Department of Organismal Biology

2013

Scientific reports - research groups
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Scientific reports - research groups
The Department of Organismal Biology is organized into five research programs:

- Comparative Physiology
- Environmental Toxicology
- Evolution and Development
- Physiological Botany
- Systematic Biology

The research at the department has a wide developmental and evolutionary theme, including studies of early vertebrate evolution, vertebrate physiology and development, plant development, innate immune reactions in invertebrates, and the phylogenetic framework of these phenomena. The deepest branchings in the tree of life are investigated using bioinformatics and experimental molecular techniques, and genomic analyses are used to understand evolutionary processes in eukaryotes. Research about how chemicals of anthropogenic origin interact with cellular functions and give rise to long-lasting adverse health effects in humans and wildlife is also performed.

The department houses a zebrafish platform, which is part of the national SciLife initiative.
Environmental Toxicology

Brunström group

The avian embryo is an excellent model for studies of the developmental toxicity of chemicals. The embryo can be exposed to various compounds directly without interference from the mother. We study interaction of chemicals with embryonic development following injection into chicken or quail eggs. For exposure early in development the compounds are injected into the yolk and at later stages the compounds are injected into the air cell. Different end-points are studied including general toxicity, differentiation of the reproductive organs, histological changes and expression of various target genes. In our most recent experiments, we have studied perfluorinated compounds and the endogenous dioxin receptor ligand 6-formylindolo[3,2-b]carbazole (FICZ). In an ongoing study we exposed embryos to agonists for peroxisome proliferator-activated receptors (PPARs) and then sampled blood and allantoic fluid to do metabonomic analysis. Analysis of metabolites in the allantoic fluid is a new and unique way that effects by chemicals on the embryonic metabolism can be studied.

Members of the group 2013
Björn Brunström, Professor
Anna Mattsson, Research scientist
Maria Jönsson, Research scientist

Publications 2011-2013
3. Strömqvist M, Olsson JA, Kärrman A, Brunström B: Transcription of genes involved in fat metabolism in chicken embryos exposed to the peroxisome proliferator-activated receptor alpha (PPARα) agonist GW7647 or to perfluorooctane sulfonate (PFOS) or perfluorooctanoate (PFOA). *Comp Biochem Physiol C Toxicol Pharmacol* 2012, 156(1), 29-36.

Eriksson/Viberg group

The Eriksson/Viberg research group works with developmental neurotoxicology induced by low dose exposure from environmental pollutants, pharmaceuticals and ionizing radiation, during the brain growth spurt in rodents. Animals are analyzed for functional effects on behavioral and cognitive functions in adult age. Furthermore, animals are investigated for changed responses to adult chemical exposures and the susceptibility to develop additional functional disorders. The mechanisms behind these functional effects are explored by analysis
of the levels of gene expression and proteins important for normal brain development, receptor binding assays, analysis of apoptosis. In addition we are working on setting up an in vitro system for analysis of developmental neurotoxicology. Recently, we have generated results used for national and international risk assessment and our research has been recognized in media in several countries. Presently involved in two EU-projects, DENAMIC and CEREBRAD.

Members of the group 2013
Per Eriksson, Professor
Henrik Viberg, Senior lecturer
Anders Fredriksson, Research scientist
Iwa Lee, PhD student
Sonja Buratovic, PhD student
Stefan Hallgren. Postdoc

Publications 2011-2013
Berg group

Developmental and reproductive toxicity in amphibians.

Using the frog as a model we investigate endocrine disruption, developmental and reproductive toxicity using methods that range over several levels of biological organization including molecular, physiological, and behavioural. We explore effects of environmental chemicals such as pesticides and pharmaceuticals on the sex hormone system, thyroid system, and neuroendocrine systems. The overall project goals are to:

i) increase the understanding of amphibians’ susceptibility to endocrine disruption, developmental and reproductive toxicity of environmental pollutants

ii) develop biomarkers for exposure to and effect of various classes of environmental pollutants in amphibians

iii) explore the African clawed frog (*Xenopus tropicalis*) as a vertebrate model to study developmental reproductive toxicity.

