : Concepts, méthodes et interdisciplinarité

3 programmes de valorisation :

Tâche 9 (WP9) : Publication et édition scientifique

Tâche 10 (WP10) : Production d'indicateurs et expertise pour les acteurs privés et publiques de la gestion de la biodiversité

Tâche 11 (WP11) : Diffusion vers le grand public (notamment à travers les expositions du Muséum)

1 programme d'enseignement et de formation

Tâche 12 (WP12) : Master et Ecole Doctorale

Orientations stratégiques

Les objectifs stratégiques du projet sont :

- Développer les qualités propres aux UMR du Muséum : taxinomie et systématique, sciences de la conservation, anthropologie environnementale, approches historiques sur la longue durée ; toutes fondées sur des collections irremplaçables et sur des systèmes uniques de bases de données d'inventaires et de suivi.
- Stimuler la convergence et la synergie des savoirs techniques et des expertises disciplinaires réunis dans les UMR/UMS du MNHN-INEE déjà impliquées dans ces recherches.
- Créer les conditions d'une réflexion et d'une construction conceptuelle communes aux UMR impliquées.

BCDiv n'a pas pour vocation de se substituer aux UMR ni aux équipes. Il vise au contraire à renforcer ou stimuler les interfaces entre les UMR/UMS dans le but de faire émerger de nouveaux projets de recherche collaboratifs.

Modalités d'évaluation des projets

Les projets soumis à BCDiv devront impliquer EFFECTIVEMENT au moins deux UMR partenaires du LabEx. Les seules exceptions à cette règle concernent les gratifications de Master, seulement si le stage est adossé à un projet déjà financé par BCDiv.

Les projets soumis à BCDiv devront être signés par le porteur de projet et, lorsqu'il y en a plusieurs, par tous les chercheurs porteurs du projet. Ils devront être portés à la connaissance des directeurs de toutes les UMR/UMS concernées par le projet, et validés par le conseil de laboratoire de l'UMR porteuse du projet. Les conseils de laboratoire des UMR classent les projets pour lesquels l'UMR est porteuse en fonction des priorités de cette UMR. Le directeur de l'UMR porteuse rédigera un court avis motivé pour chacun des projets classés. Les projets non retenus par le conseil d'UMR ou non signés par le Directeur d'UMR ne seront pas examinés par les instances du LabEx.

Les projets de master, post-doctorat, et missions soumis à BCDiv seront évalués et classés par le conseil scientifique de BCDiv[1], composé de personnalités scientifiques extérieures au Muséum. Le Comité de pilotage (CP), composé des directeurs d'unités et de responsables scientifiques du Muséum ou du CNRS, arrête la liste des projets qui seront financés au sein des projets retenus et classés par le Conseil Scientifique, en tenant compte de leur adéquation aux objectifs stratégiques de BCDiv (schéma 1).

Concernant les stages de Master 2, seront éligibles :
- les projets portés par au moins deux UMR
- les projets portés par une seule UMR mais s'inscrivant dans le cadre d'un projet déjà financé ou en cours de financement par le LabEx (doctorat, post-doc, grande mission)

Les porteurs de projets doivent prendre en compte les contraintes liées au protocole de Nagoya, et engager au plus vite les démarches administratives permettant la réalisation du projet de faisabilité de la recherche concernée projet. Les crédits ne seront mis à disposition que lorsque toutes les autorisations auront

[1] Composition du conseil scientifique de BCDiv : Francesco d'Errico (Préhistoire, Bordeaux, Président), Rose-Marie Arbogast (Bioarchéologie, Strasbourg), Xavier Bellés (Biologie évolutive, Barcelona), Jorge Cubo (Paléontologie, Paris 6), Christophe Douady (Ecologie moléculaire, bioinformatique, Lyon), Gilles Escarguel (Systématique, biostatistiques, Lyon), Jane Lecomte (Ecologie, Orsay), Virgine Maris (Philosophie et protection de la biodiversité, Montpellier), Claude Miaud (Ecologie évolutive, Montpellier), Véronique Pardo (Anthropologie, Aix-Marseille), Remy Petit (Génétique et écologie des populations, INRA-U. Bordeaux), François-Xavier Ricaut (Anthropologie biologique), Frédérique Viard (Biologie marine, Roscoff), Emmanuelle Vila (Archéozoologie, U. Lyon).

été réunies, sans quoi le projet risque de ne pas être éligible par l'ANR. Ce dispositif est prévu dans le projet actuel de la loi sur la biodiversité et peut être amené à évoluer. La communauté des chercheurs est invitée à se tenir informée des obligations règlementaires relatives au protocole de Nagoya (recommandation du CP du 26 janvier 2016).

De plus, en cas d'utilisation d'animaux, les porteurs de projets ne se verrons attribuer le financement que sur présentation d'un avis favorable du Comité d'Ethique Cuvier (MNHN) (recommandation du CP du 26 janvier 2016).

Les porteurs de projets qui ne participent pas aux journées d'animation ou ne présentent pas une excuse valable, s'excluent de fait de l'AAP en cours et des suivants (résolution du CP du 26 janvier 2016).

