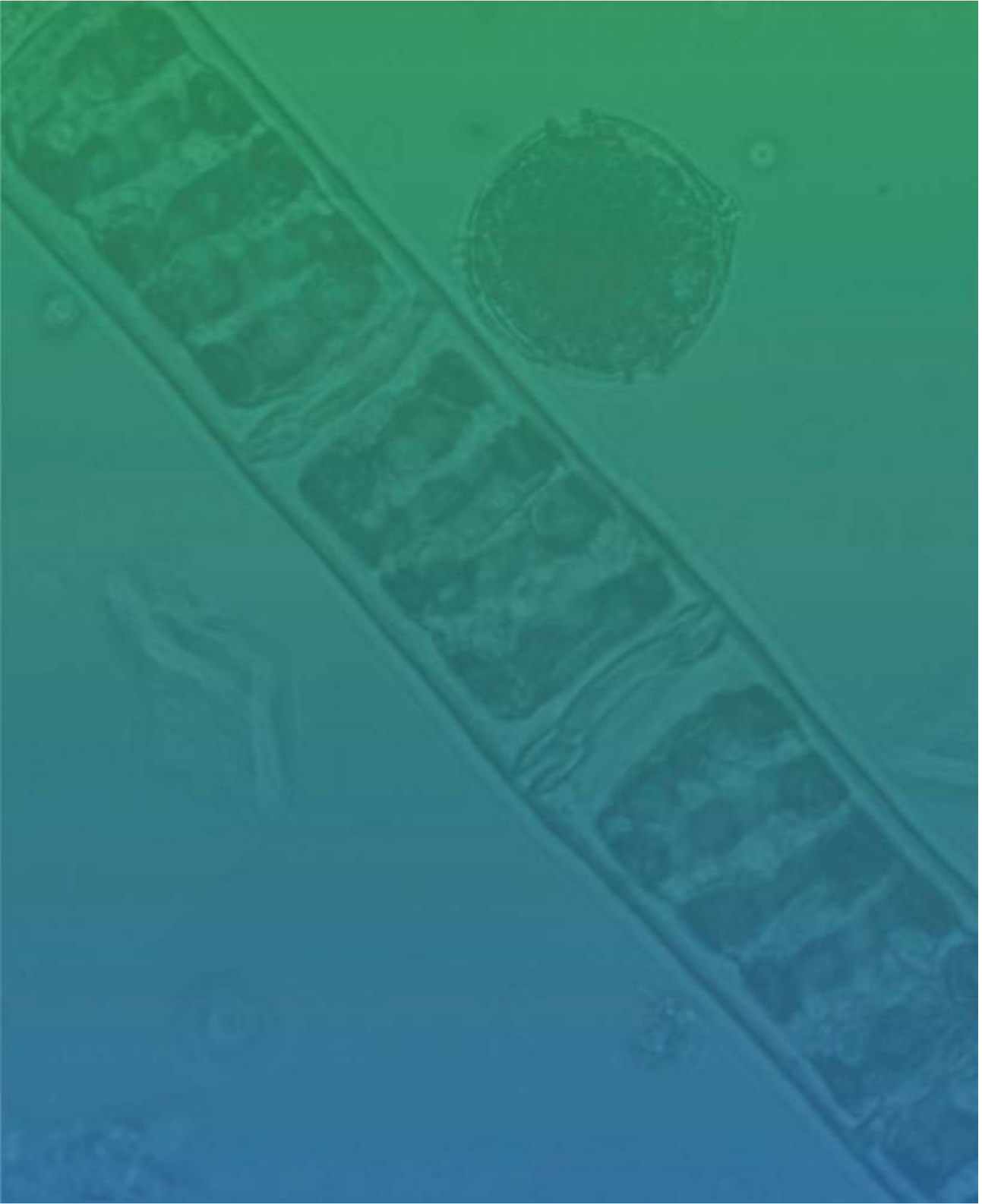
NACIONALNI INŠTITUT ZA BIOLOGIJO
NATIONAL INSTITUTE OF BIOLOGY

POROČILO O DELU 16
ANNUAL REPORT 16



Poročilo o delu 2016 / Annual report 2016

POSLANSTVO
MISSION

Ustvarjanje novega znanja s temeljnimi raziskavami na področju biologije in njej sorodnih naravoslovnih ved, varstva okolja, biotehnologije ter biomedicine za razumevanje življenjskih procesov;
Prenos ustvarjenega novega znanja v uporabo s ciljem izboljševanja kakovosti življenja;
Prenos ustvarjenega znanja na mlajše generacije z izobraževanjem na dodiplomski in podiplomski ravni.

Creating new knowledge through basic research in the field of biology and related natural sciences, environmental protection, biotechnology and biomedicine;
Applying newly created knowledge in industry with the goal of improving the quality of life;
Transfering knowledge to younger generations through education at undergraduate and graduate level.

VIZIJA
VISSION

Želimo ustvarjati vrhunsko znanje in tehnologije na področju ved o življenju in njegovem okolju kot mednarodno uveljavljena avtonomna institucija.
Z dobro organiziranostjo in vrhunsko opremo bomo skrbeli za zadovoljstvo zaposlenih in vzgojo vrhunskih kadrov.
V tesni povezavi z družbo in poslovnim sektorjem bomo zagotavljali svoj dolgoročni razvoj.

We wish to create elite knowledge and technologies in the field of life sciences and their environments as an internationally renowned autonomous institution.
We will be taking care of the satisfaction and education of top-level personnel through good organization and state-of-the-art equipment.
We will ensure our long-term development in close association with the society and the business sector.

VSEBINA
CONTENTS

