

# Evaluation of the Research and Professional Activity of the Institutes of the Czech Academy of Sciences (CAS) for the period 2010–2014

## Final Report on the Evaluation of the Institute

**Name of the Institute: Institute of Experimental Botany of the CAS, v. v. i., Lysolate**

**Fields, in which the Institute registered its teams:**

Biological sciences including biotechnology and agricultural sciences

Observer representing the Academy Council of the CAS: Vladimír Mareček

Observer representing the Institute: Radomíra Vaňková, substitute observer Jan Martinec

**Commission No. 7: Biological sciences including biotechnology and agricultural sciences**

Chair: Emeritus Professor Erick Vandamme

Date(s) of the visit of the Institute: November 2 - November 11, 2015

Programme of the visit of the Institute: see attached Minutes from the visit

Evaluated research teams:

*No. 1 - Station of apple breeding for disease resistance; No. 2 - Laboratory of Hormonal Regulations in Plants; No. 3 - Laboratory of Cell Biology; No. 4 - Plant Reproduction Laboratory; No. 5 - Laboratory of Virology and Laboratory of Stress Physiology; No. 6 - Laboratory of pollen biology; No. 7 - Laboratory of Plant Biotechnologies; No. 8 - Laboratory of Growth Regulators and Isotope Laboratory; No. 9 - Laboratory of Signal Transduction, Laboratory of Pathological Plant Physiology and Laboratory of Biologically Active Compounds; No. 10 - Centre of Plant Structural and Functional Genomics*

## **A. Evaluation of the Institute as a whole**

### **1. Introduction**

The major focus of the Institute is basic research in plant cell and molecular biology, chemical biology and genetics. The Institute also has important biotechnology traditions, the outstanding example is the apple breeding. The major location is in Prague that recently got consolidated in a new building. Two large groups are located in Olomouc that received large EU infrastructure investments. There have been numerous large investments in Instrumentations such as outstanding mass spectrometry facilities both in Prague and Olomouc, top-notch confocal microscopes,

flow cytometers. We note that the Institute has a rising profile of publications since the last review in 2009, both in quality (as measured by IF), the number of papers and their visibility in term of citations. Some of these excellent publications originated from works in the Institute, but the majority are from collaborative projects. Budget annually is €7.2-8M, more than half (57%) of which is from grant income and 9.1% is from revenues such as licences, journals and services. We evaluated 10 groups, 8 groups are at the Prague site while two prolific groups are at Olomouc. The institute's vision is to maintain its international leading position in the areas of genomics, chemical biology and cell biology as well as to continue to have applied research leading to new varieties and bioactive chemicals.

## **2. Strengths and Opportunities**

There is some really outstanding work in the institute that is recognised internationally. Highlights are the Doležel group that pioneered over the last decades innovative flow cytometry methods that was integral to numerous crop genomics projects. Another example is the Strnad group that is a leading expert in hormone measurements and together with the Isotope laboratory they pioneer the synthesis and screening of biologically active compounds. The group of Tupý remains focussed on breeding and biotechnology research with clear applications and continue to deliver excellently.

There is a large increase in the number and quality of publications. These are coming from their 4 best groups and a large portion of these are collaborative projects or results of large international consortia. To be able to maintain this excellent research output, they will need to identify new research topics.

It is clear that the institute has excellent facilities both in Prague and in Olomouc to provide the necessary infrastructure for these groups.

The Olomouc site has received large investment from the EU Competitiveness Operational program. This investment supports two groups (Dolecel and Strnad) that were already well established and provide all the creditability that these funds will be converted to important outputs. The Prague site also received substantial structural investment from the Academy.

## **3. Weaknesses and Threats**

Large reliance on grants that comes from restricted sources, the Czech Science Foundation and Ministry of Education. Lack of Agrobiotech funding and no EU projects. They got large EU investments in the previous period that clearly shows in the outputs but they will need to find new financial sources to sustain their activities in the next period. More international funding stream should be explored.

## **4. Recommendations**

- Identify young group or subgroup leaders that can eventually succeed and continue the legacy of the three most successful groups, Dolecel, Strnad and Tupý. In the Prague Centre consider attracting young group leaders that can start new topics. Some but not all groups had a very clear strategy to build up their international profile and to enhance their competitiveness.
- Continue capitalising on the large infrastructural investments and excellent facilities.