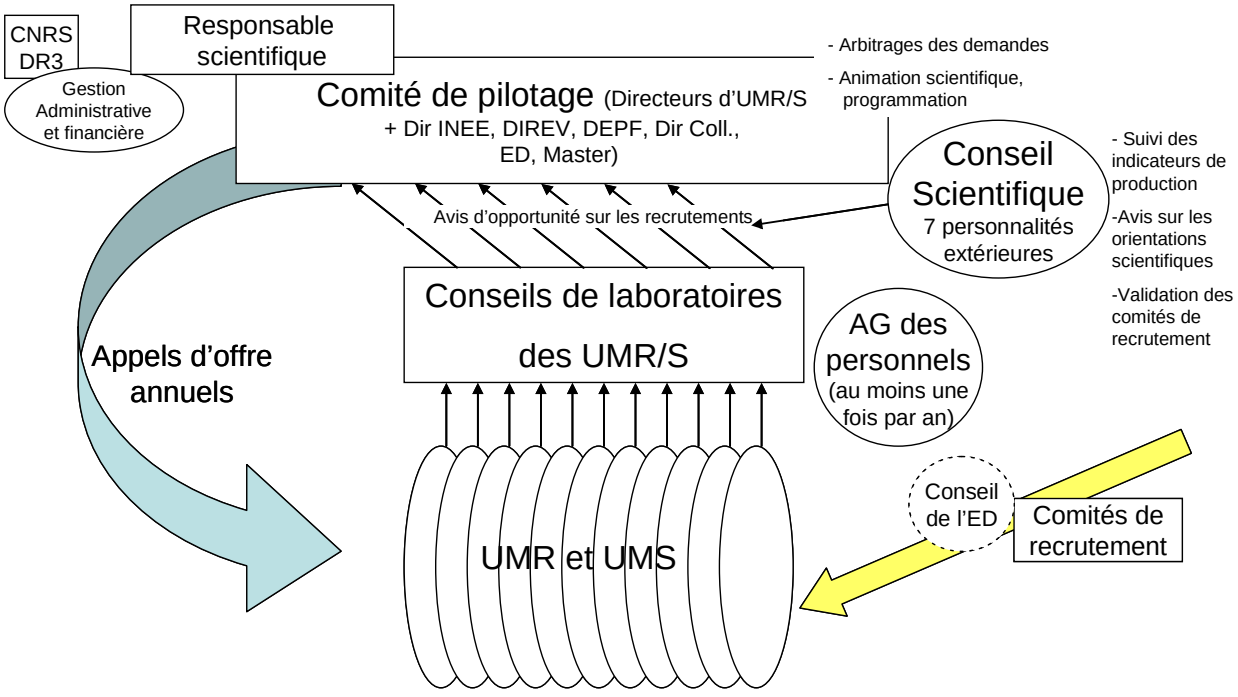


Schéma 1 – Instances et fonctionnement du LabEx BCDiv.

Procédure et critères d'évaluation des projets

L'évaluation comporte trois temps :

- Recevabilité du dossier. Un bureau composé du président et du secrétaire du Conseil scientifique et du président du Comité de Pilotage (assistés de la gestionnaire de BCDiv) vérifie que les dossiers répondent aux quatre

critères suivants : 1) respect de la date de clôture de l'appel à projet ; 2) présence de tous les éléments permettant l'évaluation du dossier ; 3) validation de la demande par le conseil de laboratoire de l'UMR porteuse du projet et signature du Directeur d'UMR et de tous les co-porteurs de projet ; 4) projet porté par au moins 2 UMR partenaires du Labex BCDiv (sauf pour les Masters, pour lesquels sont également éligibles des demandes venant en appui de projets déjà financés ou en cours de financement par le LabEx, et pour l'édition scientifique).

- Evaluation scientifique. Le Conseil scientifique classe les projets en fonction des critères suivants :

  - Qualité scientifique (déjà évaluée par le conseil d'UMR) (note de 1 à 5)
  - Innovation / originalité du projet scientifique (note de 1 à 5)
  - Qualification des porteurs de projet (note de 1 à 5)
  - Méthodologie, risques, faisabilité (note de 1 à 5)

  Il donne en outre son avis sur trois autres critères qui seront repris par le Comité de Pilotage

  - Adéquation aux objectifs scientifiques du LabEx BCDiv, notamment vis-à-vis des Tâches (Work Packages, WP)
  - Qualité de la transversalité entre les UMR de BCDiv porteuses du projet)
  - Réalisme du budget / du montage budgétaire

- Evaluation par rapport aux objectifs du Labex. Le Comité de pilotage évaluera :

- La qualité de la transversalité entre les UMR de BCDiv porteuses du projet et la capacité du projet à intéresser le champ le plus large au sein de celui de BCDiv,
- Le fait que le projet fasse explicitement état d'un questionnement historique, c'est-à-dire d'une démarche consistant à inférer les conditions passées qui expliquent l'état actuel du monde chimique, géologique, biologique, humain ou socio-culturel.
- L'articulation du projet avec les collections patrimoniales hébergées par le Muséum ou des bases de données mises à disposition, avec d'éventuelles activités d'expertise, ou avec l'enseignement, la formation ou la diffusion des connaissances.