Members of the group 2013

Cecilia Berg, project manager
Erika Jansson, PhD student
Moa Säfholm, PhD student
Frances Orton, visiting scientist
Ylva Carlsson, MSc student
Andreas Eriksson, MSc student
Anton Ribbenstedt, MSc student

Publications 2011-2013


Jönsson group

Chemical exposure during early stages of life can have harmful consequences for the individual, leading to impaired survival, reproduction, or health. Our research focuses on two proteins that are important in development and disease, β-catenin and the aryl hydrocarbon receptor (AHR). β-Catenin plays fundamental roles in regulating organ formation and growth in interaction with other proteins, including steroid and nuclear receptors and the AHR. The AHR is known for regulating expression of cytochrome P450 1 family genes and for mediating the toxicity of halogenated and polycyclic aromatic hydrocarbons. However, it influences the effects of other pollutants also. In our studies we use developmental models of fish, amphibians, and birds, as well as in vitro models. We explore the idea that the AHR regulates β-catenin signaling at certain developmental stages and that AHR-mediated toxicity involves dysregulation of this crosstalk. We also are interested in how pollutants can disrupt crosstalk between Wnt/β-catenin and steroid and nuclear receptors.

Members of the group 2013
Maria Jönsson, Research scientist
Emma Wincent

Publications 2011-2013

Brandt group

MistraPharma

MistraPharma is a broad research program investigating the impacts of human pharmaceuticals on aquatic wildlife. The program is based on team-science between Swedish and English universities and financed by the Foundation for Strategic Environmental Research (Mistra). The Uppsala consortium runs two projects exploring modes of action of steroidal pharmaceuticals in frogs and fish and a third project developing biomarkers for efficacy testing of improved sewage treatment technologies. The studies in frogs and fish have recently focused on progestins, i.e. synthetic versions of the endogenous hormone progesterone and common ingredients in contraceptive pills. Some important findings have been made, showing that levonorgestrel and other progestins are potent disruptors of both female and male reproductive functions at environmentally relevant exposure concentrations. In frogs, the gestagen levonorgestrel causes a loss of oviducts in adult frogs following exposure to the drug during the tadpole stage. In frogs exposed as adults, levonorgestrel and several other gestagens disturb egg maturation at environmental exposure concentrations. Three-spined stickleback has been introduced as a model for andogenic effects in fish. Results show that the progestagen levonorgestrel is a highly potent androgen in stickleback, inducing formation of the nest-building male protein (spiggin) in female fish and inhibiting resumption of spermatogenesis at the end of the breeding season in male fish. In the biomarker project, several new pollutant-responsive genes have been evaluated with regard to their usefulness as biomarkers for exposure to different classes of pollutants in fish, particularly the CYP1A, 1B and 1C genes. These biomarkers are currently used to examine the efficacy of new sewage treatment technologies.

Members of the group 2013

Cecilia Berg (project leader frog project)
Ingvar Brandt, Professor
Björn Brunström (project leaders fish projects)
Kristina Beijer, PhD student
Kai Gao, PhD student
Erika Jansson, PhD student
Maria Jönsson, Research scientist
Johan Svensson, PhD student
Moa Säfholm, PhD student

Doctoral Theses completed 2013

Kai Gao; Basal and Pollutant-Induced Expression of CYP1A, 1B and 1C Isoforms in Fish: Implications for Biomonitoring.