Prof. Tamara Lah Turnšek je od leta 1996 direktorica Nacionalnega instituta za biologijo, ki je tretji največji javni raziskovalni institut na področju naravoslovja v Sloveniji. Ustanovila je Oddelek za genetsko toksikologijo in biologijo raka, kjer je vodja raziskovalnega programa. Od leta 2004 je habilitirana kot redna profesorica pri Biotehniški fakulteti v Ljubljani in poučuje biologijo raka na Univerzi v Ljubljani ter matične celice in proteaze na mednarodni Podiplomski šoli Instituta Jožef Stefan. Raziskovalno področje prof. Lahove so raziskave proteoliznih encimov in njihovih inhibitorjev v pato-fizioloških pogojih, še posebno v rakavih obolenjih. Njene nedavne raziskave se osredotočajo na možganske tumorje gliome in vlogo normalnih matičnih celic v napredovanju tumorjev in zdravljenju.

Prof. Tamara Lah Turnšek, Director of the National Institute of Biology in Ljubljana, has been the head of the 3rd largest public research institution for natural sciences in Slovenia since 1996. She established the Department of Genetic Toxicology and Cancer Biology and continues to be the Programme leader of this research group. Since 2004 she is also Professor at the Biotechnical Faculty, University of Ljubljana, teaching Cancer biology, and at Josef Stefan Postgraduate School, teaching Stem cells and proteases. Basic research interests of Prof. Lah comprise the role of proteolytic enzymes and their inhibitors in pathophysiological conditions, particularly in cancer. Her recent research is focused on glioma brain tumours and the role of normal stem cells in tumour progression and therapy.

prof. dr. Tamara Lah Turnšek
direktorica/Director

UVODNA BESEDA DIREKTORICE

Ob zaključku leta 2016, na dan ustanovitve našega inštituta, smo se ponovno zbrali, da se poklonimo Znanosti in podelimo Zeieve nagrade in priznanja ter pohvalimo dosežke naših raziskovalcev in mladih raziskovalcev. Star kitajski pregovor pravi »Vir modrosti je neustavljiva želja po učenju«, in učiti se je del človeške narave pravega raziskovalca in učitelja, kot je bil tudi ustanovitelj tega inštituta prof. Miroslav Zei, izjemen morski biolog in strateg. In seveda, v vseh preteklih desetletjih do danes je NIB soustvarjala vrsta odličnih znanstvenikov in učiteljev. Kaj pa bo v nadaljnjih letih, se vsaki dan bolj zaskrbljeno sprašujemo.