Un demi-point ou un point supplémentaire sera attribué au projet sur chacun de ces trois critères.

Les projets seront donc notés entre 4 et 23. Le classement final s'appuiera sur cette note.

Tous les porteurs de projet recevront un avis motivé du CS et du CP. Ceux dont les projets auront été retenus recevront en outre un certain nombre de recommandations budgétaires et administratives pour leur mise en œuvre.

Calendrier

Les projets doivent être envoyés en format électronique avant le 30 septembre 2017 à Anne-Cécile Haussonne (achausso@mnhn.fr). On se conformera aux formulaires ci-joints, également disponibles sur le site de BCDiv : http://labex-bcdiv.mnhn.fr/.

Le résultat des évaluations sera diffusé au plus tard le 31 janvier 2018.

Annexe 1 – Procédures de recrutement des personnels temporaires

A l'exception des professeur(e)s invité(e)s, gérés par le Muséum, les emplois sont rémunérés sur des crédits CNRS, gérés par la Délégation Régionale Paris B. Pour toute information administrative, contacter Anne-Cécile Haussonne (38 51 ; achausso@ mnhn.fr).

Pour les Post-doctorants :

1. Mise en place d'un appel d'offre le plus large possible, nécessairement international pour les post-docs.
2. Mise en place d'un comité de recrutement composé de 5-7 personnes, dont le porteur de projet et un ou deux représentants du Comité de Pilotage de BCDiv (membres votants uniquement). Il est recommandé de s'adjoindre l'expérience d'un représentant du service des Ressources humaines du CNRS Paris B ou du MNHN.
3. La composition du comité de recrutement doit être communiquée dès que possible, pour validation, à A. Herrel (anthony.herrel@ mnhn.fr), avec copie à A.-C. Haussonne.
4. Le comité de recrutement validé examine les candidatures sur dossier et retient les meilleurs candidats pour audition (utilisation de Skype possible). Il se charge d'informer les candidats non admissibles des raisons du rejet de leur candidature.
5. Après audition (et éventuel examen écrit/ pratique pour les ingénieurs), le comité de recrutement classe les candidats et en retient un pour recrutement[2].