Publications 2011-2013


The publications on frogs are reported in a larger frog project by Cecilia Berg

**Related papers**


Developmental neurotoxicity of the environmental neurotoxin BMAA

Dietary exposure to the neurotoxic non-protein amino acid β-N-methylamino-L-alanine (BMAA) has been suggested to be involved in the etiology of neurodegenerative diseases such as ALS, Parkinson and Alzheimer’s disease. BMAA, produced by cyanobacteria and diatoms, is present in fish, shellfish and mussels in marine and freshwater systems and human exposure is presumably higher than anticipated. The project aims to explore long-term disturbances in brain function following exposure at early life-stages. Routes of exposure during early life-stages are also investigated. Regional responses in protein and neuropeptide expression have been characterized using MALDI-imaging mass spectrometry. The results imply that BMAA affects a variety of proteins and peptides in discrete brain regions in rodents. BMAA was demonstrated to be efficiently excreted in milk and subsequently transported to the brain of neonatal mice. These results suggest that mother’s milk and cow’s milk could be important sources for human exposure.

Members of group 2013
Ingvar Brandt Professor
Marie Andersson, PhD student
Oskar Karlsson, PhD student

Publications 2013
Evolution and Development

Ahlberg group

This 'group' is somewhat loosely defined as it includes both people who work directly under Ahlberg and others who have junior PI status and hold, or are seeking, their own funding. The integrative and cross-disciplinary ambitions of the Evolution and Development Programme also serve to blur the boundaries between 'groups' by actively encouraging collaborations across 'group' boundaries; for example, Bettina Ryll (Ahlberg group) is working in close collaboration with Lina Emilsson (Emilsson group). In essence, the people listed as belonging to the Ahlberg group are those that have been recruited directly by Ahlberg, or by people that were in their turn recruited by him. This equates to most of the programme, with the exception of Elena Jazin, Lina Emilsson and their respective groups.

Research in the Ahlberg group spans palaeontology and developmental biology. On the palaeontological side we focus principally on early vertebrates, where we study phylogeny and morphological evolution of stem-group gnathostomes (anaspids, thelodonts, placoderms), lobe-finned fishes and the origin of tetrapods. A particular strength of our palaeontological research is the application of synchrotron microtomography to the three-dimensional investigation of early vertebrate anatomy and especially histology (where we are the world-leading group); this work is carried out in collaboration with the European Synchrotron Radiation Facility (ESRF) in Grenoble. We also study Mesozoic ray-finned fish, dinosaurs and early birds.

Our developmental biology research covers several topics but most of it centers round our zebrafish facility (which is also a component of the SciLifeLab comparative genetics platform). Transgenic permanent cell lineage labelling in zebrafish is used to investigate the relationship between early gene expression and resulting adult phenotypes, with focus on neurodevelopment (in collaboration with the Emilsson group), muscles, and muscle attachments. A separate research area, led by Johan Ledin, focuses on the role of glycosaminoglycans (GAGs), including heparan sulfates and chondroitin sulfates/dermatan sulfate, as regulators of cell differentiation and pharyngeal cartilage morphology during zebrafish embryonic and larval development. We are presently applying the CRISPR/Cas9 system to systematically target GAG biosynthesis genes with expression in developing cartilage structures. The resulting transgenic animals are then subjected to high-end microscopy (confocal and lightsheet) to track even subtle changes in cartilage development. With this selection of powerful methods for experimental biology we explore the unknown territory of the role of the glycome for cartilage and bone development and evolution.

Members of the group 2013
Per Ahlberg, Professor (and Director, zebrafish facility)
Henning Blom, Senior Lecturer
Johan Ledin, Manager, zebrafish facility
Katarina Holmborn Garpenstrand, Associate manager, zebrafish facility
Sophie Sanchez, Junior Lecturer
Vincent Dupret, Research scientist
Tatjana Haitina, Research scientist
Martin Kundrat, Research scientist
Jazin group

Our area of expertise is Human Genetics, in particular Psychiatric Genetics. Our research has focused in previous years on the search for candidate genes involved in the development of schizophrenia. Among them, the research group is currently studying the functions of QKI in early development of vertebrate brain (from zebrafish to humans). Another current research focus of the group is the investigation of the genetics and early development of sex differences in the brain of humans and other primates. This recent interest developed from several observations, by many researchers around the world, of common sex differences in the inheritance of several psychiatric diseases such as autism (more common in human males) and unipolar depression (more common in human females).