- Continue collaborating with excellent international groups that provided the basis to large numbers of excellent publications.

## **5. Detailed evaluations**

### *Declaration on the quality of the results and share in their acquisition*

Around half of the groups have outstanding outputs in excellent journals, but also the Institute as a whole substantially raised their performance with plenty of international standard publications. There is some really excellent work going on here, and some groups are poised to do better.

### *Declaration on the involvement of students in research*

The involvement of students seems appropriate.

### *Declaration on societal relevance*

Many groups have clear societal relevance, which interfaces with medicine (e.g. cancer drugs in clinical trial), agriculture (e.g. crop genomics), and the apple breeding.

### *Declaration on the position in the international and national context*

Many groups have clear international status, some need to expand their frontiers beyond the borders of the Czech Republic.

### *Declaration on the vitality and sustainability*

We were pleased by the efforts and pride some of the groups placed on outreach activities both at the Prague and in Olomouc sites.

### *Declaration on the strategy and plans for the future*

There are no novel elements that the Institute has identified in their future strategy and plans. The advisory board structure is very limited in its diversity of expertise.

## **A. Evaluation of the individual teams**

### **Evaluation of the Team No. 1: Station of apple breeding for disease resistance**

#### **1. Introduction**

This is an amazingly productive programme in releasing varieties of apple that are meeting market needs in terms of disease resistance and quality traits.

#### **2. Strengths and Opportunities**

The team has a clear insight into market needs in terms of farmer/home garden requirements (disease resistance, columnar form), planting material sales (market pull), licensing issues/plant breeders rights, and flavour/brix/quality/keeping characteristics that are required. The group was well-aware of issues such as the impact of modified atmosphere packaging and complex new variety licensing such as that for Pink Lady, on needs and marketing of new varieties. They have a suitable germplasm pool for making crosses, and many collaborations across the world, with sales in Europe, Asia and Australasia. Their varieties sell something like 1,000,000 plants per year, with revenue income of c. 1Eur per plant.

### **3. Weaknesses and Threats**

It seems unlikely that the market for new apple varieties will reduce, and disease resistance is an increasingly important trait. Molecular selection might become more extensive for this trait, within potential competing breeding stations.

### **4. Recommendations**

Obviously the programme is very successful. The team should ensure they maintain and extend dialogue with molecular geneticists to enable identification of key genes in their material, and enable the potential introduction of molecular marker technology (particularly with publication of the genomic sequence of apple recently). They should consider instrument-based quality approaches to complement their taste and phenotype assessments. They should consider wider sources of diversity for breeding, keep on top of (and lead adoption and standards) for germplasm protection in the market, and consider whether a small-scale rootstock evaluation project should be introduced.

### **5. Detailed evaluations**

#### *Declaration on the quality of the results and share in their acquisition*

The breeding quality is excellent and entirely the responsibility of the team.

#### *Declaration on the involvement of students in research*

There is little option for additional student involvement, although can be achieved through the outreach activities.

#### *Declaration on societal relevance*

Varieties of apple with better disease resistance and quality are essential and very valuable to farmers, smallholders and consumers – as well as public health through increased fruit consumption.

#### *Declaration on the position in the international and national context*

They are a major international breeding group for this crop.

#### *Declaration on the vitality and sustainability*

The group has a range of ages involved, with real commitment to breeding and knowledge of the crop and its challenges.

#### *Declaration on the strategy and plans for the future*

Continued exploitation of germplasm, awareness of market pulls, and exploitation of new techniques are all included within the strategy.

## **Evaluation of the Team No. 2: Laboratory of Hormonal Regulations in Plants**

### **1. Introduction**

The group, composed of 30 members with a wide range of ages (some senior researcher > 45, many young workers < 30), has a long history of studying phytohormone homeostasis. They focus on 1) Qualitative and quantitative aspects of processes involved in establishment and modulation of their homeostasis (i.e. metabolism and transport), 2) Related aspects of their signaling and 3) Control of physiological processes (namely stress reactions). They are a recognized and distinguished group in the field of auxin and cytokinin research with a high publication

productivity, most of which are under tight collaboration with world's leading scientists from all over the world.