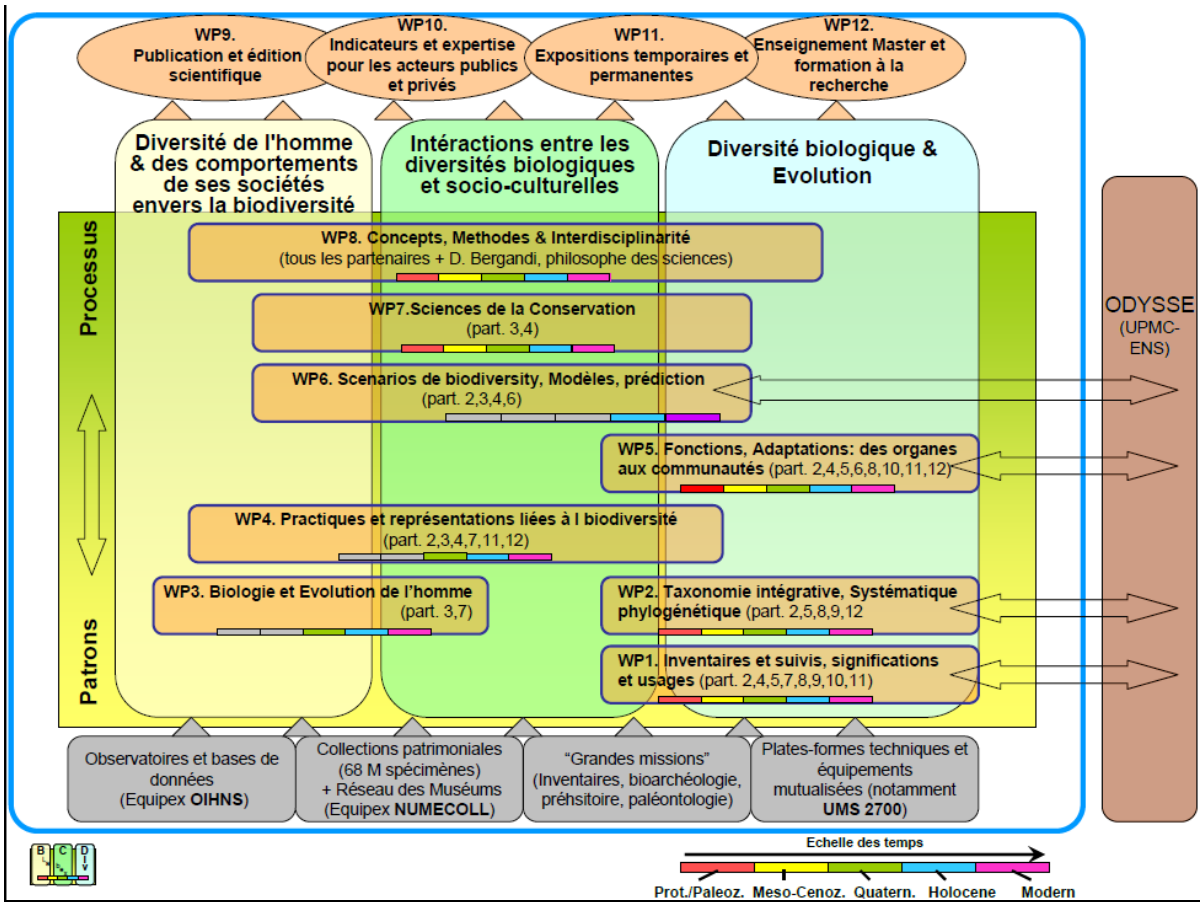
Paris, le 2 mars 2012,

Texte révisé le 5 juillet 2012, le 17 juin 2013, le 10 juillet 2014, le 2 juillet 2015, le 11 juillet, 2017.

Le président du Comité de Pilotage du LabEx

[2] Les Post-Docs sont recrutés à un niveau de salaire correspondant à leur expérience dans la recherche. S'ils sont recrutés en tant que chercheur contractuel de plus de 4 ans d'ancienneté après le Doctorat, les porteurs de projet devront choisir une réduction entre le salaire proposé par le CNRS ou la durée du contrat.

Annexe 2 – Description des 12 working packages de BCDiv



WP1: Inventories and Monitoring, meanings and uses.

Keywords: Taxonomy, Molecular and morphometric tools, Species richness, Biogeography, Palaeo- and archaeo-biogeography, Inventory surveys, Citizen science, Common/rare species (part. 2,4,5,7,8,9,10,11).

Knowledge on the state and dynamics of biodiversity is important for our project, which aims to fill the wide knowledge gaps from two related perspectives: 1) inventories, to improve the knowledge on the biological entities that compose biodiversity, 2) monitoring to record as completely as possible their present dynamics, in relation to global change. We will develop scientific synergies between these two different, albeit complementary, approaches.

As we are far from having described all biological entities, let alone all species, inventories are concerned with two challenges:

- The development of molecular and morphometric tools for the study of biological patterns, stimulating new methods of inventorying biodiversity (see WP2).

- However, the question is not only a matter of knowing what we count but also how we do this; methodologies of species richness and rarity assessments have been long been the subject of research and this conceptual effort is ongoing through the research of part. 5, 9 and 10. In particular, based on its taxonomic expertise, the Museum surveys particularly megadiverse regions (from Madagascar to New Caledonia). Methodologies have to be complemented and coupled with methodologies developed for monitoring, so that both types of data can be used, co-analyzed, and related, to complete the information that has been obtained.

To understand the dynamics of biodiversity and to infer large-scale temporal trends in relation to environmental and human pressures, we intend to monitor biodiversity in the long-term and on a large spatial scale, recording in particular species abundances and diversity through palaeontological and archaeological approaches (part. 2,7,8). The results of such surveys can be used in comparative analyses, in order to define different patterns of biological dynamics in response to human pressures and to prioritize responses (Baillie et al. 2008). There data led to the characterization of the state of communities (birds, bats, fish, butterflies, pollinators, plants, mircoorganisms..), of their functional traits, and hence to the characterization of the state of ecosystem services (see WP5). In order to obtain large-scale data on biodiversity, concerning public and private spaces, citizen-science programmes are particularly appropriate tools (Cooper et al. 2007), and are developed by scientific teams at the Museum (part. 4), where simple survey protocols are proposed to the general public, who can collect data which are then analyzed by scientists. For sampling reasons, monitoring usually focuses on common species. An exciting possibility is to connect these data with the data in the inventories, specifically geared towards rare species (see above), to have at the same time a precise, complete and dynamic image of biodiversity.

WP2: Integrative Taxonomy and Phylogenetic Systematics.

Keywords: Character analysis, Barcoding, Clades, Classification, Algorithms, Comparative anatomy, Extinct taxa, Phylogeny, Genealogy, Evolutionary transitions, Species, History, Horizontal transfers (part. 2,5,6,9,10,12).

The first objective of this WP will be to question and refine the existing taxonomies and phylogenies in the broad taxonomic field of expertise of the BCDiv labs (from unicellular to plants and vertebrates), in light of the increasing number of taxa brought by the inventories, and including past biodiversities. All the appropriate characters and systems of analyses will be used from the genome

(part. 5) and the (ancient) DNA markers to the use of structural (comparative anatomy) or morphological (geomorphometrics) phenetic or functional traits (part. 2,5,8,9,10).

Though closely linked to WP2, evo-devo is not part of the BCDiv project, but several partners (namely part. 8 & 9) will of course continue with their collaborations with other labs of the MNHN (namely the group of Giovanni Levi) in this promising field of research.