Nad znanostjo se še vedno zbirajo črni oblaki, saj aktualna politika znanstveno raziskovanje in seveda modrost, ki naj iz tega izvira, še vedno marginalizira. Zaradi slabe koherentnosti politik glede vključitve raziskovalnega pristopa v aktualne probleme družbe in okolja vlada medsebojno nezaupanje med raziskovalno sfero in politiko – ter družbo do obeh! Zaradi proračunskih težav v času gospodarske krize, smo se krepko oddaljili od smernic raziskovalno-razvojne strategije (RISS), sprejete v DZ leta 2011, in bili priča najhitrejšemu drastičnemu krčenju raziskovalne dejavnosti v Sloveniji po vojni in od vseh dejavnosti javnega sektorja! Danes je raziskavam namenjenih le še polovico javnega denarja, kar bi po sprejeti strategiji od leta 2011 morali vlagati v znanost. S tem smo na repu evropskih držav glede javnega vlaganja v znanost in
Raziskovalci NIB-a še kako vemo, da je človek neločljivo povezan z različnimi ekosistemi, saj veliko, če že ne večina naših raziskav, posega na področje temeljnih in aplikativnih raziskav okolja in bioloških sistemov v njem, vključujoč seveda človeka in njegovo – naše zdravje! Ugotovitve naših raziskav so uporabne tako v okolju, kmetijstvu, zdravstvu, celo obrambi in ne nazadnje, če ne celo najprej, v gospodarstvu, zato se trudimo z več ali manj uspeha sodelovati tudi z večino relevantnih ministrstev in agencij, tako neposredno ali seveda posredno, in z drugimi partnerji. Tako smo še kako vpeti v družbene probleme, ki so med drugim tudi pogojeni s spreminjajočim se naravnim okoljem in vsem živim v njem, tudi človekom. A zdi se, da mi in razvoj Nacionalnega inštituta za biologijo ni družbeni problem, saj naša oprema zaostaja, propada in raziskovalci, posebej mladi, nas zapuščajo.
Ko sem pred 20 leti prevzela ta inštitut in je zrasel več kot enkrat, ko smo zgradili novo Morsko biološko postajo v Piranu, ko so ustvarili Infrastrukturni center NIB, danes z velikim razočaranjem skoraj brezmočno opazujem njegovo krčenje, zdaj že za skoraj tretjino. Čeprav je trend zniževanj zdaj že drugo leto zastal, nedvomno zaradi prizadevanj MIZŠ, je nerazumevanje potreb in pomena znanosti same s strani najvidnejših politikov pospešil tudi neustavljivi enosmerni beg možganov, žal tudi iz naše hiše.

A malodušje, ki ob tem nastaja med tistimi, ki smo si najbolj prizadevali za drugačno politiko in nas danes sili v medsebojna kritiziranja in obtoževanja, vendarle ne more zadušiti navdušenja tistih raziskovalcev, ki kljub težkim pogojem dosegajo celo nadpovprečne uspehe. A ti žal ne temeljijo na dobrem sistemu, ampak le na prizadevanju in še vedno neustavljivi volji do spoznavanja, raziskovanja posameznikov. Zato jih ne smemo spregledati in naj bodo zgled mladim in starejšim v upanju, da bomo prav s to energijo odkrivanja novega prebrodili slabe čase. Opažamo nove poganjke, nove dosežke mladih in malce starejših, ki jih iščemo v sodelovanjih in izven domovine, sinergije med in izven znanstvenih ustanov, in upamo, da se bomo kmalu tudi mi prenovili in našli niše, kjer bomo ponovno vzcveteli in naše znanje tudi primerno umestili, kamor sodi. Zato potrebujemo modrost in pametne odločitve, ki seveda izvirajo iz neustavljive strasti in želje po znanju, kot pravi tisti kitajski pregovor.