## **2. Strengths and opportunities**

The assets of the group are single-cell-based biochemical, enzymatic and cell biological analyses with a collection of special cell lines. The group has good personnel infrastructures and methodologies to conduct world leading research in auxin transporters and auxin-metabolizing processes. As a result, they have a lot scientific publications mainly in the first quartile and their research results have appeared in prestigious journals (i.e. Nature, Cell, Plant Cell).

## **3. Weakness and threats**

Auxin research is one of the most competitive areas of plant biology; however, the group integrates themselves into a proper place both in auxin and cytokinin societies.

## **4. Recommendations**

To keep their very good work going, they should continue and extend their collaboration in the institute to have broader spectrum of their methodological tools (e.g. molecular biology methods) and further extend their international collaboration with an effort to obtain international funding of their research.

## **5. Detailed evaluations**

### *Declaration of quality of the results and share in their acquisition*

During the evaluation period they published 82 articles in journals with impact factor, 1 professional book, 9 chapters in professional books, and 4 applied results. The group has an excellent quality profile.

### *Declaration on the involvement of students in research*

Well-integrated with many students in different stage of their studies .

### *Declaration on societal relevance*

The group organizes an international symposium “Auxins and Cytokinins in Plant Development (ACPD)” in Prague, with a growing number of participants.

### *Declaration on the position in the international and national context*

Well recognized group both nationally and internationally. The group is one of the world's leading groups in the field of auxin and cytokinin.

### *Declaration on the vitality and sustainability*

Their age profile is well-proportioned and they are well-funded.

### *Declaration on the strategy and plans for the future*

In principle the group continues to maintain their successful strategies. Besides their research in hormonal crosstalk, they are expanding the horizon by including stress-related hormones. Also complex hormone responses under abiotic stress conditions are explored.

## **Evaluation of the Team No. 3: Laboratory of Cell Biology**

### **1. Introduction**

The laboratory some 20 years back put their sight to a large membrane bound protein complex, the exocyst; cell polarity module. This is a challenging topic as it is involved in numerous cellular and developmental processes, very heterogeneous and dynamic. They also developed considerable expertise how the exocyst system is interfaced with the actin cytoskeleton and signalling processes. They have expertise in root hair and pollen tube growth. The group operates in two locations, Prague University and at the Institute of Experimental Botany, have 16 members, 70% of which are below the age of 40. Though the topic originated from some of their pioneering studies in yeast, now they focus on plants using *Arabidopsis* and tobacco. Recently they also started to use the moss, *Physcomitrella patens*.

### **2. Strengths and Opportunities**

The group has built up the right expertise and international collaboration, developed a stable and dynamic research group driven by enthusiastic skilled cell biologists.

### **3. Weaknesses and Threats**

Elucidating the role of exocyst in cell polarity and morphogenesis is rather competitive area. The heterogeneity of the exocyst complex is challenging when genetically phenotyping whole plant. However it is apparent that they are well aware of it since they exploit simpler model system, moss *Physcomitrella patens*, to overcome the genome complexity of exocyst in *Arabidopsis*.

### **4. Recommendations**

Continue improving the imaging side of exocyst research, e.g. combine these with lipid sensors. Extend research to connect signalling to exocyst dynamics and functions.

### **5. Detailed evaluations**

#### *Declaration on the quality of the results and share in their acquisition*

Very nice quality profile. The publication record of the group has increased tremendously both in quantity (30 articles in journals with impact factor) and quality (Plant Cell, Developmental Cell).

#### *Declaration on the involvement of students in research*

Excellent student involvement and record of a good science school producing top scientists for the research community.

#### *Declaration on societal relevance*

They are actively involved in knowledge transfer to young generation (i.e. “Days of opened laboratories”, summer school “Arachne”, lectures at high school)

#### *Declaration on the position in the international and national context*

The group has excellent working collaborations with leading groups in the field. Invited reviews in good journals provide evidence for the international recognition that goes beyond the plant field.

#### *Declaration on the vitality and sustainability*

The group belongs both to the University and Academy. At both places there are experienced leaders who are capable of running the labs and defining the research directions. They have all the potential to have a sustainable bright future.

*Declaration on the strategy and plans for the future*

They have clear perspectives to corroborate cell biological relevance of exocyst and membrane lipids in morphology and cell polarity.