However, no scientific approach to the biological and/or human world could be developed without knowing first what we are facing. Basic knowledge is acquired by making a link between an object, a concept and a name. This remains true even if we try to grasp the variety of things present in a given area: we need to decide on the scientific meanings of the concepts we use to group the things we find. For instance, a classical tension from the origin of natural sciences is found between concepts based on what organisms do (e.g. algae, plankton) and concepts based on what organisms have (e.g. phaeophyceae, athropods). Inventories are not just counting what we find. Methods to identify biological entities beyond what we can detect with our eyes alone will be developed. Molecular taxonomy (helped with barcoding), integrative taxonomy, the epistemological refinement of our categories in the biological sciences as well as the human sciences are examples that will play a key role in our ability to know what is in this world.

Another more integrative objective of WP2 will be to refine the meanings of the entities that we assess in a given environment, in biological sciences as well as in the human sciences. A comparison of these meanings will be undertaken in WP8. Knowing processes by which the present state of nature and human interactions arrived to what we see now partly depend on how structures that characterize organisms and human societies at hand arose over time. The relative ordering of characters in time is given by phylogenies. Phylogenies are not genealogies, but first of all they express what is shared by whom. Then, if an evolutionary theory is at play, this sharing of characters (organs, DNA sequences, genomes) indicate degrees of kinship. Systematics is highly involved because, since Darwin, the meaning of our categories is common descent based on vertical heritage. Part of the explanation of structures as well as the functional abilities of an organism or a human population (in terms of biological traits) is historical; they must undergo phylogenetic reasoning. However, some of these traits have been recently "stolen" from other entities of the same environment. Today our reasoning is also able to handle such horizontal inheritance (DNA horizontal transfers, cultural/technical/linguistic exchanges, etc.). New techniques and methods of constructing networks to represent relationships will be developed to obtain

better representations of the complexity of causes for sharing traits. In WP8 there will be comparison and/or exchanges in methodologies - when appropriate - between the human sciences and sociological sciences.

WP3: Human Biology and Evolution.

Keywords: Human evolution, Adaptation, Genetics, Population genetics, Demography, Physical anthropology, Primatology, History, Palaeoanthropology (partners 3,7).

Humanity has gone through many environmental changes during its history. This has often led to large biological responses as well as environmental modifications. The study of human biology, in close connection with cultural evolution (WP4), gives us therefore a unique historical depth to understand the complex relationships that humans have experienced with their environments.

This allows: 1) A unique perspective on the biological modifications arising from a large range of environmental transitions: climatic changes (e.g., glaciations), anthropization of the environment (including domestication, agriculture and husbandry), and colonization of new environments through migrations. 2) To understand the complex dynamics between human populations and environments by coupling ecological data on past environments to data on demographical, geographical, cultural and biological history of human populations. 3) To obtain precious information on the impact of environmental changes on human biology, both genetically and morphologically, emerging from long-term evolutionary processes rather than focusing solely on short-term phenotypic responses to environmental changes observed nowadays.

For example, in the case of diet, the environment constrains the nature and the availability of resources available for human diets. In turn, the analysis of human genetic diversity has revealed that human populations adapted to the availability of resources as well as to their own subsistence lifestyle: partner 3 is investigating the pattern and processes of lactose tolerance for pastoralist societies (Simoons 1969, Bersaglieri et al. 2004, Tishkoff et al. 2007) and the example of *NAT2* gene for agriculturalist societies (Magalon et al. 2007). We will also address the question of the current responses to environmental changes, with the example of the increase in the prevalence of obesity observed in many contemporary populations (Wells 2003). The way diet impacts on demographic traits and therefore on human population dynamics is still debated. Population genetics has, however, showed how the agriculturalist revolution is intimately linked to the massive human demographic expansion observed during the Neolithic transition (Bocquet-Appel 2002, Bocquet-Appel & Naji, 2006).

We will therefore combine genomic data from current and past populations (using ancient DNA), anthropometric data, demographical data and biological/behavioural data on other primates to study the natural history of the human species in time and space. This will allow us to assess the importance of the biological adaptation phenomena that past human populations have undergone and will enable us therefore to better understand the reactions observed nowadays to the pressure of the environment, whether it is the physical environment itself (climate) or its influence on the choice of food or the diversity of diseases (pathocenosis).

WP4: Practices and Representations Connected to Biodiversity.

Keywords: Hunting-gathering, Agriculture, Husbandry, Domestication, Diet, Trade & Exchanges, Symbolic uses of biodiversity, Nature socialization (partners 2,3,4,7,11,12).

This WP aims to describe and classify the diversity of the behaviour of human societies towards biodiversity in a large variety of situations through space and time, in order to better understand the processes which created this diversity. The output of this WP should be directly useable for the construction of scenarios, modelling and prediction of WP6.

Both know-how, knowledge and representations of biodiversity will be taken into consideration, because they are essentially interconnected (Lévi-Strauss 1958). The biological determinants of cultural behaviours (e.g. genetic determinism of tastes and its consequences on the choice of prey by hunters) will also be taken into account.

Since 1992 the recognition of traditional ecological knowledge (TEK) of indigenous and local people has been enhanced within legal instruments, as in article 8j of the Convention on Biodiversity. This WP will examine the relationship between TEK and the conservation and sustainable use of biological diversity among communities or groups of hunter-gatherers, pastoralists or peasants, both in cases where there is a sustainable use of resources and in situations where biodiversity is threatened.