Letos je leto voda, ki je pomemben predmet naših raziskav. Voda je osnovni pogoj za življenje, za kemike enostavna formula, ki jo fiziki razkosajo na težko predstavljivo majhne delce, biologi pa v njej vidijo molekulo, ki je vpletena v biokemijske mehanizme našega delovanja in medij za razvoj živih organskih struktur nezaslišane kompleksnosti in precizne regulacije. Voda kot okras narave je tudi umetniški navdih, kot simbol očiščenja duhovnosti nastopa v religijah in verovanjih, a postaja danes "nafta 21. stoletja", saj voda predstavlja eno največjih svetovnih tržnih valut.

A postaja tudi družbeni problem v Sloveniji, obdarjeni s toliko čudovitih virov pitne vode! Inženirska akademija Slovenije (IAS) kot osrednja ustanova uveljavljenih in družbeno prepoznanih raziskovalcev in inženirjev na področju naravoslovnih in tehniških ved, z zaskrbljenostjo spremlja dolgoročno politiko do voda v Republiki Sloveniji kot tudi njen vsakodnevni odnos do vode v vseh njenih pojavnih oblikah. IAS ugotavlja, da se zanemarja temeljne principe urejanja voda. Obstoječi modeli upravljanja voda so v veliki meri centralistični in temeljijo na stacionarnosti in reverzibilnih spremembah v naravnih sistemih. Danes v ospredje vse bolj prihajajo zahteve po pripravah na nenapovedane spremembe, ki sledijo iz kompleksnih povezav in povratnih vplivov med družbenimi skupnostmi, gospodarstvi, kot ugotavlja prof. dr. Matjaž Mikuš. IAS izrecno poudarja, da je voda sicer javna dobrina, ki pa ima svojo ceno, saj je za preskrbo s pitno vodo in za odvajanje in čiščenje odpadnih voda nujna obsežna infrastruktura, ki zahteva redno in investicijsko vzdrževanje. V celoti se strinjam tudi s prof. dr. Mihaelom Tomanom, prodekanom Oddelka za biologijo Biotehniške fakultete, ki meni (citiram), da so voda in vodni ekosistemi dobrina in življenjska sila za vsa živa bitja, ne lastnina izbrancev. Je planetarna dediščina, narodovo bogastvo, pa vendarle ne izključna človekova pravica. Pripada vsem organizmom sveta, antropocentrizem in razprodaja vodnih virov sta posledično pogubna za vse. Ohranjena površinska in podzemna vodna okolja so ključna za preživetje, a kljub visoki osebni in družbeni deklarativni odgovornosti država in posamezniki z veliko lahkotnostjo delijo več desetletne koncesije za slovenske vodne vire domačim in tujim mešetarjem, ki jim ni mar za vodo, pač pa za dobiček od nje.
Nujno je torej, da nekaj ukrenemo! A to ni le naloga biologov, inženirjev, naravovarstvenikov, pravnikov, ampak vseh, ki hočejo razumeti pomen vode in vodnih okolij za življenje nasploh. Tudi v opredelitvah o dolgoročnem razvoju Slovenije beremo, da je voda ena od strateških naravnih bogastev Slovenije, temelj njenega nadaljnjega družbenega in gospodarskega razvoja. Zato ne spreglejmo, da so človekove pravice tudi v odnosu do narave in celinskih voda.

