Evaluation of research and professional activity of research-oriented institutes of the Czech Academy of Sciences for the period 2015–2019

Final Report

Name of the Institute: Institute of Biotechnology of the CAS, v. v. i.

Evaluated team and its leader:

1. Development of Diagnostic and Therapeutic Procedures (Jiří Neužil)

2. Structural Biology and Protein Engineerign (Bohdan Schneider)

Part A: Evaluation of the institute

Strengths:
Highly dynamic institute with excellent technical infrastructure. Interesting possibilities of synergy between the various research groups.

Weaknesses:
The number of (small) individual projects is high. Location of the site is not optimal to attract international students.

Opportunities:
Institute topics are clearly driven by medical applicability. Some projects are close or reach applicability (several patents and numbers of applied results). This scientific strategy is currently a success. BIOCEV has a large number of top-notch instruments and devices, but lacks an in-house cryoelectron microscopy facility which could open-up projects tackling larger macromolecular complexes with potential for wider grant application.

Threats:
The institute size has been growing steadily till now. They reached a critical mass which certainly needs to be stabilized for some years before initiating a new round of recruitment. In particular, the administrative services are apparently under pressure (this problem is particularly important for grant administration and more strikingly patent services). An effort should be made to decrease the administrative paper load from the group leaders. Similarly, some training should be made in a systematic manner on the newly recruited personnel to sensitize them to the specific communication requirements linked with patent deposition.

Main criterion: 1. Quality of results (H1.1-H1.5)

H1.1	Quality of selected outputs of Phase I
Publications are of good to excellent quality. They nicely reflect the variety of topics and projects present in the various groups composing the institute. The number of publications is quite high: more than 200, reflecting the outstanding level of their research for a reasonable number of researchers.	
H1.2	**Contribution of workers on the outputs reached**
The work is clearly coming from the personnel present in the groups of the team 1. However, if required, the team 1 PIs easily cooperate with the other scientific groups. Team 2 publications are of good quality vis-à-vis their subject closer to basic research.	
H1.3	**Quality of all outputs and results**
Some of the non-evaluated outputs are within journals with lower impact factors. Nevertheless, outputs are well written and scientifically correct.	
H1.4	**The most valuable discoveries and findings in the fields, their importance for the field**
The fields are diverse and a number of them have significant impact in their field (from fertility to cancer treatment with more fundamental structural dynamics approach). The most valuable discovery is certainly the development of potent anticancer drugs named MitoTam and derivatives. Of note, their work on fertility is certainly also full of promise as their effort on HDAC inhibitor development or their strategy regarding new protein engineering. We can appreciate also the number of structures deposited in the Protein DataBank.	

H1.5	Contribution of the participation of the authors in large collaborations
The PIs from the institute are very active in seeking funds especially. Of note, they participated in two major funding schemes aimed at developing infrastructure (INSTRUCT-ERI and MOSBRI) and to at least one large international collaborative research effort exemplified by the study performed in Neuzil's research group.	

Main criterion: 2. Societal relevance (H2.1-H2.5)

H2.1	Societal relevance of outputs and results pursuant to CAS and institute mission
The topics chosen by the institute direction are clearly oriented toward medical care. The results from the various group research are highly promising for the treatment of numerous types of diseases or infections such as various cancer types, HIV or bacterial infections. In addition, some studies such as the one on fertility issues may represent exciting avenues for the development of new diagnostic strategies.	
H2.2	**System functionality for knowledge transfer into practise, its usefulness for society. The impact of the institute´s activity on proper practice in society in the area of social sciences and humanities**
PIs from the institute are very much aware regarding applicability. The institute has several FTEs specifically in charge of knowledge transfer. The institute PIs are very active in communicating their results but also in educating a wider public (interviews regarding nobel prize winner for example). Only in the year 2019, they participated or organised more than 20 activities related to outreach activities.	
H2.3	**Relation to practice**
According to the report, at least 8 patents are currently either deposited or under deposition at various levels (national, european and world-wide). Specific personnel are dedicated to preparation and setting-up of documents required for patent deposition. Moreover, several research groups are collaborating with biotech company for the development or the commercialization of material directly issued from the research performed at the Institute. The institute strategy toward research applicability is clearly working very efficiently.	