An interface positioning, at the intersection of ecological/biological/chemical and socio-cultural questions, will be developed particularly in the context of Man-Nature relationships. It concerns the identification of the active chemical substances from plants that are currently used in traditional medicines (ethnopharmacology).

Partners 2 and 7 are responsible for the inventories and analyses of ancient practices and representations from ca. 30,000 to the Industrial times, using

archaeological evidence. This involves not only a lot of different aspects of the behaviour of *Homo sapiens* and of its societies, but also those of *Homo neanderthalensis*. The study of the transition between them from the point of view of attitudes towards biodiversity will be an important contribution towards a better definition of our own specific behaviours. For *H. sapiens*, efforts will be focused on transitional periods which better evidence the processes of disequilibrium and resilience, such as abrupt climatic variations of the Late Glacial, Holocene sedentary hunter-gatherers (e.g. Natufians), the birth and the diffusion of the Neolithic *mode de vie*, traditional highly hierarchic societies (Scythians, Gallic..), traditional city-country systems, empires (Greeks, Roman, Persian, Moche), consequences of long distance exchanges (Western inputs in the Roman and early medieval societies) and of the great discoveries (prestige introduction of American species to the Old world in connection with biological invasions), development of off-shore and river fishing in Europe.

WP5: Functions, Adaptations, from organs to communities.

Keywords: Selection, Desadaptation, Functional inferences in fossil organisms, Comparative anatomy, Functional anatomy, Population dynamics, Communities dynamics (partners 2,4,5,6,8,10,12).

In this WP, we will analyze the effects of adaptation, considered as an evolutionary phenomenon, on functions at different spatial scales, from organs to organisms, from organisms to populations and to communities, integrating higher temporal scales, with phylogenetic studies. Phenotypic traits of interest for adaptive studies – from morphology to behaviour – have to be characterized with their pattern of variability, and integrated into phylogenetic studies. When evolutionary reconstructions are performed on a wealth of different organisms, comparisons and powerful generalizations can be made. One of the main strengths of the BCDiv project is this wealth of different organisms (see also WP1). Microevolutionary studies combining genomic, genetic and (geometric) morphometric approaches for different traits under selection will complement phylogenetic studies. Interpretations are contingent to the geographical and ecological contexts, and our ambitious inventories and monitoring actions (see WP1) will provide large data sets to shed light on the spatial and temporal contingency of evolution of these traits.

Special attention will be paid to adaptations under anthropic pressure. This is e.g. the case of commensal vertebrates such as shrews or mice, the adaptation of which on the century time scale can be explored with the joint research of part. 2,5,10,12 crossing archaeozoological, geomorphometric, morphofunctional and even palaeogenetic analyses. The biological consequences of domestication of plants and animals are an exceptional field for exploring the mechanisms of adaptation under human pressure. Part. 2 is already asking a lot of questions

based on the archaeological and bioarchaeological observations, and is already developing geomorphometric and palaeogenetic approaches which ought to be widened and expanded in collaboration with part. 5, 9, 10 and 12.

Microorganisms, which are ubiquitous in environments where they play a major role through a variety of essential functions, are very good models for studying the mechanisms subtending adaptive dynamics and interaction processes established between prokaryotes (competitions), or between prokaryotes and eukaryotes, including their hosts (symbiosis, commensalism, parasitism and co-evolution processes). These processes have a key role for understanding the functioning of ecosystems. Metagenomics will contribute to consider in an original and integrated fashion the questions raised by the molecular and cellular mechanisms governing the interactions established by microorganisms with their environments. In this way, different ecosystems will be compared, and the number and diversity of microbial species and their variations according to biotic and abiotic environmental variables will be evaluated. Studying the microbial component of a given ecosystem, which is often under-evaluated, should help in understanding the global processes studied in the LabEx. Integration of the data generated at the finest scale and towards the more complex scale at the global ecosystem level, will help to develop a modelization approach. These aspects will be developed by part. 11.

A special effort will be made at the scale of communities, with functional traits of communities being characterized to understand their role in the structure and dynamics of communities, in relation to species composition. This dynamics has to be related to environmental factors, to taxonomic and phylogenetic diversity, and to the set of interactions between species, in order to understand the ways adaptation proceeds up to the scale of communities. This field of research is not only directly efficient for the main scientific purpose of the BCDiv project, but it is also a privileged place for interactions between ancient and modern biodiversities.

WP6: Biodiversity Scenarios, Modelling, Predictions.

Keywords: Integrative approach, Ecosystem service, Biodiversity protection, Indicators, Historical depth, Risk analyses (partners 2,3,6).

Reconciling the human demand for ecosystem services with the protection of biodiversity in a sustainable way is one of the major challenges facing decision-makers in the coming decades, especially in the light of climate change. This issue is particularly relevant at international level within the intergovernmental science-policy platform on biodiversity and ecosystem services (IPBES). In this context, scenarios of the future of biodiversity and ecosystem services are of increasing importance (MEA, 2005).