## **Evaluation of the Team No. 4: Plant Reproduction Laboratory**

### **1. Introduction**

The Plant Reproduction Laboratory team consists of only 1 researcher and 1 technician in permanent position and some PhD. students. However they cover very interesting and important fields of plant reproduction failure with two topics: cytoplasmic male sterility and mitochondrial-nuclear interactions (in *Silene vulgaris*) and flowering in the genus *Chenopodium* using some experiments in plants and numerous single gene studies. Despite a small number of staff in their team, they have published a sufficient number of scientific publications of very good quality, almost all of them being in the first or second quartile. The principal researcher spent a part of evaluated period in study stay in U.S.A and is also engaged in teaching in different universities.

### **2. Strength and Opportunities.**

This is an internationally recognized team in the field of reproduction biology in plants with good international collaboration and good publication activity in this field. They cover an important and promising field of study.

### **3. Weaknesses and threats.**

The very small size of the team is a vulnerability that could cause a serious problem to the continuation of work.

### **4. Recommendations.**

They have a strong need to extend the team, of course in concordance with the effort to extend their financial income from both national and international grants. The field of study is very promising.

### **5. Detailed evaluations**

*Declaration on the quality of the results and share in their acquisition.*

The quality of the results is very good.

*Declaration on the involvement of students in research.*

In the team there are some students in different stage of their study including PhD students.

*Declaration on the societal relevance.*

High impact on new knowledge in this field is promising especially for basic research but also with practical impact in the future.

*Declaration on the position in the international and national context.*

The team is well-recognized both nationally and internationally.

*Declaration on the vitality and sustainability.*

The team has some promising young PhD. students, some of which should be upgraded to a permanent staff position.

*Declaration on the strategy and plans for the future.*

The team has a clear strategy and research plan with a precise methodology strategy. They should probably extend the topics of interests in concordance to extension of the size of the team.

## **Evaluation of the Team No. 5: Laboratory of Virology and Laboratory of Stress Physiology**

### **1. Introduction**

The presentation consisted of two relatively small groups of about 7 researchers, half over 55 and half under 45. The common research area is plant virus interactions, with virology and stress work being the separate focus of the two groups. One group is working in collaboration with the Institute of Haematology & Blood Transfusion, using plant viruses as a possible therapeutic vaccine; the main interest is in using plant viruses as a protein scaffold to induce human immune response against human papillomavirus. Another topic is oriented to the plant viral diagnostics (particularly potato) in project of applied research under the Ministry of Agriculture. The other group is looking at antioxidants and oxidative stresses.

### **2. Strengths and Opportunities**

Virus genome processing and finding common features of plant and animal viruses are interesting and potentially important areas. The stability of plant proteins and DNA without refrigeration for many years has huge potential for storage of animal (including human vaccines). The plants can also modify proteins as required for immunogenicity via glycosylation. Surveys of plant virus epidemiology and monitoring of spread is required nationally and in a European context.

### **3. Weaknesses and Threats**

The main part of the work is yet unfinished, with much, as yet, unrealised promise. The scientific publication quality is not outstanding. There has been an enormous decline in Czech seed-potato production, so potential demand for potato virus diagnostics has largely disappeared.

### **4. Recommendations**

The future could be more fully integrated in international/EU-wide programmes. The plant viral diagnostics and monitoring in Czech Republic should be coordinate with Czech authorities and producers. It would be good if the pathway to impact for the plant-derived vaccines could be better defined.

### **5. Detailed evaluations**

*Declaration on the quality of the results and share in their acquisition*

The research output profile has a strong peak at the mediocre quality 3 level. There is no reason why some of the papers related to vaccines should not be higher, although much of the diagnostics work has a more national profile as expected.

*Declaration on the involvement of students in research*

There seem to be several students involved.

*Declaration on societal relevance*

Outreach is appropriate for the group sizes. Both phytodiagnostics and plant vaccines have substantial potential for impact in non-academic areas which are being considered by the researchers.

*Declaration on the position in the international and national context*

As suggested by the output quality profile, the work could be more international in scope and quality, and it would be good to see further international involvement in projects and collaborations.

*Declaration on the vitality and sustainability*

And

*Declaration on the strategy and plans for the future*

Further clarity with respect to strategy and plans of both groups would be valuable. It is not clear entirely how the work as proposed can reach higher, international, standards and which collaborations should be initiated.