Further criterion: 1. Position in international and national context (D1.1-D1.3)

D1.1	Comparison of the teams and the institute with similar international and national institutes
Several laboratories are in world-leading positions. At the level of Czech Republic, the IBT is certainly within the top 5 institutes or better. Internationally, the IBT is still a step below the top continental structures such as ETH, EMBL or several english institutes, but it is mostly due to their smaller size and to their stronger choice for translational research which may limit their interest in publishing more fundamental studies in potentially more prestigious journals.	
D1.2	**Scope and quality of international and national cooperation and the role of the institute in such cooperation; engagement in broad international cooperation**

The IBT is strongly involved in the development of excellent infrastructures (in structural biology, in biophysics and in high-throughput sequencing) via national and European cooperation. The IBT has been very proactive and very successful.

D1.3	Participation of the workers in scientific community activities (organizing of conferences and workshops, invited lectures, awards)
IBT's personnel are quite active in communicating about their results. They all participate in numbers of scientific events as well as by being part of national or international scientific bodies related to their speciality.	

Further criterion: 2. Vitality, sustainability and strategy (D2.1-D2.9)

D2.1	Direction in line with the perspective of the planned research directions
The direction is fully in line with the planned research direction.	
D2.2	**Assessment of the previous research objectives and their achievement**
They have clearly fulfilled all the previous research objectives and are likely to achieve the coming one!	
D2.3	**Assessment of implementation of recommendations from past evaluation**
Past recommendations have been implemented and even surpassed with the establishment of a Scientific Advisory Board, which will give to the IBT a fully independent view of its research programs.	
D2.4	**Success in receiving grants**
The funding level of the IBT is outstanding, both thanks to high success rate to national grant and thanks to their link with the private sectors.	
D2.5	**Adequacy of instrumental equipment**
Outstanding as well. Of note is the requirement for a cryo-Electron Microscopy facility which would open up new research projects on more fundamental aspects.	
D2.6	**Effectiveness of management**
IBT's director is doing an excellent job in its management as the working atmosphere appeared very pleasant.	
D2.7	**Assessment of professional structure, development strategy and the strategy of keeping best scientists, age structure, career and qualification growth**
The IBT has stabilized two research groups during the last period (group PI status switching from Junior to Senior). They are very aware of the age structure which is pretty good for the IBT. They also promote their personnel career by making sure that they publish during their time at IBT, leading to a steady number of publications per FTE between 1 and 1.5.	
D2.8	**Creating work-life balance conditions, assessment of approach towards possible gender issues**
The IBT is not respecting the gender issues at the level of PIs but overall more women than men are working at the IBT. Work-life balance appears respected.	

D2.9	Relation of the institute with regard to the integration, development and sustainability of the research centre funded by the National Programme of Sustainability II.
Excellent.	

Further criterion: 3. Cooperation with universities and participation in education (D3.1-D3.6)

D3.1	Scope of cooperation with universities on national and international level
IBT group leaders are regularly teaching at the nearby Universities. At least one PI has a dual affiliation with Griffith University in Australia. They also seek actively the pedagogical qualifications for their junior personnel.	
D3.2	**Effectiveness of joint research centres**
The development of the service laboratories is excellent both in securing funding for the future and in providing technological platform for their own research laboratories.	
D3.3	**Success rate in supervision of PhD students**
Each PI supervises several PhD students which are regularly defending their thesis. According to the interviews, access to student is not an issue despite their geographical location outside Prague.	
D3.4	**Participation of PhD students in the outputs**
Author list are generally containing PhD students reflecting their active participation in the research outputs of the IBT.	
D3.5	**Participation of the institute in master or bachelor studies**
PIs are in their majority teaching at the various University levels and IBT's direction is actively promoting such activity.	
D3.6	**Assessment of cooperation intensity with universities in the form of teaching**
See above.	