Model-based scenarios are scientifically sound and exceptionally useful tools for such decision support, in that they potentially help to assess system responses to alternative public policies and pressure or to exhibit novel scenarios satisfying specific prescribed performances. They also provide a strong foundation for dialogue between actors - science/society/policy - and governance.

We aim to model possible patterns for the evolutionary trajectories of the interactions between humans, the environment and societies, thereby providing a forecasting tool which will help with decision-making in terms of biological diversity management strategies in a broad range of situations and in terms of the abilities of current and future societies to adapt to environmental changes.

A major aim is to relate social data with ecological, demographic and even population genetics data, to provide ways of thinking more integratively and in a multidisciplinary way about the future of our societies and environment. This integrative approach is underpinned by a long duration approach, making connections with the work of neontologists (part. 3,4) and bioarchaeologists who work on the late Holocene (part. 2). Given this broad multidisciplinary perspective, of major methodological interest are multi-criteria approaches and risk analysis. Finally, models will rely on perennial, database and broad-scale information systems provided by WP1.

Scenario outcomes will be provided in particular in the form of indicators. The indicators used for the evaluation of the scenarios should have a strong institutional legitimacy. Indeed, scenarios and indicators will provide reflection tools and decision-making tools that will be useful in meeting the expectations of the Environment Round Table, the 2020 European Union biodiversity targets, and the 2020 targets for action against climate change as set out by the Copenhagen Accord (2010).

WP7: Sciences of Conservation.

Keywords: Anthropology of conservation, Conservation biology (partners 3,4).

WP7 aims to integrate two different points of view of cohabitation between humans and nature: that of conservation biologists (part. 4) and that of conservation anthropologists (part. 3).

Conservation biology has been developed over the past thirty years in response to biodiversity decline and crisis (Soule & Wilcox, 1980; Barbault, 1999; Machon, 2008). As well as preserving endangered species and restoring damaged habitats, conservation biology aims to study the relationships between biological and social dynamics (ecology of reconciliation, Rosenzweig 2003), by keeping the dynamics of biodiversity as a focal point. In this context, partner 4 aims to

combine biodiversity conservation, especially maintenance of ecosystem services, and human practices. The case studies involve socio-ecological systems involving endangered species (both plants and animal species), as well as common nature, in highly human-modified habitats (agricultural and urban areas). Biological dynamics are followed by partner 4, notable by the use of biodiversity indicators (WP1) and biodiversity scenarios (WP6). In addition, human practices and perceptions are studied in collaboration with social scientists (partner 3 and external collaborations).

Indeed, partner 3, proposes to incorporate the humanities within the sciences of conservation and to promote the development of anthropology of conservation. Using tools and methods from both anthropology and ethnoecology, the anthropology of conservation seeks to understand the complex relationship between biodiversity and cultural diversity, in conjunction with conservation biology. Anthropology of conservation aims to: 1) Analyze how humans classify and interpret their environment. Ethnoecology and local knowledge are very important in data interpretation (Berkes, 2000; Huntington, 2000; Roturier and Roué 2009); it allows, for example, the identification of the cultural and environmental variables which are the most relevant in describing how humans interact with their environment. 2) Incorporate cultural factors in the description of environmental patterns. This includes all the humans' practices related to environment such as, for example, how humans use specific, spontaneous, and domesticated resources and then interact with natural and transformed ecosystems (Danielsen, 2007). 3) Implement conservation policies. To analyze when and how protecting biodiversity helps to protect cultural diversity (and reciprocally)... but also when it does not, leading to conflicts or incomprehension between the different actors of conservation policies.

WP8: Concepts, Methods and Interdisciplinarity.

Keywords: Comparison of objects, Abduction-deduction, Prediction-retrodiction, Transfers of concepts and tools (all partners with help of Donato Bergandi, epistemologist).

The BCDiv project embraces domains of research that can be taken up by predictive and retrodictive methods of research. To explain what has happened in the past and to forecast and predict what will happen in the future are two complementary aspects of the same knowledge process. In fact, when we deal with a number of biodiversity conservation issues, we must necessarily handle methodological problems about more efficient methods to study natural and social complexities. And when prediction is not possible, or too complicated, some very useful explanatory clues can be given by retrodictive forms of reasoning about the development of the processes and their constituent objects.

One facet at the core of this LabEx project is to compare the processes which are involved in the cultural and biological systems in search of a common methodological base shared by the scientific disciplines independent of the specific objects of research. Such a comparison aims to stimulate a common interdisciplinary reflection on the objects, concepts, methodologies and models involved in the study of the "system of interactions between societies and biodiversity". More particularly, comparing the models themselves could lead to profitable epistemological interactions between natural and social disciplines that could lead to better valuation of changes of past and future human-biological systems: retrodictions about the natural and/or social causes of the decline of ancient and modern cultures and societies, as well as predictions about the future scenarios on development of natural and social systems (biodiversity erosion or improvement, societies' development or decline).

A special point of this interdisciplinary reflection, complementary to the previous aspect, is the comparison of objects. Real objects have autonomous existence independent of the observer and of the formal system that created them (e.g. a phylogeny). Abstract objects (e.g. mathematical, logical objects) are theoretical constructs or a set of objects resulting from a specific logical organization of real objects. To compare real objects (natural and/or social objects) between them, or to compare abstract objects between them, allows us to discover possible common properties and to better understand some structural aspects of natural and social reality.