DIRECTOR'S INTRODUCTION

At the end of 2016, on the day of the anniversary of our institute, we have gathered once again to pay tribute to Science and present the Miroslav Zei awards and recognitions to commend our researchers and young researchers for their achievements. An old Chinese proverb says: "The source of wisdom is the unstoppable desire to learn" – and learning is a part of human nature of every true researcher and teacher such as Prof. Miroslav Zei, an outstanding marine biologist and strategist. Through the past decades NIB was also co-created by a string of excellent scientists and teachers. These days we ask ourselves with increasing concern - What will happen in the years to come?

Black clouds still gather over science as the political administration currently in power continues and even intensifies the process of marginalizing research and the wisdom that it produces. Poor political coherence regarding the application of scientific approaches to pressing social and environmental issues results in mutual distrust between the scientific and the political sphere – and a lack of trust of society into both! The tightening of the budget during the economic crisis has caused us to depart quite severely from the direction set in the research and development strategy (RISS), which was confirmed by the parliament in 2011, and we have witnessed the fastest and most drastic reduction of research activities in Slovenia since the war affecting science most severely among all portions of the public sector! Today research receives merely half of the funds predicted for that purpose in the 2011 strategy. This places us at the very back among the European states according to public investments into research and development.

This is happening precisely at the time when the need to adapti to sudden changes resulting from complex associations and mutual influences among various communities, economies and the environment is becoming more and more acute. It is taking place while the unstoppable revenge of nature is falling upon the human race for all the actions of our chosen biological species, assertedly the very peak and unique achievement of the evolutionary helix. But despite the fact, that our awareness of these interactions and our increasingly concerning relationship with our complex environment has grown immensely during the last few decades, our words and actions are often separated by a huge divide. This is also increasingly clear in Slovenia, a celebrated natural treasure that has fallen under the care of ignorant bureaucrats and profiteers, when it comes to its mere preservation – let alone its recovery!

Researchers at NIB are profoundly aware that humans are inseparably connected to various ecosystems. The major part of our work concerns the field of basic and applied research of our environment and the biological systems it contains, including humans, of course, as well as human – our own - health! Our research findings are applicable in the realms of environment protection, agriculture, healthcare, and even defence, as well as – perhaps most importantly – economy; we strive, with greater or lesser success, to cooperate with most relevant ministries and state agencies, directly and indirectly, as well as other partners. We are deeply involved in social problems, which result among other things from changes in natural environment that affect all life, including humans. Nevertheless, it seems that we ourselves and the progress of NIB do not represent a problem to society, with our equipment aging and lagging behind and as our researchers, particularly the young ones, continuously leaving.

I took leadership of the Institute 20 years ago, since then we have doubled in size and built a new Marine Biology Station in Piran and created the NIB Infrastructural centre. Today I observe, disappointed and nearly powerless, how it diminishes with cuts reaching nearly one third. Though the reduction trend has been paused for the second year in a row, undoubtedly due to great exertions of the Ministry of Education, Science and Sport (MESS), the lack of understanding of our needs and the significance of science itself on the part of some of the most prominent politicians is accelerating the unstoppable and unidirectional brain drain, which unfortunately affects our Institute as well.

Fortunately the dismay of those, who have tried the hardest to establish a different kind of politics and are now turning to mutual criticism and accusations, cannot smother the enthusiasm of researchers who continue to deliver outstanding work even under these difficult circumstances. Their achievements are unfortunately not a result of a well-functioning system but rather their own individual research endeavours and their ever-unstoppable will to learn. Thus we cannot let their achievements go unnoticed and are here to highlight their example for researchers young and mature in hope that their kind of energy in discovering the new will help us endure these hard times. We are noticing new growth, new achievements of young researchers as well as more mature scientists, finding it in the realm of international cooperation and collaborations extending outside research institutions and hope that our Institute as well will soon be revitalized and will discover niches that will allow us to thrive once again and bestow upon our knowledge the position it deserves. To do so, we will need wisdom to make the smart decisions, which originate from unstoppable desire and thirst for knowledge, just like that Chinese proverb says.