Further criterion: 4. Outreach activities (D4.1-D4.3)

D4.1	Sufficiency of media strategy and activities in the area of research popularisation
The IBT's PI are very active towards research popularisation. This is exemplified by the numerous interviews in which they participated during the last 5 years.	
D4.2	**Publishing activities and its quality**
More than 200 scientific publications plus book chapters. Maybe, reducing the number of publications may help increase the impact by increasing the output size per publication.	
D4.3	**Participation in professional organisations in the area of research and development**

IBT research group leaders are well connected with the private sectors. It is not clearly stated if they as individuals participate in professional organisation in the area of research and development.

Other comments of the commission:

Excellent institute. Definitely one of the top institutes from the Czech Academy of Science.

Part B: Evaluation of teams

1. Development of Diagnostic and Therapeutic Procedures

Strengths:
Team 1 comprises five individual laboratories, they are of different sizes but all reached excellent results, outputs and valorisations. In the period, they published more than 130 papers, some in excellent journals, with two patents and 13 ongoing ones. Their subjects of research are diverse but all linked to pathologies analysed with different views and tools. The team is of great quality at the International level.

Weaknesses:
In regards to the limited number of permanent positions, the number of research topics can be seen as too important. However, as Team 1 was successful in securing numerous grants, most of the topics have provided publications in good to excellent journals. A potential issue will be to deal with obsolescence of some materials and absence of dedicated grants for instrument maintenance.

Opportunities:
Team 1 had during the evaluated period shown an important number of collaborations, both national and international. A large number was with top class laboratories. As facilities are also of great quality, it would be interesting to recruit new teams.

Threats:
Location of BIOCEV is not perfect to attract international students, and also can limit the recognition of the individual research groups embedded within the Team.

Main criterion: 1. Quality of results (H1.1-H1.5)

H1.1	Quality of selected outputs of Phase I
Excellent quality with ~ 1/3 of them being in the top journal (first decile or first quartile).	
H1.2	**Contribution of workers on the outputs reached**
More than half of the output with corresponding authorship from the team.	
H1.3	**Quality of all outputs and results**
Outputs are published in excellent journals and specialized journals highly recognized in their field.	
H1.4	**The most valuable discoveries and findings in the fields, their importance for the field**
Every group of Team 1 had highly pertinent discoveries published during the evaluated period. Hence, the Laboratory of Reproductive Biology had expertise in sperm-egg membrane protein interaction that will have direct biomedical applications and impact on fertility. Laboratory of Molecular Therapy showed that MitoTam is efficient against a number of cancers. They study the molecular mechanism of horizontal transfer of mitochondria with a large spectra of impacts ranging from platelets to oncological issues. Laboratory of Gene Expression focuses on developmental biology and neurobiology using sophisticated new approaches, for instance providing new insights on Alzheimer's disease. Laboratory of Molecular Pathogenetics used very different models ranging to analyse	

transcription factor networks and how their dysfunction affects embryonic development. Laboratory of Tumour Resistance showed significant results on tamoxifen resistance in breast cancer.

H1.5	Contribution of the participation of the authors in large collaborations
Every laboratory of Team 1 collaborates with multiple laboratories in Europe, Asia, Oceania, and USA. They are supported by international grants, i.e. EU, German, Taiwan. They participated in two majors funding schemes aiming at developing infrastructure (INSTRUCT-ERI and MOSBRI).	