Members of the group 2013
Elena Jazin, Professor
Katarzyna Radomska, PhD student
Martin Johansson, PhD student
Mohammadreza Mirzazadeh, Research assistant

Emilsson group

We conduct research to further understand basic aspects of normal brain development and cognitive functions as well as the development of neurodegenerative and psychiatric diseases. More specifically are we interested in how specific temporal and spatial changes in gene expression regulate inter- and intra-cellular processes and how these biological events modulate higher brain functions early and late in an organism's life. Genes under investigation are screened for in human biological samples from patients with cognitive disabilities in comparison to healthy control individuals. Identified genes are then functionally characterized in vivo using zebrafish as our model system, targeting both molecular, cellular and behavioral aspects.

Members of the group 2013
Lina Emilsson, PI, Research scientist
Jonathan Sager, Postdoc
Bryn Farnsworth, PhD student
Katarzyna Radomska, PhD student in the Jazin group and co-supervised by Dr. Emilsson
Henrik Hallgren, MSc student
Publications Ahlberg, Jazin and Emilsson groups 2011-2013


ematical model for mechanotransduction at the early steps of suture formation. Proceedings of the Royal Society B 280, 20122670, 10pp.


Comparative Physiology

Söderhäll group

We are investigating innate immune reactions in an invertebrate and compare these reactions with those present in higher animals (vertebrates). One example is melanization; a reaction that is present in virtually all organisms, but detailed studies on this reaction is mainly performed in crayfish and a few insects. We are also focusing on the possibility of specific immunity in invertebrates, by detailed studies of the Dscam molecules, which may be functional predecessors to the adaptive immune response in vertebrates.

We are further investigating invertebrate hematopoiesis and links between immunity and neurogenesis, and have discovered a new class of peptides so called astakines the role of which in these processes are examined.

By using WSSV and crayfish as a model we have discovered an evolutionary conserved mechanism by which two proteins, calreticulin and gC1qR interact to regulate the crossroad between apoptosis and proliferation both in arthropod cells and in human cancer cells.

Members of the group 2013

Kenneth Söderhäll, Professor
Irene Söderhäll, Senior lecturer
Chadanat Noonin, PhD student -nov, Research scientist
Apiruck Watthansurot, PhD student -nov, Research scientist
Veronica Chico-Gras, Research scientist
Enen Guo, Research scientist
Yueling Zhang, Guest scientist
Hong Shiu, Guest Scientist
Gizem Korku, PhD student
Kingkamon Junkunlo, PhD student
Anthong Pachanporn, guest student

Publications 2011-2013


7. Söderhäll I. 2013. Recent advances in crayfish hematopoietic stem cell culture: a model for studies of hemocyte differentiation and immunity (Invited Review) **Cy-totechnology** 65, 691-695.


**Schmitz group**

The main research focus of our group is the neuro- and endocrine regulation of puberty in fish. The initiation of sexual maturation (puberty) is the process by which an immature animal acquires for the first time the capacity to reproduce. In fish, puberty is characterized by the start of spermatogenesis in males and vitellogenic ovarian development in females. Puberty occurs when individuals have accumulated enough energy for a successful reproduction. Pe-
Peripheral metabolic signals, conveying the energy stores of the animal to the brain, are therefore considered important in the initiation of puberty. We aim to understand the underlying signalling pathways between the nutritional status of the fish and activation of the reproductive axis during puberty. These processes are studied in two model fish species, Atlantic salmon, where males can mature early depending on growth conditions and energy stores, and in zebrafish, using both transgenic and mutant zebrafish lines.

