

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 Molecular Genetics of the CAS, v. v. i.

Fields, in which the Institute registered its teams:

Biochemistry and molecular cell biology, biophysics, virology, ...

Observer representing the Academy Council of the CAS: Karel Aim

Observer representing the Institute: Vladimír Kořínek, substitute observer Petr Dráber

Commission No. 6: Biochemistry and molecular cell biology, biophysics, virology

Chair: Professor emeritus Morten Kielland-Brandt

Date(s) of the visit of the Institute: November 10 - November 11, 2015

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

Evaluated research teams:

No. 2 - Laboratory of RNA Biology; No. 3 - Laboratory of Viral and Cellular Genetics; No. 6 - Laboratory of Molecular and Cellular Immunology; No. 7 - Laboratory of Cell and Developmental Biology; No. 8 - Laboratory of Mouse Molecular Genetics; No. 10 - Laboratory of Cell Signalling and Apoptosis; No. 13 - Laboratory of Epigenetic Regulations; No. 14 - Laboratory of Transcriptional Regulation; No. 15 - Laboratory of Structural Biology; No. 16 - Laboratory of Genomics and Bioinformatics; No. 17 - Laboratory of Molecular Virology; No. 18 - Laboratory of Cancer Cell Biology; No. 20 - Laboratory of Biology of the Cell Nucleus

A. Evaluation of the Institute as a whole

1. Introduction

The basis for our evaluation of the Institute as a whole is the site visit, reports from the teams, report from the Institute, and publications during the evaluated period.

The Director of the Institute of Molecular Genetics, prof. V. Horejsi, described in his presentation the work of the institute. IMG is a large institute with 22 research laboratories, of which Commission 6 has evaluated 13 (see below), the research groups working mainly in the area of molecular and cell biology.

About 60% of the IMG budget is covered from grants.

The research directions pursued at the Institute combine continuation of the topics from the highly successful periods (e.g. the excellent pioneering work on retroviruses by J. Svoboda), and innovations brought by young researchers.

The main research directions in the evaluated period have been: Cancer cell biology (including DNA damage), Developmental biology, Molecular genetics and (functional) genomics, Molecular and cellular immunology, Cell biology of nucleus and cytoskeleton, Molecular virology, Molecular pharmacology.

IMG is the managing institute for the newly designed and built BIOCEV institute, the potential of which is already now recognized by an international review as the Centre of Excellence in European Science.

The IGM has several service facilities, on a level directly comparable to that of similar institutions in Western Europe. These are: Transgenic Unit, Animal Facility, Light Microscopy and Flow Cytometry Facilities. The transgenic facility is able to produce tens of genetically modified mouse strains per year, and is a crucial part of the BIOCEV project. Another facility is the recently built National Centre for Chemical Biology – OPENSREEN – setting up a robotic platform for extensive screening of chemical libraries.

2. Strengths and Opportunities

The Institute has a policy of a strong support for creation of new independent junior groups, bringing new research topics and experimental approaches, affecting overall strength:

- Research topics are relevant in the context of world-wide research and of clear biomedical relevance.
- Long tradition of research on internationally competitive level.
- Strong international collaborations, International Science Advisory Board established.
- International environment (English used as a common scientific communication language), 15% of employees are foreigners, 20% of incoming PhD students are international.
- At present no research groups could be considered as problematic or low quality; all of them are internationally well visible.
- Outstanding students; strong and emancipated PhD student community.
- Sufficient financial support from grants and program projects on national and international levels.

Supporting the strength are further:

- Excellent central facilities (state-of-the art microscopy, cytofluorometry, genomics and bioinformatics, histology, irradiation, monoclonal antibodies, cryo-facility, culture media, IT, animal facilities, transgenic unit).
- Unique collections of mouse and chicken strains and cell lines.
- The **BIOCEV project** finalized by the end of 2015; this will have a positive impact on IMG, allowing to increase the IMG capacity by about 30%, and bringing new opportunities, e.g. in the area of functional genomics.

3. Weaknesses and Threats

The IMG (although relatively international, compared to other Czech institutions), would like to attract still more international scientists. One of the obstacles to achieve this is the still markedly lower levels of salaries.

The above-mentioned project **BIOCEV**, besides the many promises, may also present certain risks (e.g. obligations concerning the financial sustainability).

4. Recommendations

IMG should maintain the good monitoring of team leaders and of the research quality, and continue the involvement in high-risk-high-benefit projects.