Main criterion: 2. Societal relevance (H2.1-H2.5)

H2.1	Societal relevance of outputs and results pursuant to CAS and institute mission
The research of Team 1 is clearly driven by the patients and the pathologies. Their results are highly interesting for fertility issues and for multiple cancer types. The different themes had clear societal impacts.	
H2.2	**System functionality for knowledge transfer into practise, its usefulness for society. The impact of the team´s activity on proper practice in society in the area of social sciences and humanities**
As a large part of the studies provided by Team 1 has societal and practical interest, they have been deeply implicated in communication activities of various types, even to a general audience, including Youtube channel, TV and radio. It is rare to have so many media.	
H2.3	**Relation to practice**
Two patents have been completed during the evaluated period and a large number of potential ones have been presented. Many collaborations with companies are also done. The strategy for valorisation is clear and efficient.	

Further criterion: 1. Position in international and national context (D1.1-D1.3)

D1.1	Comparison of the team with similar international and national institutes
Several laboratories of Team 1 are in world-leading positions, and of course at national level. As part of IBT, they can be seen as slightly below bigger institutions, but it is mostly due to the number of permanent positions and the translational research that limit the access to top 1% journals.	
D1.2	**Scope and quality of international and national cooperation and the role of the team in such cooperation; engagement in broad international cooperation**
It is excellent in both national and international cooperation, their numbers are impressive both in terms of quantity and quality. European cooperation is excellent, but also with Asia and the US.	
D1.3	**Participation of the workers in scientific community activities (organizing of conferences and workshops, invited lectures, awards)**

Team 1 researchers are quite active in communicating about their results. They all participate in numbers of scientific events as well as by being part of national or international scientific bodies related to their speciality with important places in learned organizations and societies both nationally and internationally.

Further criterion: 2. Vitality, sustainability and strategy (D2.1-D2.9)

D2.1	**Direction in line with the perspective of the planned research directions**
The direction is fully in line with the planned research direction.	
D2.2	**Assessment of the previous research objectives and their achievement**
They have clearly fulfilled all the previous research objectives and are likely to achieve the coming one!	
D2.3	**Assessment of implementation of recommendations from past evaluation**
The recommendations have been effectively followed up.	
D2.4	**Success in receiving grants**
The funding level of the Team 1 is excellent. It includes a high success rate with national grants, some international, and good links to the private sectors.	
D2.5	**Adequacy of instrumental equipment**
Excellent and highly diverse.	
D2.6	**Effectiveness of management**
Management is excellent, every laboratory had its own independence but the number of interactions is good.	
D2.7	**Assessment of professional structure, development strategy and the strategy of keeping best scientists, age structure, career and qualification growth**
Although location is not the most practical in theory to attract young scientists and students, there are reasonable numbers of them present. There is a good follow-up of careers locally, the students have good opportunities. The average age of permanent staff has a natural tendency to advance, it will be good to add Junior teams in the future.	
D2.8	**Creating work-life balance conditions, assessment of approach towards possible gender issues**
IBT is an excellent place for pleasant work with facilities and the gender balance is correct in Team 1.	
D2.9	**Relation of the team with regard to the integration, development and sustainability of the research centre funded by the National Programme of Sustainability II.**
Excellent.	

Further criterion: 3. Cooperation with universities and participation in education (D3.1-D3.6)

D3.1	Scope of cooperation with universities on national and international level
Group leaders are teaching in numerous Universities. It is very correct.	
D3.2	**Effectiveness of joint research centres**
The development of the service laboratories is excellent both in securing funding for the future and in providing technological platforms for their own research laboratories.	
D3.3	**Success rate in supervision of PhD students**
Salary of PhD students is very correct in regards to Czech Republic; several former PhD students have good postdoc positions. PIs have correct number of PhD students.	
D3.4	**Participation of PhD students in the outputs**
Author lists are generally containing PhD students reflecting their active participation in the research outputs. They have a good average number of publications.	
D3.5	**Participation of the team in master or bachelor studies**
PIs are implicated in numerous masters.	
D3.6	**Assessment of cooperation intensity with universities in the form of teaching**
They are well implicated.	