The MNHN is the core of comparative sciences at the national level, perhaps even beyond. The comparison of objects is the basis of the sciences that are historically set in the institution and the methodological basis upon which we can develop epistemic synergies between the human and natural sciences. More particularly, in the context of this project, comparative methods are very operative and incisive ways to develop knowledge on the basis of an exceptional sampling density (MNHN collections; large sampling cruises in the field all around the world). But this is not the most unique advantage. The comparison of objects (whether this is via DNA sequences, genomes, skulls, bones, fossils, languages, musics, paintings, bifaces, chemical compounds..) is a very special kind of proof. A retrodictive epistemic perspective can be used to outline the historical sequence of biological and/or social chain of events: this reconstructed chain of events has an enlightening retro-explanatory power about the antecedents that produced a specific effect-object (real or abstract object). In fact, in cases where we cannot duplicate, or reconstruct, the initial conditions of a chain of events, with a retrodictive form of reasoning we can try to infer the past historical situations - the antecedent conditions that enabled some specific events to occur in the present, or at least to reduce uncertainty about them - from the actual outcomes,

objects or experiences. Finally, from a methodological point of view, this interdisciplinary project aims to set up the algorithms able to carry out comparisons about different kinds of objects belonging to the natural and social sciences.

In conclusion, the aim of this interdisciplinary project is to create some lasting collaborations and synergies between different theoretical and practical universes. In the BCDiv project the three main focuses of interest are the following interfaces: systematics and ecology, natural and cultural concepts, and modern and past realities. In this context, we will explore the diversity of the concepts, methodologies and models and we will share among the participants this diversity in order to create a common and original epistemological development of methods and models. This WP will encourage dialogue through regular meetings and collaborative reflections which will necessarily lead to high profile publications and will raise the level of collaborations.

WP9. Scientific publication and publishing.

Increase the average rate of publication of indexed papers/scientist/yr to 3-3.5. Encourage publication in high profile journals. Sustain the publication of inventories, archaeological or ethnographical monographs, namely through the *Publications Scientifiques du Muséum*.

WP10: Production of indicators and Expertise for public and private actors of biodiversity management.

The MNHN has been appointed by the government to maintain biodiversity inventories and expertise on national, European and international levels. This privileged position should be sustained and strengthened, based on the experience of expertise of the BCDiv scientists and on the OIHNS Equipex project.

WP11 : Dissemination of results to the general public via the MNHN exhibitions.

The galleries of the MNHN and their temporary exhibitions were visited by 1.7 million visitors in 2009. The MNHN also has a strong regional and national impact on primary and high schools (websites, exhibitions and special collaborations with teachers). BCDiv will boost this impact by:

- The participation of the LabEx project in designing and putting together the new permanent exhibition of the Musée de l'Homme.
- Designing and putting together at least two temporary exhibitions over the 10 years of the project at the Grande Galerie de l'Evolution and/or at the Musée de l'Homme.
- Creating a web portal leading to the sites of the different UMRs

- Actively participating in the permanent updating of the permanent exhibition at the Grande Galerie de l'Evolution.
- Actively participating in National Dissemination Events (Fête de la Science, Années Internationales, etc.) by inviting the public to the BCDiv labs.

Annexe 3 – Liste des UMR et des équipes partenaires de BCDiv

UMR partenaires du LabEx BCDiv :

1. UMR 7209, Archéozoologie, archéobotanique : Sociétés, pratiques et environnements (AASPE) (dir. M. Tengberg)
2. UMR 7206, Eco-anthropologie et ethnobiologie (dir. S. Bahuchet)
3. UMR 7204, Centre des Sciences de la Conservation (CESCO) (dir. R. Julliard)
4. UMR 7205, Institut de Systématique, Evolution, Biodiversité (ISYEB) (dir. P. Grandcolas)
5. UMR 7208, Biologie des organismes et écosystèmes aquatiques (BOREA) (dir. S. Dufour)
6. UMR 7194, Histoire naturelle de l'homme préhistorique (HNHP) (dir. C. Falguères)
7. UMR 7207, Centre de recherche sur la paléobiodiversité et les paléoenvironnements (CR2P) (dir. S. Crasquin)
8. UMR 7138, Evolution Paris Seine, Equipe : Adaptation, Intégration, Réticulation, Evolution (dir. D. Higuet)
9. UMR 7179, Mécanismes adaptatifs et évolution (MECADEV) (dir. F. Aujard)
10. UMR 7245, Molécules de communication et adaptation des micro-organismes (MCAM) (dir. P. Grellier)
11. UMR 208 : Patrimoines locaux et Gouvernance (PALOC) (dir. L. Emperaire)

UMS associées au LabEx BCDiv :

1. UMS 2700, Outils et méthodes de la systématique intégrative (dir. E. Pasquet)
2. UMS 3468, Bases de données, Biodiversité, Ecologie, Environnement, Sociétés (BBEES) (dir. C. Callou)