## **Evaluation of the Team No. 6: Laboratory of pollen biology**

### **1. Introduction**

The group are interested predominantly in the biology of pollen activity and DNA repair processes using the model plants, Arabidopsis, tobacco, and Physcomitrella. This is a young group (17 staff under 45, one aged 60-65, plus 7 PhD students) with a good gender balance. Grant funding is predominantly GACR, plus some smaller amounts from elsewhere. Five PIs have funding. Most work is with international collaboration (Germany UK, USA).

### **2. Strengths and Opportunities**

Good systems and study area with potential to unearth fundamental insights into plant gene activity. The integration of DNA repair, with transcriptomics, proteomics and mutagenesis experiments is likely to prove very powerful.

### **3. Weaknesses and Threats**

The approaches and direction are likely to generate good output, but perhaps the totality of the activity are limited, see recommendations.

It is unclear why phosphorylation of proteins is the key focus, as opposed to other post-translation modifications. We recommend more focus on small RNAs, as well as detailed comparisons of transcriptomes and proteomes.

### **4. Recommendations**

At the last review, it was recommended that three groups merged to form the Laboratory of Pollen Biology. Whilst this has happened, there was little evidence that the research is fully coordinated as a whole. Yet it could be, with small RNAs and comparisons of transcriptomes and proteomes, the work could be focussed at linking pollen biology with DNA repair/recombination processes.

## **5. Detailed evaluations**

### *Declaration on the quality of the results and share in their acquisition*

There are some excellent papers (4 papers graded in quality profile 1 and 2), some published in very good journals (e.g. Nature Communications, NAR, the Plant Journal, plus text books entries). Around 75% of publications have a member of this group as first and corresponding author.

### *Declaration on the involvement of students in research*

The involvement is appropriate. In the period of assessment they have had 11 PhD students, two of whom have successfully defended their thesis, with prizes/awards given to two Master's theses.

### *Declaration on societal relevance*

Work is of a fundamental nature. One member (Angelis) has given advice to the Ministry of the Environment on GMOs.

### *Declaration on the position in the international and national context*

Honys has many international collaborations and contributes to research on an international stage, e.g. his activities as a member of the Executive Council of the International Association of Sexual Plant Reproduction and as the Czech Republic Representative on the ESF/COST Food and Agricultural Committee.

### *Declaration on the vitality and sustainability*

Work is going well and is sustainable

### *Declaration on the strategy and plans for the future*

Plans are suitable.

## **Evaluation of the Team No. 7: Laboratory of Plant Biotechnologies**

### **1. Introduction**

This is a group with almost 10 researchers and a young age profile has only one person over 50yrs. Their work considers the plant as a chemical factory, looking at plant-chemical interactions largely with conventional approaches. They have a good number of European collaborations. While the paperwork suggests the research is for applications in phytoremediation particularly with heavy metals, the presentation indicated a focus on other areas, including looking at medicinal plants and pharmaceuticals, at secondary metabolites and interesting novel biologically active compounds. The anti-cancer paclitaxal is being worked with, and other metabolites include some which have been patented: anti-inflammatory compounds, and ginseng metabolites were mentioned. The impact of nanoparticles and related plant stress responses are being studied, a niche few work in. The work is novel in looking at changes in gene expression with nanoparticle treatment.

### **2. Strengths and Opportunities**

There is huge interest in phytoremediation of polluted areas for land restoration and also in secondary products and plant metabolites to find new compounds with biological activities. This group has a good number of non-academic partners from companies. There is some work with transcriptomics. They have been successful in participating in 16 COST projects.

### **3. Weaknesses and Threats**

The plans and description are rather generic. What about the role of microbes in soil and water associated with plants? Many aspects of hypothesis- and the target-led approaches - were vague as to which species would be appropriate targets, and the major options for modelling seemed to be missing. It was not clear if the presentation was different from the paperwork because of a significant change in strategy, or choice of focus for the talk.

### **4. Recommendations**

The aims and objectives need to be much more specific and hypothesis driven; as presented they are all very generic and not target oriented. Species for study should be specified, and collaborations initiated with labs interested in parallel work with the microbial component of plant-soil or plant-water interactions.

### **5. Detailed evaluations**

#### *Declaration on the quality of the results and share in their acquisition*

Although there are impacts of the work outside academia, it is still essential that high-quality and novel research is generated and the overall quality profile was rather low: 13 of the 17 were evaluated at 3, four others graded at 2 and 4.

#### *Declaration on the involvement of students in research*

They have had 8 PhDs over period, but currently the numbers are not low, with no 2014 PhD students.