Further criterion: 4. Outreach activities (D4.1-D4.3)

D4.1	Sufficiency of media strategy and activities in the area of research popularisation
It is excellent. Number of interviews with a large number of media is impressive.	
D4.2	**Publishing activities and its quality**
More than 130 publications are concerned, an excellent ratio per scientist. Moreover, they are in good to excellent journals. Due to the specificity of translational biology and applications, the number of citations is a little more limited. Having less research applied should increase this factor.	
D4.3	**Participation in professional organisations in the area of research and development**
Group leaders are well connected with various private sectors. It is more limited for the younger scientists.	

Other comments of the commission:

2. Structural Biology and Protein Engineering

Strengths:
Dynamic team with excellent record of publication. Very active in translating their research results. Excellent facilities.

Weaknesses:
Difficulty to keep funding at such a high level. Individual research groups have to foster more intra-team collaborations.

Opportunities:
Several projects have high potential for applicability. Patenting is ongoing and licenses should be acquired by local or international companies.

Threats:
May be difficult to keep such a high level of productivity. Individual group leaders would certainly benefit from regular group leader meetings to keep a shared research focus.

Main criterion: 1. Quality of results (H1.1-H1.5)

H1.1	Quality of selected outputs of Phase I
Excellent quality with ~ 1/3 of them being in the top journal (first decile or first quartile).	
H1.2	**Contribution of workers on the outputs reached**
Almost 2/3 of the output with corresponding authorship from the team.	
H1.3	**Quality of all outputs and results**
Globally, outputs are mostly published in reviewed journals indicating the high standard of the performed research.	
H1.4	**The most valuable discoveries and findings in the fields, their importance for the field**
Several achievements are to be noticed with regards to the team goal, i.e. provide mechanistic explanation of biological processes: detailed view of the transcriptional regulatory network, understanding of DNA bending within the nucleosome. Regarding the potential applications of their results, several patents and multiple contracts with pharmaceutical companies have been established or carried out clearly demonstrating the quality of their research (HDAC isoform production and inhibitors, non-cognate ligands, Interleukin antagonists).	
H1.5	**Contribution of the participation of the authors in large collaborations**
The team members participated in large international collaborative efforts mostly to gather and finance a state-of-the-art technological platform (Instruct-ERIC) and in developing the use of biophysical methods in biology (ARBRE-MOBIEU).	

Main criterion: 2. Societal relevance (H2.1-H2.5)

H2.1	Societal relevance of outputs and results pursuant to CAS and institute mission

Excellent fit of the team research outputs with the societal goal of the CAS and with regards to the institute missions. They produced both applied and fundamental results on the various topics they are interested in.	
H2.2	**System functionality for knowledge transfer into practise, its usefulness for society. The impact of the team´s activity on proper practice in society in the area of social sciences and humanities**
Knowledge transfer is also excellent with several patents deposited or about to be as well as several contracts with companies to provide materials or samples. Impact in the area of social sciences and humanities is not applicable.	
H2.3	**Relation to practice**
Very effective strategy with more than 400 000 Euros received from contracts with biotech companies plus several research contracts for an additional 250 000 Euros. Definitely profitable activities for the team.	

Further criterion: 1. Position in international and national context (D1.1-D1.3)

D1.1	**Comparison of the team with similar international and national institutes**
The team is competitive with similar institutes, and likely bigger institutes in Europe or else. The team is very dynamic and apparently man power is easily shifted between projects, making success more likely to occur within the short time frame of the received grants (3 years).	
D1.2	**Scope and quality of international and national cooperation and the role of the team in such cooperation; engagement in broad international cooperation**
Individual research groups have quite a number of international and national collaborations with roles of various importance. The team is active in joining broad international collaboration, in particular to keep its technical platforms at the top level.	
D1.3	**Participation of the workers in scientific community activities (organizing of conferences and workshops, invited lectures, awards)**
Most group leaders are members of international associations at various levels (chairman, members and auditors). They (co-)organized 18 conferences/work-shop during the last 5 years, which is impressive, considering that 2020 was a tough year for conferences.	