The excellent strategy to invest resources into talented young researchers (from a not too large Czech scientific budget!), and to send them to spend time in the best world laboratories (e.g. in US, England, France, Australia), has shown very good results in highly efficient budget spending. Upon return to Czech Republic, they can compete with their peers in the best laboratories, as demonstrated by the highly respectable publication list in international journals. It would be useful for the Direction of the Czech Academy of Sciences to evaluate how efficient is direct budget support on training of Czech scientists and junior group leaders in foreign laboratories (including the contributions to International Research Organizations). Comparing how many scientists are trained with the budget should enable to find the most efficient way of supporting them.

5. Detailed evaluations

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

Publication activity and quality are very high, indicated by Phase I evaluations, with publications in journals with higher IFs. There have been original research results achieved and published in all of the principal research directions.

IMG is the managing institute for the newly designed and built BIOCEV institute, the potential of which is already now recognized by an international review as the Centre of Excellence in European Science.

Eight IMG research groups will be working at BIOCEV, two of the existing ones, led by J. Forejt and R. Sedlacek, and six newly established since 1.1.2015.

The dynamic structure of IGM, in which laboratories are closed, merged, and new are formed, indicates efforts of the institute to maintain and increase quality of the research and teams.

The Director Vaclav Horejsi and the managing Board should be congratulated on providing an excellent working environment and motivation for young researchers. The Institute of Molecular Genetics should continue to participate in the world-class research.

Declaration on the involvement of students in research

PhD students represent the critical labor force. About 100 PhD students are conducting their PhD research at IMG; 15-25 students are accepted annually. The Institute places strong emphasis on recruiting talented students. IMG is a training place with legal contracts with Universities (mainly Charles University), which officially administer studies and award degrees. IMG has a centrally organized PhD selection system, on a level with the most prestigious institutes in Western Europe. Prospective students apply online and are pre-screened; the most promising candidates (20-40) are invited for the **Interview Day**. They present their research in English to a Selection committee, ensuring recruitment of the best applicants. The PhD community is thriving at IMG, visible e.g. at the annual one-day **IMG PhD conference** organized entirely by the students.

Declaration on societal relevance

Concerning the basic research at the Institute, it is of very high quality, with clear goals. Research results, combined with the technological and methodological development, are expected to have important societal impact, in clinical and commercial applications.

IMG supports public outreach, significant achievement in this area is e.g. the public laboratory project Bioskop (www.bioskop.cz) developed by a team of students and postdocs, organized by Petr Svoboda and Petr Bartunek. Bioskop was implemented successfully also at the Masaryk University in Brno.

Declaration on the position in the international and national context

The IMG has extensive, fruitful international and national research, and teaching collaborations. Its teams are internationally highly visible.

Declaration on the vitality and sustainability

The IGM's long-term sustainability is secured by the quality of output, resulting in securing grants and other research funding:

- There is sufficient financial support from grants and projects on national and international levels, about 60% of the IMG budget is presently covered from grants.
- Research topics of IGM are relevant in the context of world-wide research, biomedically relevant.
- Continuous upgrading of research equipment.
- Long tradition of research on internationally competitive level.
- Skilled and motivated research and administrative personnel, outstanding PhD students.

Declaration on the strategy and plans for the future

Activity plan for the new 5-year period at the institute level is clearly formulated; a major factor influencing the IMG in the near future will be the project BIOCEV.

Two main **management priorities** will be:

- the BIOCEV project, (where eight IMG research groups will be working, two of the existing ones - led by J. Forejt and R. Sedlacek- and six newly established since 1.1.2015).
- Further consolidation and improvement of IMG (in particular the financial stability of IMG while bearing responsibility for BIOCEV).

B. Evaluation of the individual teams

Evaluation of the Team No. 2: Laboratory of RNA Biology

1. Introduction

The work of the team was presented by its leader Dr. D. Stanek. The interest of the team is pre-mRNA splicing, focusing on two major topics – formation of splicing machinery in living cells and regulation of alternative splicing by chromatin modifications. In addition, the group studies snRNP mutations in human hereditary disease retinitis pigmentosa, a project that stemmed from the research of snRNP biogenesis.

2. Strengths and Opportunities

The strengths are the strong model combined with modern methodology. With a relatively small number of staff the laboratory is covering very good biology and the tools needed for the projects, e.g. FRET techniques in Microscopy for analysis of living cells, Image storage and processing techniques, collaborations with mathematical modelling for analysis of cellular processes in time.