#### *Declaration on societal relevance*

The group has some work on water purification, although the international novelty of this work was not entirely clear. There were good interactions with companies.

#### *Declaration on the position in the international and national context*

They are involved in range of international collaborations, giving a reasonable number of talks at international meetings.

#### *Declaration on the vitality and sustainability*

The research has considerable interest for environmental remediation, but has not reached high international levels.

#### *Declaration on the strategy and plans for the future*

The strategy needs to be much more specific, with detailed, scientific targets set. Currently the plans are very generic and lack specificity.

## **Evaluation of the Team No. 8: Laboratory of Growth Regulators and Isotope Laboratory**

### **1. Introduction**

Laboratory of Growth Regulators (in Olomouc) and Isotope Laboratory (in Prague) focus on development of i) new phytohormone probes and biomolecules and ii) new phytohormone bioanalytical methods and their applications. The former activity include, production of new phytohormone standards, probes, and labelled derivatives; studies on chemical modulators of kinases; and for testing natural phytochemicals as potential drug candidates. The team is quite young with majority researchers at age 25 -40. Scientific level of the laboratory is very high and about 80% of their work is through collaborations. The team publishes in top journals related to general biology and biological chemistry.

### **2. Strength and Opportunities.**

The group established themselves in an unique position in the field of cytokinin research. 1) Due to their rigorous, sensitive and reliable profiling of cytokinin molecules, the group is considered to be one of the world's distinguished groups. 2) To the best of our knowledge, they are pioneer in developing drugs by modulating cytokinins, which include Pyratine-6 (anti senescence), Olomoucine II, Roscovitine/Selaciclib (both for anti cancer).

### **3. Weaknesses and threats.**

No major weakness was identified, but some adjustments may be recommended (see below).

### **4. Recommendations.**

Team seems to be a bit technologically-oriented, more biological basic hypothesis-driven may be appropriate. The team would also benefit from integration of genomics into their research.

### **5. Detailed evaluations**

*Declaration on the quality of the results and share in their acquisition.*

Their works appear in top journals, including *Nature* and *Science*. They are involved with many international collaborations, including large collaboration outputs, and both citations and quality profiles are very good. Numerous patents were awarded. Clear commercial outcome of work.

*Declaration on the involvement of students in research.*

Group has plenty of young people, good profile of youth. 11 foreign PhD students. Numerous courses are lectured or co-lectured at major Czech universities.

*Declaration on the on societal relevance.*

Very high relevance to important issues related to production of prodrugs. Good outreach, good activity in knowledge dissemination to the public.

*Declaration on the position in the international and national context.*

The team is well-recognized in national context and is very well recognized on international context, as well.

*Declaration on the vitality and sustainability.*

Age structure is very good with the majority of young researches. The team activity is well managed. Future leaders are named, but time will tell to what extent they will carry on the current level of research.

*Declaration on the strategy and plans for the future.*

The team has good and realistic research plans for the future.

## **Evaluation of the Team No. 9: Laboratory of Signal Transduction, Laboratory of Pathological Plant Physiology and Laboratory of Biologically Active Compounds**

### **1. Introduction**

The team consist of three laboratories. Laboratory of biologically active compounds (LBAC), led by Martin Vagner, works on somatic embryogenesis in spurs. Laboratory of pathological plant physiology (LPPP), led by Lenka Burketova, works on molecular plant pathology. Laboratory of signal transduction (LST), led by Jan Martinec, works on lipid signalling. Although they are willing to converge in the future, these units are rather independent in their scientific questions and approaches at present. There are some possibilities of collaborations within this unit in the future, e.g. biotic stress signalling.

### **2. Strengths and Opportunities**

Good set of expertise in tissue culture techniques, plant pathogen signalling and lipid signalling. Long term studies on non-specific phospholipase C (NPC) gave the group a unique opportunity to explore the role of NPC in abiotic stress responses. In fact, 5 out of 11 articles related to plant NPC are from LST. Some of their works are carried out in important crop species and trees, rapeseed or spruce. They have niches in non-model pathosystems, e.g. *Leptosphaeria*, *Sclerotinia*.

### **3. Weaknesses and Threats**

The work on somatic embryogenesis is a bit sketchy and largely descriptive. To assess lipid signalling roles vs hydrolysis of structural lipids needs to be more taken into account.