It is the Year of Water, an important subject of our research. Water is a basic requirement of life, a simple formula to chemists, broken down to hardly imaginable particles by physicists, while biologists see it as a substance involved in biochemical mechanisms of functioning life and a medium for the development of tremendously complex and precisely regulated organic structures. Water, nature's embellishment, is also inspiration to artists, it appears in religions and cults as symbol of spiritual purification, but it is also the "oil of the 21st century" as it has become one of the biggest global market currencies.

Nevertheless, it is also becoming a social problem, even in Slovenia with so many wonderful water sources! The Slovenian Academy of Engineers (SAE), the central institution uniting established and publically recognized engineers active in natural and technical sciences, is observing the long-term policies regarding water in Slovenia and our everyday dealings with water in all of its forms with great concern. SAE finds that the basic principles in managing water are neglected. The current management models are largely centralistic and based on static systems affected by reversible change. But as Prof. Matjaž Mikuš finds, the need is now entering central focus to prepare for sudden changes arising from complex associations are feedback influence loops joining various living communities and economies. SAE explicitly states that water might be a public asset, but it comes with a price, as the supply of drinking water as well as the collection and cleaning of wastewaters demand extensive infrastructure, which requires regular investments and maintenance. I also fully agree with Prof. Mihael Toman, the Vice-Dean of the Department of Biology of the Biotechnical Faculty, who said that water and water ecosystems are crucially important goods and a life force for all living creatures not posessions at the disposal of the chosen few. Water is our planetary heritage, national wealth, and yet not an exclusive human right. It belongs to all organisms in the world, anthropocentrism and selling out our water sources will ultimately destroy all. The health of surface and underground water ecosystems is crucial to our survival, yet despite the publicly stated high level of personal and social responsibility, the state and individuals continue to frivolously grant exclusive rights to use Slovene water sources for future decades to come to domestic and foreign merchants, who are not concerned with water but rather the profit it brings.

It is therefore urgent to act! This is not only a task for biologists, engineers, environmentalists and advocates but rather a concern of everyone who wants to understand the significance of water and water ecosystems for life itself. The guidelines for the long-term development of Slovenia contain a statement that water is a strategic natural wealth of Slovenia and the foundation of its social and economic development. Let us therefore not overlook the fact that human rights are also contained in our relationship towards nature and continental waters.

Jata mladih salp (Sarpa salpa) na travniku kolenčaste cimodoceje (Cymodocea nodosa). / *School of young dreamfish (Sarpa salpa) on the little Neptune grass (Cymodocea nodosa) meadow.*

VODSTVO INŠTITUTA / INSTITUTE'S MANAGEMENT

DIREKTORICA
DIRECTOR

prof. dr. Tamara Lah Turnšek
(od / from 1996)

Mandat / Mandate:
1. 1. 2015 - 31.12. 2019

POMOČNIK DIREKTORICE
ASSISTANT DIRECTOR

mag. Franc Potočnik
(od / from 1999)

Mandat / Mandate:
1. 1. 2015 - 31. 12. 2019

UPRAVNI ODBOR
BOARD OF GOVERNORS

Ivana Erjavec, MKGP - predsednica / president
prof. dr. Marina Dermastia, NIB – podpredsednica / vice-president
dr. Peter Venturini, Helios d.o.o.
dr. Matjaž Oven, Lek d.d.
Luka Živić, MIZŠ

Mandat / Mandate:
28. 5. 2014 - 28. 5. 2018.