3. Weaknesses and Threats

No obvious weaknesses.

4. Recommendations

It seems the team could have internationally competitive position in the field of pre-m RNA splicing, and find even more collaborations.

5. Detailed evaluations

Based on the output, the laboratory is internationally in a very good position, the success is particularly noticeable when considering the relatively small number of staff.

Plans and the strategy are in line with the expected next progress in the field, of great interest in the cell biology.

The number of students in the evaluated period is high, including the PhD students, which certainly must take quite a lot of time.

Organisation of international conference on Microscopic techniques in Prague is a sign of International recognition, confidence and expertise on the part of the team.

Dr. Stanek is an internationally recognized scientist in his field, is reviewer in top journals, and member in top science organisation in Czech Republic

Declaration on the strategy and plans for the future

The plans for the future are well set, with good attention to detail and methodology.

Evaluation of the Team No. 3: Laboratory of Viral and Cellular Genetics

1. Introduction

The work of the team was presented by its leader Dr. J. Hejnar. The Laboratory of Viral and Cellular Genetics is oriented on the retrovirology with emphasis on the interaction between

retroviruses and the host cells at the molecular level. It involves all stages of the retroviral function, as the entry to the invaded cell, formation of the viral DNA and its integration into the cell genome and finally the expression of the retroviral genetic material.

The team consists of 23 members, reasonably distributed with regard to the age and experience.

2. Strengths and Opportunities

The strength of the team is given by the fact that it is a highly successful unit of the IMG in their research activities and outcomes of the work.

Opportunities of this group of scientists are enormous as the retroviral research belongs to one of the most fundamental and important fields of contemporary molecular biology with applications in human and veterinary medicine.

3. Weaknesses and Threats

There are no obvious weaknesses or threats.

4. Recommendations

Possible orientation to clinical aspects, or a collaboration with clinicians, or eventually a commercial company may be recommended. This could also be the basis for founding a spin-off company.

5. Detailed Evaluations

Documents provided as well as the site visit give strong impression that the team is pursuing a highly interesting and internationally recognized research with fundamental importance in molecular biology.

Quality of the results.

The number of original scientific papers published is well corresponding to the structure and strength of the team. Scientific output of this team in the last five years is 43 contributions, and ten results were classified as “Applied”. The productivity of this group is excellent.

As to the pedagogical activities, each member of the team is responsible for a full lecture course. Jiri Hejnar and Jan Svoboda are frequently invited for *ad hoc* lectures on retroviruses, mobile DNA, cancer genetics and epigenetics, for the advanced courses in magister and doctoral students.

Recognition of the work of the group members is also reflected in their memberships in the panels of the Czech Grant Agency. The popularization activity of their research themes and results is very high and frequent.

Involvement of students.

The students contribute significantly to the success of this Laboratory. Nine theses are supervised by laboratory members. The Ph.D. studies take usually four years, and the students are then fully competent postdoc colleagues.

Position in the national and international context.

The position of this group in the scientific community is highly recognized (also due to excellent pioneering work on retroviruses by Dr. J. Svoboda), corresponding to the importance and quality of its results. Success in obtaining the funds is a part of the recognition. The team is involved in projects and grants organized and provided by various agencies.

Vitality and sustainability.

With the young workers, leadership and grants, there are resources for a successful work.

Strategy and plans for the future.

Strategy, research plans and methods, as outlined, summarize the most important planned activities of this laboratory. All ingredients are present for high quality results in the future.

Evaluation of the Team No. 6: Laboratory of Molecular and Cellular Immunology

1. Introduction

The work of the team was presented by Dr. M. Lipoldova. The Laboratory of Molecular and Cellular Immunology is oriented on the identification of genes and molecular mechanisms participating in the control of immune response mostly to various infectious agents, as protozoan parasites of *Leishmania* genus. It consists of 14 members.

2. Strengths and Opportunities

Probably the most important is the opportunity to extend the research to clinical applications, e.g. the visceral forms of leishmaniasis caused e.g. by *L. donovani*. Another opportunity for the researchers is a translational application with newly found potential drug. Search for a vaccine is another possibility for translational research, as outlined in the report.

3. Weaknesses and Threats

The researchers should try to be more pro-active in finding funding within translational medicine financing authorities/agencies, with their research quality there are opportunities.