Further criterion: 2. Vitality, sustainability and strategy (D2.1-D2.9)

D2.1	**Direction in line with the perspective of the planned research directions**
The direction is fully supportive of the planned research projects.	
D2.2	**Assessment of the previous research objectives and their achievement**
Consolidation and gain of visibility for the team has been successfully implemented, maybe even more than expected!	
D2.3	**Assessment of implementation of recommendations from past evaluation**

Recommendations have been applied with the establishment of tighter scientific links with the local ELI beamlines at the Institute of Physics.	
D2.4	**Success in receiving grants**
The team is very successful in acquiring grants with an average of 2-3 grants per laboratory composing the team.	
D2.5	**Adequacy of instrumental equipment**
Outstanding. Hard to imagine a better situation.	
D2.6	**Effectiveness of management**
From the interviews, the commission felt an excellent working atmosphere with individual PIs being solely focused on their research rather than on space issues or else.	
D2.7	**Assessment of professional structure, development strategy and the strategy of keeping best scientists, age structure, career and qualification growth**
One research group was created in 2015. The junior group was successful in gathering funding and published nice outputs. The group should be positively reviewed in the coming year to switch its status to Senior group.	
D2.8	**Creating work-life balance conditions, assessment of approach towards possible gender issues**
Gender issues are taken into account whenever necessary (working schedule adjusted, maternity and paternity leave, etc).	
D2.9	**Relation of the team with regard to the integration, development and sustainability of the research centre funded by the National Programme of Sustainability II.**
Excellent.	

Further criterion: 3. Cooperation with universities and participation in education (D3.1-D3.6)

D3.1	**Scope of cooperation with universities on national and international level**
The team is located in the BIOCEV, which is a joint centre with Charles University. They belong to the Program 3 dedicated to structural biology and protein engineering. They clearly are perfectly suited for such cooperation.	
D3.2	**Effectiveness of joint research centres**
Such joint research centre organization is outstanding and represents an example to follow and strengthen.	
D3.3	**Success rate in supervision of PhD students**
They supervised more than 25 PhD students indicating that approximately each group enrolled 1 PhD student every year, which is pretty good.	
D3.4	**Participation of PhD students in the outputs**

They are important components of the scientific outputs with 15 papers as first author for a total of 32 publications with PhD students in the author list. This represents 1/3 of all publications has some participating PhD students during the evaluation period.	
D3.5	**Participation of the team in master or bachelor studies**
The team PIs teach significantly at all levels in the nearby Universities. This team is one of the most involved in teaching from all the evaluated teams.	
D3.6	**Assessment of cooperation intensity with universities in the form of teaching**
Collaboration seems adequate. Several PIs also have the title of Full Professor or Associate Professor in the nearby universities. This includes lecturing at all levels (Bachelor and Master).	

Further criterion: 4. Outreach activities (D4.1-D4.3)

D4.1	**Sufficiency of media strategy and activities in the area of research popularisation**
The team is participating in numbers of outreach activities such as secondary school lectures or interviews on TV. They had an average of 3-4 actions every year during the evaluated period.	
D4.2	**Publishing activities and its quality**
They do not report specific publishing activity directed towards science popularization.	
D4.3	**Participation in professional organisations in the area of research and development**
They have not indicated specific participation in professional organisations.	

Other comments of the commission:

Final report was elaborated by:

Commission 5.2 - Biological sciences A
Evaluated teams No.: 1, 2

Commission Chair: Professor Bryan Cullen
Commission Deputy Chair: Marcela Chmelařová
Commission Members:

- Nicholas Foulkes
- Josef Glössl
- Michael Hausmann
- Stéphanie Robert
- Didier Stainier
- Martin Teichmann
- Stéphane Thore
- Jianlong Wang
- Alexandre G. de Brevern