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izr. prof. dr. Valentina Turk, predsednica / president
doc. dr. Meta Virant-Doberlet, podpredsednica / vice-president
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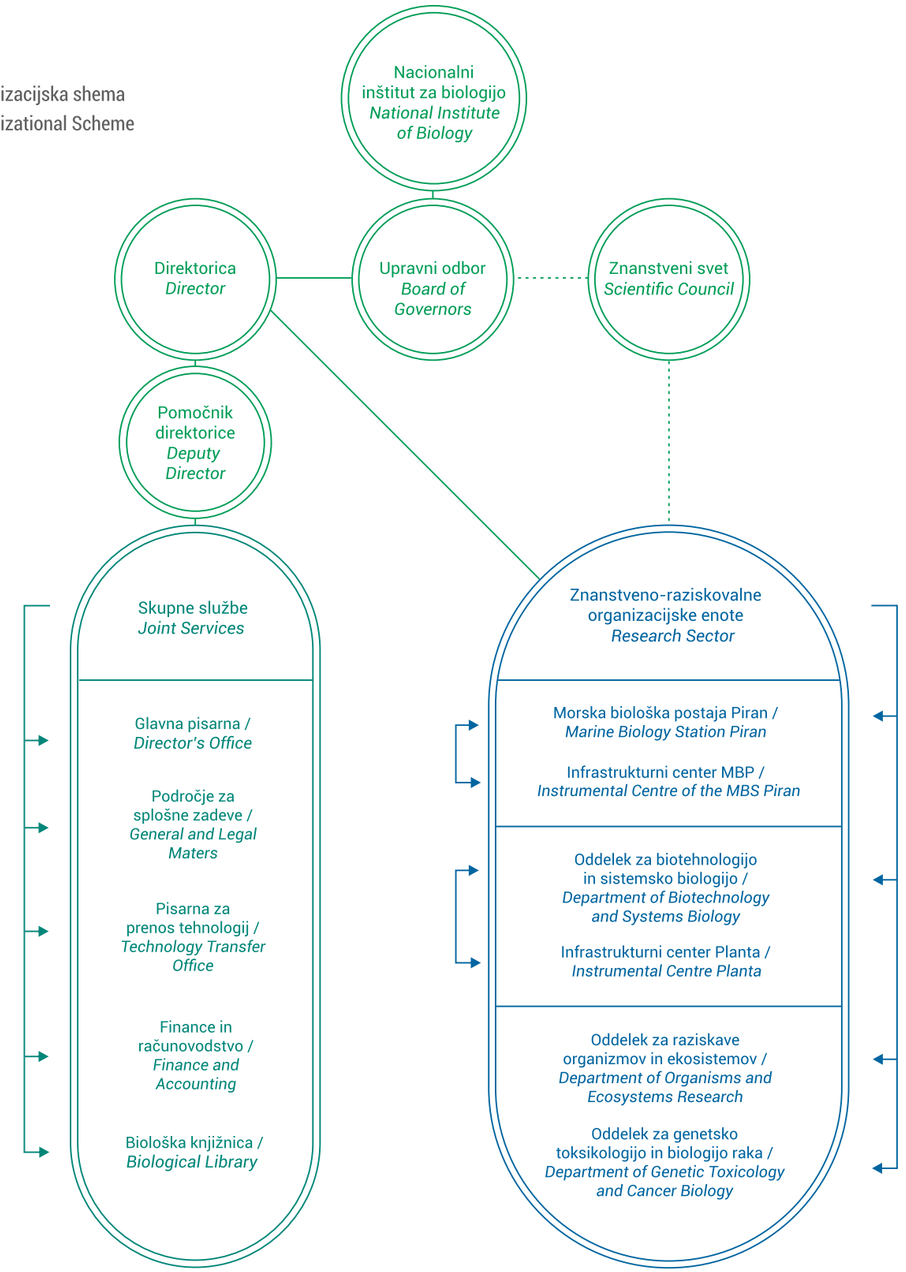
prof. dr. Metka Filipič
prof. dr. Kristina Gruden
izr. prof. dr. Patricija Mozetič
doc. dr. Andreja Ramšak
izr. prof. dr. Jana Žel