4. Recommendations

Focus on the most promising directions of their research, aimed at the causal mechanistic explanation of susceptibility to infectious parasitic diseases and to the research of shared components of leishmaniasis and other complex serious parasitary pathologies. This project would require close collaborations with biochemists, organic chemists and pharmacologists to understand the structure-activity relationship and optimize the drug design and efficiency. The researchers are aware of the need to develop translational applications of their work in collaboration with clinicians.

5. Detailed Evaluations

Quality of the results. The number of original scientific papers (12) published is corresponding to the structure of the team. Scientific output of this team is 12 papers in international peer reviewed journals, incl. Nature Methods (Kobets et al. 2010) and Biological Reviews (Gusareva et al. 2014). The scientific output is thus very good, for 8.23 FTE workers incl. Ph.D. students it is a very good productivity, taking into consideration the high impact factor of the journals taken into account.

In the technology transfer field, the team has applied for a patent for a novel compound against *Leishmania parasites*, and the search is on for a commercial partner.

Involvement of students.

Members of the team participate in the teaching at the Charles University (3 one-semester courses) and seminars/lectures for pregradual and postgradual (Ph.D.) courses. The students are an integral part of the research in this laboratory: Six Ph.D. students are supervised by members of this team; one thesis work (to obtain the degree M.A.) and one bachelor thesis are supervised as well; team members are consultants or co-supervisors of five more bachelor and four M.A. theses. Three students of the Ph.D. programme, two of the M.A. and six bachelors successfully defended their theses during last five years.

Societal relevance.

The team has memberships in Editorial Board of three journals; team members are active in popularization of their work in media. The relevance of the research is high, as it is oriented to very difficult parasite diseases.

Position in the national and international context.

The team is doing good work in the popularization of its results. However, its position in the scientific community should have more recognition, corresponding to the importance and quality of its results.

Vitality and sustainability.

Young and perspective workers are available. Some funds are running out in the end of 2015 and in 2016. International cooperation in grant applications could help obtain further funding.

Strategy and plans for the future.

The research plan involves: (i) Studies on regulation and mechanisms of leishmaniasis, (ii) Studies on common shared components and mechanisms of leishmaniasis and other complex diseases and (iii) Development of translational applications.

Evaluation of the Team No. 7: Laboratory of Cell and Developmental Biology

1. Introduction

The team leader is Dr. V. Korinek, main topic is study of the signalling mechanisms leading to cellular transformation and cancer. Wnt signalling pathway, in particular to the Wnt pathway components and molecular mechanisms were examined with the aim to identify genes regulated by physiological or aberrant Wnt signalling in the mouse gastrointestinal epithelia or in human intestinal cancer cells.

2. Strengths and Opportunities

Dr Korinek is a scientist of established reputation. The interdisciplinary expertise of the team is a strong asset. The quality profile as estimated in Phase I is fine, as well as the quality of outputs, although the most important work was published after the report period. The expertise in use of most up-to-date methodical approaches is a strong tool for further studies. The necessary new methods were already introduced. The share of the team in creation of outputs is very good.

3. Weaknesses and Threats

The group leader wishes more of good quality PhD students.

4. Recommendations

We recommend that team members participate in outreach to the general public. The international networking could be perhaps expanded.

5. Detailed evaluations

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

The quality profile from Phase I is much better than the citation profiles achieved. Citations may be delayed due to longer time required by the used methodical approaches. A minority of papers are described to be collaborative with other teams, with labs of world reputation and highly respected scientists. The team thus has a very large share in the acquisition of the results.

Declaration on the involvement of students in research

The teaching activities are mostly based on lectures of Dr. Korinek. The number of PhD theses defended in the period is very good considering the team size. Also 4 undergraduate students were involved during the evaluated period.

Declaration on societal relevance

Basic research questions are addressed in an efficient way using modern approaches. A positive and important societal impact can be expected. All achievements in the direction of understanding development of cancer of colon and rectum are of great medical importance.

Declaration on the position in the international and national context

Of the thirteen outputs, three were prepared in cooperation with foreign teams, with very highly respected labs and names.

Declaration on the vitality and sustainability

Only 16% of the group budget comes from the IGM institutional money, the 84% are grants. The very good quality of this research should enable the team to continue apply successfully for grants that will form the necessary basis for their future activities.

Declaration on the strategy and plans for the future

The plans for the future are well prepared, ambitious but achievable. All planned activities are based on established methodical approaches, with experiments based on increasing complexity of the models, from *in vitro* to *in vivo* using unique mouse strains developed by the team. The proposed research directions, like gene activation, genome-scale screening, targeted genome editing or studying metastatic model of intestinal cancer, high-throughput screening of anticancer compounds, would require probably more people and steady grant support.