Members of the group 2013
Monika Schmitz, professor
Arshi Mustafa, PhD student
Susanne Trombley, PhD student
Gregorio Moles Miro, post-doc
Ana Maria Rocha Dos Santos, post-doc

Publications 2011-2013
Lind-Karlberg group

Iron has a dualistic character. On the one hand it is essential for the life of most organisms, on the other hand it is involved in the generation of reactive oxygen species that are implicated in diseases and aging. The challenge of avoiding iron deficiency and overload has resulted in a tightly controlled and complex regulation of iron homeostasis. We are studying the regulation of iron homeostasis (especially in the mitochondria) by using the model animal *Drosophila melanogaster*, the fruit fly. In these projects we are using fly mutants as a genetic tool together with molecular biology techniques to investigate the regulation of iron homeostasis and the consequences of impaired iron metabolism on cellular functions as well as development of neurodegenerative diseases and male sterility.

Members of the group 2013
Maria Lind-Karlberg, Research scientist
Jose Llorens, postdoc
Qin Peng, Research Assistant

Publications 2011-2013
Physiological Botany

Carlsbecker group

We are interested in the genetic control underlying the development of plants. We focus on the development of the roots and the vasculature, and primarily use the model plant *Arabidopsis thaliana* for our studies. In an international collaboration we found that the identity of the water conducting xylem cells are controlled by a microRNA moving from the outer cell layers into the vasculature, determining differential levels of class III HD-ZIP transcription factors over the vasculature, that dose-dependently determines xylem cell types. This study was published in Nature, 2010, and we have continued by studying up and down-stream components of these factors. We find that they influence and are influenced by hormonal and other cues suggesting that the HD-ZIP III transcription factors act as key nodes controlling important aspects of plant development. Recently we have also focused on how environmental conditions affect root vascular development, and we have got funded to initiate comparative analyses of root and vascular development in the recently sequenced conifer, Norway spruce, *Picea abies*.

**Members of the group 2013:**
Annelie Carlsbecker, PI, Research Scientist
Christina Roberts, postdoc,
Ana Elisa Valdés, post doc,
Guodong Wang, post doc,
Jan De Vries, master student

Engström group

The major interest of the group is in the development and evolution of reproductive organs in plants, with a focus on conifers. We have approached the extensive variation in morphology of female reproductive organs among different major groups of conifers, by studying a range of developmental regulatory genes with potential functions in female organ development. By this approach we have established that the evolution of different morphologies has been associated with a shift in the timing of activation of reproductive development, in relation to the yearly season. By similar approaches, in combination with the use of a naturally occurring mutant, we have provided molecular genetic support for the notion that the ovule-bearing organ of conifer reproductive organs has evolved by reduction from a complex shoot structure.

**Members of the group 2013**
Peter Engström, professor,
Marie Englund, senior technician
(previous members contributing to publications 2011-2013: Erika Groth, PhD-student, Karolina Tandre, post-doc, Elin Övernäs, PhD-student, Henrik Johansson, PhD-student)

**Publications from the Physiological Botany Department 2011-2013**


Systematic Biology

Baldauf Group

We are studying the deep phylogeny and early evolution of eukaryotes. This includes determining the identities of the major groups (supra-kingdoms), the relationships among them, and some of the major forces that shaped them. The latter work focuses on the origin and early evolution of the mitochondrion and nucleus, the latter in collaboration with the lab of Siv Andersson. In order to study ancient phylogeny, we use bioinformatics, NGS sequencing and comparative genomics to assemble and analyze large multigene data sets. Most recently, we developed a large multi-gene data set that allowed us to redefined the root of the eukaryote tree of life. The new root identifies the little known Excavata as a unique ancient branch of eukaryotes.

Resolving deep branches also requires populating those branches. Therefore, we also work on orphan taxa that represent critical under-sampled regions of the tree (so-called “missing links in the tree of life”). This includes describing new species (alpha-taxonomy), biogeographic analyses and molecular dating. Over the past 10 years we have focused primarily on the origin, evolution and phylogeny of the multicellular amoebzoans, the dictyostelid social amoebas. More recently we have shifted our focus to Acrasids. Although superficially similar to dictyostelids, acrasids are in fact the only multicellular lineage of Excavata, and therefore represent independent origin of aggregative multicellularity.