### **4. Recommendations**

Develop spurs somatic embryogenesis as a model to understand the basis of reprogramming. Comparing these with other well-developed systems, such as *Arabidopsis* would greatly facilitate to generalise mechanisms.

The lipid signalling should be focused on signalling contexts. Should aim to couple lipid signalling molecules to relevant signals. Consider more the dynamics of the lipid signals, e.g. using lipid biosensors, other signalling lipid detection methods.

### **5. Detailed evaluations**

*Declaration on the quality of the results and share in their acquisition*

All three groups had consistent outputs at an internationally recognised level. These outputs are largely originated from these research groups and supported by collaborations. The team published 42 journal articles with impact factor and 3 chapters in professional books during the period.

*Declaration on the involvement of students in research*

They have a good number of students being supervised at all levels. They are well-integrated in projects.

*Declaration on societal relevance*

All three projects are in a category defined as a “potential” for societal relevance. Jan Martinec is a main organizer of the conference series “Methods in Plant Sciences”. Owing to his popularizing efforts, “Medal of Vojtěch Náprstek” was awarded to him in 2012.

*Declaration on the position in the international and national context*

They have demonstrated international collaborations.

*Declaration on the vitality and sustainability*

The three diverse topics within one unit without much integration questions the vitality of the team.

*Declaration on the strategy and plans for the future*

The future plan largely follows what they have done in past. They provide logical and feasible future plans, however ambitious goals are largely missing.

## **Evaluation of the Team No. 10: Centre of Plant Structural and Functional Genomics**

### **1. Introduction**

The Centre has been world leading for more than 3 decades now in flow cytometry applications in higher plants and specifically crops. Combining this with plant genomics gave this centre a special importance and allow this centre to develop significantly and to participate in important international genomics and breeding initiatives. Three main topics on this field, wheat, hybrid grasses, bananas are all excellent example of innovative application of combination of methods with flow cytometry. Recently they went back to one of their initial and fundamental science interests, chromosome architecture and apply flow sorting of chromosomes from synchronised cells. They start to produce some exciting results in this field as well.

### **2. Strengths and Opportunities**

Clear strength is the decades of accumulated expertise and state of the art instrumentation in flow cytometry of plants and crops. Combining this innovatively with a plethora of other tools and research approaches such as BAC cloning, genomics, NGS sequencing, molecular cytogenetics, breeding and proteomics makes them truly stand out worldwide. Well thought through group structure with senior sub-group leaders and young scientists in place. Extensive list of collaborators both in academia and breeding companies.

### **3. Weaknesses and Threats**

There is a threat that new technologies will overtake the core flow cytometry/lrys activities. The work is technically very demanding, and the mapping methods are important, with commercial value. However there is a danger that biology insights are not progressing at the same pace as technological advances (nuclear proteins excepting). There is also a potential problem in the middle term with the retirement of Professor Dolezel. Leadership issues need to be considered into the future.

### **4. Recommendations**

There could be an increased focus on fundamental biological questions that would protect the group against technology changes and increase the paper quality output measure. The legacy in a post-Dolezel situation should be considered, either the breakdown of the group to independent project leaders, or for the emergence of an international lead, following the Dolezel model. Given the technology is likely to change over the next 5-10 years, perhaps individual post docs, early career scientists should be encouraged into setting their own programs from now.

### **5. Detailed evaluations**

#### *Declaration on the quality of the results and share in their acquisition*

Truly world leading science providing underpinning technology at extremely important fields of crop genomics and crop breeding. They also started to produce novel results on cell cycle regulation of chromosome architecture.

#### *Declaration on the involvement of students in research*

They have a continuous supply of Czech and International students with a good record of retaining them or getting them to outstanding institutions worldwide.

#### *Declaration on societal relevance*

Top relevance in food security as an underpinning technology. They have demonstrated this already in banana breeding.

#### *Declaration on the position in the international and national context*

The group is very well recognised internationally

#### *Declaration on the vitality and sustainability*

The group has built up a structure with deputy head and subgroup leaders that will provide a stable future for this Centre.

#### *Declaration on the strategy and plans for the future*

There is no need to comment on this, it will naturally arise from their track record. An example of forward looking exciting topic is the proteome of chromosomes around the cell cycle.

**Date:** December 15, 2015

**Commission Chair:** Emeritus Professor Erick Vandamme