Evaluation of the Team No. 8: Laboratory of Mouse Molecular Genetics

1. Introduction

The lab head is Dr. J. Forejt, the work of the team was presented by Dr. Z. Trachtulec. Most work in this team concerns hybrid sterility in mouse and is highly relevant for the understanding of appearance of new mammalian species during evolution. The team has mapped loci responsible for hybrid sterility, and at least one of the new teams emerged after the split is working on identifying responsible genes and molecular mechanisms.

2. Strengths and Opportunities

The quality profile from Phase I, the citation profile, and the journal impact of the publications are all very good. A previously constructed large set of chromosome substitution strains, which are house mice with single chromosomes of wild mice instead of their native corresponding chromosomes, and the expertise on its use, are strong tools in these studies.

3. Weaknesses and Threats

No obvious weaknesses.

4. Recommendations

We recommend that team members participate in outreach to the general public and increase involvement of students in the research. The already existing international networking could be expanded with much advantage to all parties, including the two teams that have emerged from the split.

5. Detailed evaluations

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

The quality profile from Phase I, the citation profile, and the journal impact of the publications are all very high. A large majority of the papers have Jiří Forejt as last author, and a minority of papers are described to be collaborative with other teams. The team thus has a very large share in the acquisition of the results. A valuable collection of chromosome substitution strains are available worldwide for research, and was licenced to a company for commercial exploitation.

Declaration on the involvement of students in research

No bachelor students have been involved in the period. This presumably has the background that experiments involving crosses of mice take longer time than many other biological experiments. At the Master and PhD student levels, the numbers could possibly be higher, considering the team size.

Declaration on societal relevance

Fundamental questions are addressed in an efficient way in this basic research. It is therefore expected to have positive and important societal impact, but not immediately. Use of the strain collection in the collaborative article by Boell et al. (2011) might show a way to complex and quantitative trait studies of medical importance.

Declaration on the position in the international and national context

The (two) team(s) has a strong international standing, not least because it has made its valuable collection of chromosome substitution strains available worldwide for research and licenced it to a company in a commercial context.

Declaration on the vitality and sustainability

The very good quality of this research should enable the two new teams to successfully apply for grants that will form the necessary basis for their future activities.

Future Plans

Plans for future activities are clearly **described**.

Evaluation of the Team No. 10: Laboratory of Cell Signalling and Apoptosis

1. Introduction

The Laboratory was discontinued, so no future research plan was provided. Former team leader Dr. L. Andera presented the work of the group. The Laboratory of Cell Signalling and Apoptosis investigated the signalling of death receptors of TNFR family, on which it published several papers.

2. Strengths and Opportunities

The Laboratory has had national and international collaborations.

3. Weaknesses and Threats

The quality scientific output of the Laboratory by journal ranking was medium or below medium.

The number of students involved in the research was relatively low.

The pedagogical activity of the team members was limited; only two PhD degrees were obtained during the evaluation period.

4. Recommendations

No recommendations, the team was discontinued.

5. Detailed evaluations

The scientific output of the Laboratory was of medium level. In addition the quality of the outputs by number of citations was also medium or below medium. The number of students involved in the research work was relatively low. This could be probably due to the fact that the group has relatively small size. The Laboratory has had national and international collaborations.

All the grants obtained by the Laboratory end by the end of 2015.

The Laboratory was discontinued, so no future research plan was provided.

Evaluation of the Team No. 13: Laboratory of Epigenetic Regulations

1. Introduction

The group leader Dr. P. Svoboda in his impressive presentation described the work of the lab. The current Laboratory of Epigenetic Regulations (**LEG**) team includes 4 researchers, and six PhD students are currently supervised.

The LEG team investigates the molecular mechanisms that control the mouse oocyte-embryo transition using molecular biology techniques combined with bioinformatics analysis. They focus on post-transcriptional control of maternal mRNAs, miRNAs and long non-coding RNAs during oocyte-embryo transition.

OE transition is highly complex and after fertilization the zygote activates its genome and after cell divisions pluripotent embryo cells arise.