Members of the group 2013
Sandra Baldauf, Professor
Chengjie Fu, Research scientist
Maria Romeralo, Research scientist
Omar Fiz-Palacios, Research scientist
Pravech Ajawatanawong, PhD student
Ding He, PhD student
Allison Perrigo, PhD student
Sanea Sheikh, PhD student

Publications 2011-2013


Jaensson group

Our research focuses on:
The impact varying densities of large mammals on the abundance of *Ixodes ricinus* and the prevalence *Ixodes*-borne pathogens of humans.
Ecology of tick-borne encephalitis virus (TBEV) and Lyme borrelioses bacteria.
Ornithophagous ticks and their association with pathogens of humans.
Introduction of pathogens by ticks infesting birds migrating from Africa to Europe.

Comparative wild orangutan gut metagenomics.
The aim is to describe the diversity and composition of the flora of microorganisms and viruses of the intestinal tract of wild orang-utans inhabiting rain forest habitats on Borneo and Sumatra, in particular the microbial flora’s potential relationships and variations due to differences in habitat, age, gender and feeding behaviour. Moreover, based on our own data and of previously published data, we aim to compare the composition of the intestinal flora of the orang-utans with that of the other great apes. We are currently drafting a manuscript that focuses on the differences in habitat and feeding behaviour between orang-utans and other great apes.

Members of the group 2013
Thomas Jaensson, professor,
John Pettersson, PhD student

Publications 2011-2013


**Korall group**

Our research centres on the question "What impact has long-distance dispersal in shaping the biogeography of ferns and lycopods?". In our group we use phylogenetic, historical biogeographical and phylogeographical approaches to address questions on the evolutionary history of ferns and lycopods with a focus on distribution patterns.
Members of the group 2013
Petra Korall, Senior lecturer
Anders Larsson, PhD student
Stina Weststrand, PhD student

Publications 2011-2013

Thollesson group

The group works with marine invertebrates, particularly siliceous sponges, and some bioinformatic and theoretical aspects of systematics. Sponges encompass c. 8 500 described species, but estimates of undescribed species usually double that number. Sponge taxonomy is primarily based on spicule morphology and spicule arrangement within the sponge body, albeit the spicule morphology is influenced by environmental conditions and convergent evolution and secondary loss of spicules bring further phylogenetic noise phylogeny of sponges. In this context, molecular data are highly welcome, and as a consequence, the ‘integrative taxonomy’ approach combining all kinds of data is considered the best way to evaluate the status of sponge species. More specific areas of research in our group are systematic revisions of Tetractinellida, phylogenetic relationships of the non-monophyletic group referred to as “lithistids” and systematics (including phylogenetics, taxonomy, and phylogeography) of a group formed by Suberitidae and Halichondridae. We also take a special interest in Swedish sponge fauna, supported by Svenska Artprojektet.

Members of the group 2013
Mikael Thollesson, Senior lecturer
Paco Cardenas, postdoc
Astrid Schuster, PhD student

Publications 2011-2013


**Ryberg group**

I am working on Fungal diversity, macroevolution, and bioinformatics (including phyloinformatics). The main goal is to characterize and understand the processes generating the massive diversity of Fungi. The main focus is on Agaricomycotina, the mushroom forming fungi, and especially ectomycorrhizal groups (groups forming a partnership with plants). It has been estimated that less than 10% of all fungal species have been described and I am therefore participating in projects to survey poorly investigated areas and groups. Much of the research in the laboratory is based on molecular phylogenies and how they can be used to understand character evolution and patterns of diversity. Bioinformatics methods are developed to be able to synthesize datasets from public databases and to help characterize communities based on molecular methods. I am also developing protocols to use next generation sequencing to answer questions within systematic biology.

**Members of the group 2013**
Martin Ryberg, Research scientist

**Publications 2011-2013**


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**Kruys group**

We study the systematics of ascomycete fungi, with the aim of resolving phylogenetic relationships and tracing the evolution of different features among fungi. Our main groups of interest are fungi that live as saprobes on animal dung, as well as fungi living as parasites on insects.