A major contribution of the LEG team was the finding that the amount and the localization of P-bodies which are supposed to encapsulate certain mRNAs decrease in growing oocytes. Furthermore, miRNA activities are also suppressed. This goes together with changes in the decapping activity which is strongly increased in oocytes ready for fertilization. This goes together with translation of the mRNAs encoding decapping subunit proteins Dcp1 and Dcp2 during oocyte meiosis. This suggests that decapping is important for maternal mRNA degradation. Furthermore, the LEG team identified ELAVL2 in a bioinformatic screen and provided evidence that ELAVL2 acts as a translational repressor that becomes degraded during oocyte maturation. Now the lab focusses on the identification of selectively degraded mRNAs as well as the proteins involved during various stages of development (meiosis, fertilization and zygote gene adaptation (ZGA)).

2. Strengths and Opportunities

The LEG team is innovative and the research project is challenging. The interdisciplinary of the team is a very strong asset as well as networking with other groups. Active engagement in PhD programmes is appreciated.

3. Weaknesses and Threats

No weaknesses and threats are obvious.

4. Recommendations

The lab follows a large number of significant research projects and with the current man power a stronger focus needs to be considered. The lab relies for bioinformatics on a group in Zagreb, there seem a general need for generation of a strong Bioinformatics team on-site, combining efforts e.g. with the bioinformatics team from the Institute of Microbiology.

5. Detailed evaluations

The publication record of the LEG team is very good with some outstanding publications in highly recognized journals.

The results reported have significant impact on the understanding of the molecular events during oocyte-embryo transition. Beside fundamental research aspects they are also relevant with respect to clinical aspects and in stem cell research.

This work is of high societal relevance.

The lab is very active and provides for students an excellent environment for developing their scientific skills.

It is internationally recognized, obvious by the large number of international collaborations.

The future research focus is clearly visible and promising.

Evaluation of the Team No. 14: Laboratory of Transcriptional Regulation

Team leader: Zbyněk Kozmík (Institute of Molecular Genetics of the CAS)

1. Introduction

It is a team consisting of about 5 researchers and 8 other members. The main research target of the team is investigation of the evolution of development focused mainly on the role of transcription factors and signalling cascades using laboratory mouse (and other organisms) as a model organism to study embryonic development. The approach in the basic research is well described and documented in publications, in 25 original papers.

2. Strengths and Opportunities

The research team is very young (the majority of research members are younger than 25 years). It is highly competent in its field, and achieved very good results. The perspectives are indicating further successful development.

3. Weaknesses and Threats

It is not quite clear what activities are jointly carried out with the so called “other workers” (in the almost doubled number, to 8 researchers).

4. Recommendations

More focused approach may be useful, concentrating on smaller number of animal models, to be able to continue the successful identification of regulatory components in the Pax6 pathway.

5. Detailed evaluations

The quality of the published results is very good, papers were accepted in journals with high impact factors: 5/9 papers are in the first decile/quartile of journal ranking, and 4/3 in the citation ranking.

During the evaluating period 10 PhD students were involved in the research, 3 of them defended their PhD thesis; perhaps the participation of bachelor and master students could be higher.

With the existing expertise, more Societal relevance activity should be achievable.

In the field of eye development and morphogenesis, the position in the international context is very good, and at the national level exceptional, also due to the topic.

The team has prognosis of very good vitality and sustainability

The future strategy and plans are well described and recommended for realization.

Evaluation of the Team No. 15: Laboratory of Structural Biology

1. Introduction

The work of the team was presented by Dr. P. Maloy-Rezacova. The research group – focusing on protein crystallography - is composed of 5 experienced researchers and a total of 11 members (evidently including PhD students as well as technicians). The group is highly successful, mainly in their own field, also via collaborating with different laboratories in the Czech Republic.

2. Strengths and Opportunities

The strength of the group is clearly in their ‘home-field’, e.g. in results on the structure and function of human carbonic anhydrase, and the preparation of recombinant antibody fragments for potential diagnostic and/or immunotherapeutic use.

Another strength is in their good unique position in Czechia, as concerns the facilities and expertise for structural biology in their field. This offers excellent opportunities and numerous collaborations on important biological problems; it helps the lab obtaining research grants.

3. Weaknesses and Threats

Collaboration with the highly competent team for Structural Biology at the BIOCEV Institute has not been discussed, e.g. for work with the robots for preparation of protein crystals and their analysis on the most modern equipment at BIOCEV.

Research subjects and people are over-lapping with the Structural Biology of the Inst. Org. Chem. Biochem.

4. Recommendations

Important impact should have a collaboration with the highly competent Structural Biology team at the BIOCEV Institute, it was not clear what connection with them are planned, or if the team intends to continue their work in the field where they are established and good. Probably more PhD and MSc students would be beneficial both for the internal and external projects.

The possibility of joining the Inst. Org. Chem. and Biochem. (Structural Biology) and Inst. Mol. Genet. (Structural Biology) should be considered.

5. Detailed evaluations

Quality of the results and share in their acquisition

The productivity of this group is excellent (40 IF papers), with 12 and 11 papers in the first decile and quartile, respectively in journal ranking. Citation ranking is however somewhat lower. Although the weight of group members' contributions vary, this is evidently the consequence of their open attitude towards external projects.

Involvement of students in research

Relatively low: 2 MSc and 1 PhD theses were defended.

Societal relevance

No activity in this field reported, with their expertise it should be possible to be more pronounced.

Position in the international and national context

The position of the group – based on their publication records - is of high standard both on the national and international levels.

Vitality and sustainability

The excellent infrastructure and publication records, good collaborating partners suggest very good chances for good vitality and sustainability

Strategy and plans for the future

Plans are clearly presented, essentially continuation and extension of previous projects.

Evaluation of the Team No. 16: Laboratory of Genomics and Bioinformatics

1. Introduction

There are two main research topics, early evolution of eukaryotes, the evolutionary history of eukaryotic organelles, developmental processes in metazoans and evolution of endogenous herpesviruses in eukaryotic genomes. The second topic concerns transcriptomic analyses of the epithelium. The team has long time experience in sequencing, transcriptome profiling, and bioinformatics and statistics. Impressive research results are published in respected impact journals.

2. Strengths and Opportunities

The multidisciplinary expertise is contributing to the high quality of the outputs. The outputs of the team (mostly in collaborations with other groups) in the quality profile from Phase I are 1 belonging to world-leading, 3 to internationally excellent and 9 as recognised internationally, by journal ranking most of the outputs falls into the first quartile. The age structure is from highly experienced ones to postdocs and students. The basic research outcomes are mostly oriented to solve problems of high importance for everyday life, from cancer to remediation of contaminated sites.

3. Weaknesses and Threats

The emphasis seems to be on obtaining the genome sequences, but the annotation efforts should be strongly improved. A medium-to-low involvement of students in the research is visible. The team members might make more visible also the methodical developments

achieved within work of the teams.

4. Recommendations

It would seem perhaps more useful to streamline the operation, organising the team as a service for the whole campus, providing it with the most modern equipment, e.g. replacing the old 454 system, expensive in operation. The institute has the expertise (both genomics and technologically) to become the central facility in the Czech Republic. For this purpose we recommend to join forces with the strong bioinformatics team from Institute of Microbiology.

5. Detailed evaluations

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

The quality profile from Phase I is very good, the citation profile, and the journal impact of the publications is less good, slower turnover of citations. A majority of the papers are collaborative. In the main research topics the team members have a large share in experimental setup, results acquisition and especially their evaluation. The number of publication is very high.

Declaration on the involvement of students in research

In the evaluated period no bachelor students have been involved, probably due to the prerequisite of complementary knowledge of biochemistry and genetics. At the Master and PhD student levels, the numbers are relatively low, considering the team size.

Declaration on societal relevance

The team is specialised in genomics and bioinformatics, and the members are continually developing new methods and pipelines for the fast developing field, providing also support to other research groups within own institution and extramurally. Important methodical questions are addressed in an efficient way. It can be expected that outcomes will have an important societal impact, particularly of importance in the health care field.

Declaration on the position in the international and national context

The team has a strong international standing, participating in projects, papers and conferences.

Declaration on the vitality and sustainability

The good quality of this research and specialised know-how should lead to new successful applications for grants as necessary basis for future activities.

Declaration on the strategy and plans for the future

The plans for the future seem to be very promising, the need for research exploiting genomics and bioinformatics research is indisputable, as well as methodology development.

Evaluation of the Team No. 17: Laboratory of Molecular Virology

1. Introduction

The Laboratory was discontinued because of the retirement of the head of Laboratory, so no future research plan was provided.

The work of the former group was presented by Dr. J. Kralova.

Laboratory of Molecular Virology focused on complex investigation of cancer.

2. Strengths and Opportunities

The quality scientific output of the Laboratory by journal ranking was good as judged by the Phase I evaluation.

The Laboratory had national and international collaborations.

3. Weaknesses and Threats

The quality of the outputs by number of citations was good.