**Members of the group 2013**

Åsa Kruys, Research scientist
Henrik Sundberg, PhD student
**Publications 2011-2013**


**Savic/Tibell group**

The group has a wide scope of interest covering both non-lichenized and lichenized fungi. A unifying approach in our research is molecular phylogenetics and its impact on the understanding of the systematics and taxonomy of the groups. Among the lichenized fungi, e.g. the diversity of Verrucariales and calcioid lichens and lichen phylogeography are studied. Within current projects main emphasis rests in African basidiomycetes, involving some aspects of phytopathology and ecology of African species; further in marine fungi, here with a concentration on exploration of diversity of these fungi in North European marine habitats and the ecological role of marine fungi in the Baltic, along with processes in which they are involved.

**Members of the group 2013**

Sanja Savic, Research scientist
Leif Tibell, Professor emeritus

**Publications 2011-2013**

7. Mats Wedin, Heidi Döring, Anders Nordin, Leif Tibell. Small subunit rDNA phyloge-
ny shows the lichen families Caliciaceae and Physciaceae (Lecanorales, Ascomycotina) to form a monophyletic group. Canadian Journal of Botany 02/2011; 78(2): 246-254.

Thulin group

We study systematics, phylogeny and biogeography of flowering plants, with a special focus on plants in the Horn of Africa region. One of the ongoing projects concerns the mapping of distributions of all tree species in this region. Otherwise we have a taxonomic focus particularly on legumes (Fabaceae) and on the order Caryophyllales. We pay special attention to patterns of endemism and to groups with large disjunctions in their distributions, such as the trans-Atlantic disjunctions that are being found in a growing number of plant groups.

Members of the group 2013
Mats Thulin, Professor
Anneleen Kool, Research scientist

Publications 2011-2013:


**Ståhl group**

My research interests include the taxonomy and systematics of woody Primulales (Myrsinaceae, Theophrastaceae), taxonomy of Andean Sympllocaceae, Neotropical Leguminosae, and tropical biodiversity and floristics in general. Much of my research is field-oriented and focuses, besides the above-mentioned groups, on the investigation of the flora and vegetation in Ecuador and speciation processes in premontane and sub-Andean cloud forests. Present activities include a floristic treatment of Cerro Samama in western Ecuador, an internationally recognized hotspot for biodiversity, and the coordination of taxonomic research on legumes for the Flora of Ecuador series.

**Publications 2011-2013**


Hedberg group

I have continued my research in African Botany - flora of the high level of the east African mountains. Currently I focus my activities on the processing of data from field trials in Africa. A recently completed project, in cooperation with P. Sklenar, Charles University, Prague, and AM Cleef, University of Amsterdam, was a comparative biogeographic study of the vegetation at high levels in Africa, South America and New Guinea (see below under publications). I continue the review of data from the field studies for my own research and to make them available online for other researchers. Research on biodiversity at a high level in Africa, and its preservation, has in recent years been resumed at various institutions in Europe, making the early data very valuable and in demand. This includes a visit later this spring at the University of Amsterdam and at the Kew herbarium to continue discussions on the project scope. I have also begun to prepare for a publication on the Internet of Flora of Ethiopia and Eritrea - an important project because a sufficient number of volumes of the Flora has not been printed in Addis Ababa, although it is very important for all botanical research with focused on Africa. (Flora, 8 volumes in A4 format with between c 300 and c 600 pages per volume is the result of a collaborative project between the Universities of Uppsala and Addis Ababa under 29 years). I have received funding from SIDA for the scanning of all the volumes. It is now completed, but the copyright problem with online publication of the illustrations remains and I are now working together with researchers at Kew Herbarium in London to solve the problem. Furthermore, I also edit the department’s magazine "Symbolae Botanicae Upsalienses".

Publications 2011-2013