The pedagogical activity of the team members was limited; four PhD degrees were obtained during the evaluation period.

Most of the grants obtained by the Laboratory ended in 2012, one ended in 2014.

4. Recommendations

No recommendations, since the team was discontinued.

5. Detailed evaluations

The quality scientific output of the Laboratory by journal ranking was good, as judged by the Phase I evaluation.

The number of students involved in the research work was relatively low, probably due to the fact that the group has relatively small size.

The Laboratory had national and international collaborations.

Most of the grants obtained by the Laboratory ended in 2012, only one ended in 2014.

The pedagogical activity of the team was limited. No activity in area of research popularization is listed.

The team was discontinued in 2015.

Evaluation of the Team No. 18: Laboratory of Cancer Cell Biology

1. Introduction

The work of the lab was introduced by Dr. L. Macurek. The Laboratory of Cancer Cell Biology was established in January of 2013, a junior group leader with two PhD students was extended, and now the group has 10 members. The major focus of the team is the investigation of molecular mechanisms controlling DNA damage response pathway (DDR). Since the team is young, only three outputs were evaluated in Phase I.

2. Strengths and Opportunities

The quality profile of the scientific outputs of the Laboratory as judged by Phase I is very good.

The quality of outputs by journal ranking and by number of citations is very good.

The age structure of the Laboratory is very young on the average.

The team has developed valuable research tools and methods, e.g. FRET based biosensor for detecting ATM activity.

So far the team started work with transgenic animal models and it is obvious that they are mastering the technique.

The Laboratory has national and international collaborations.

Dr Macurek's presentation, as well as the discussion, were excellent.

3. Weaknesses and Threats

No obvious weaknesses.

4. Recommendations

The team should continue with the successful research activities.

5. Detailed evaluations

The scientific output of the Laboratory is very good and so is the quality of publications.

The Laboratory has national and international collaborations.

The team has developed valuable research tools and methods, e.g. FRET based biosensor for detecting ATM activity.

The age structure of the Laboratory is very young, good perspectives for vitality and sustainability.

The research program is realistic; some of the topics already have grant funding.

Evaluation of the Team No. 20: Laboratory of Biology of the Cell Nucleus

1. Introduction

The team leader P. Hozak described the work and results of the team in his presentation. The lab employs a multi-disciplinary approach in order to study nuclear functions in relation to the higher-order nuclear structures. The research concentrates on two directions: (1) mechanisms of intranuclear structure formation and maintenance, and (2) formation of DNA transcription sites and modulation of their activity. complemented by developing some novel imaging and nanotechnology tools.

2. Strengths and Opportunities

The laboratory hosts the electron microscopy unit, and carried out substantial volume of collaborative/service work in the field of cell ultrastructure, electron microscopic detection of various antigens, ultrastructural tomography, and cryo-electron microscopy. Dr. Pavel Hozak gave an excellent presentation, followed by discussion. He is very active in the scientific community, including Euro-Biolmaging, major congresses.

3. Weaknesses and Threats

No obvious weaknesses.

4. Recommendations

The lab should continue to work on its ambitious projects.

5. Detailed evaluations

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

Developed were novel nanoparticles that improve immunoelectron detection methods by providing a wider scale of nanoparticles distinguishable in an electron microscope by their shape. Up to five molecular targets were identified simultaneously. The outcomes are a very good publication record, commercially available novel nanoparticle set, and 2 patents. There are efforts to develop a system for simultaneous detection of fluorescence in the sample, which will find a wide use in Life Science field.

Declaration on the involvement of students in research

The number of Master and PhD students seem reasonable, perhaps it could be increased.

Declaration on societal relevance

Developed were commercially available novel nanoparticle set, and 2 patents. There are contacts with a commercial company to produce the nanoparticles. Two international conferences on Electron microscopy were organized. The lab is also active in Research popularization.

Declaration on the position in the international and national context

The research has been international with useful collaborations e.g. with Dr. Masahiko Harata (Sendai), Dr. Monique Zetka (Toronto), Prof. Rolf Jessberger (Dresden), Prof. Susan Gasser (Zurich), and the German Mouse Clinic (Munich), most of them covered by collaborative grants. The team is participating in EURO-BIOIMAGING consortium.

Declaration on the strategy and plans for the future

The research plans, indicating a reorganization the team in 3 groups, as presented by the group should assure continuous success in the field.

Date: December 16, 2015

Commission Chair: Professor emeritus Morten Kielland-Brandt