Mandat / Mandate: 26. 4. 2016 - 25. 4. 2020

ČASTNI ČLANI
HONORARY MEMBERS

prof. dr. Kazimir Tarman, od / from 25. 10. 2010
dr. Guy Van Den Eede, od / from 25. 10. 2010
prof. dr. Cornelis Johannes Forrendinis van Noorden, od / from 14. 11. 2014

Organizacijska shema
Organizational Scheme



PREGLED POSLOVANJA INŠTITUTA V LETU 2016

2016 BUSINESS REPORT - OVERVIEW

NIB je v letu 2016 posloval uspešno in dosegel zastavljene cilje. Realizirani prihodki so znašali 6.127.433,42 EUR, odhodki pa 6.052.585,00 EUR. Ustvarjeni presežek prihodkov nad odhodki pred obračunom davka od dohodkov pravnih oseb je tako znašal 74.848,42 EUR oz. 61.375 EUR po obračunu davka od dohodka pravnih oseb.

V primerjavi z letom 2015 so bili realizirani prihodki NIB v letu 2016 za malenkost nižji kot v letu 2015 (za 41.666 EUR oz. 0,68 %), na drugi strani pa so bili realizirani odhodki v 2016 nižji kot v letu 2015 za 88.553 EUR (1,44 %) in tako je bil ustvarjeni poslovni izid v letu 2016 precej boljši kot v 2015.

Največja rast prihodkov v letu 2016 v primerjavi z letom 2015 je bila dosežena v kategoriji »tuji trg« (za 126.276 EUR oz. 103,09 %) kot rezultat pridobitve večjega projekta na področju laboratorijskih analiz in ekspertize za ameriškega naročnika ter v kategoriji »raziskovalni projekti ARRS« (za 101.678 EUR oz. 18,54 %) kot rezultat pridobljenih novih projektov v letu 2015. Največje zmanjšanje prihodkov v letu 2016 v primerjavi z letom 2015 je nastalo v kategoriji »domači trg – javna sredstva« (za 150.100 EUR oz. 52,05 %), predvsem zaradi ustavitve financiranja nekaterih razvojnih nalog s strani Ministrstva za okolje in prostor, ter v kategoriji »druga javna služba – drugi tuji skladi« (v katero spadajo različni programi INTERREG, LIFE+, ERA-NET in podobno) za 99.206 EUR oz. 20,93 % zaradi manjšega števila novo pridobljenih projektov iz navedenih programov financiranja.

NIB je v letu 2016 uspešno izvajal temeljno raziskovanje (objavljenih preko 80 znanstvenih člankov v znanstvenih revijah s faktorji vpliva, od tega 46 v revijah v prvem kvartilu) kot tudi aplikativno raziskovanje, kjer velja še posebej poudariti krepitev delovanja na mednarodnem trgu.

Leto 2016 je bilo tudi zaznamovano z NIB-ovim intenzivnim sodelovanjem pri prijavah projektov na različne razpise, pri katerem je bil uspešen:

-Na Javni razpis ARRS za (so)financiranje raziskovalnih projektov za leto 2017 je NIB kot nosilna organizacija prijavil 17 predlogov projektov, od katerih so bili odobreni trije;
-na razpisih v Obzorje 2020 je sodeloval v 17 prijavah projektov, od katerih je bilo pet odobrenih;
-na razpisih INTERREG programov je sodeloval v 25 prijavah projektov, od katerih je bilo odobrenih pet.

In 2016 NIB performed business successfully and the goals that were set were reached. Total revenue amounted to 6,127,433.42 EUR and total expenditure reached 6,052,585.00 EUR. The surplus of income over outcome thus amounted to 74,848.42 EUR before tax and 61,375.00 EUR after tax.

In comparison to the year 2015, the total revenue in 2016 was slightly lower (41,666.00 EUR or 0.68%), while on the other hand total expenditure in 2016 was 88.553,00 EUR (or 1.44%) lower than that of 2015. Thus the final business result was significantly better in 2016.

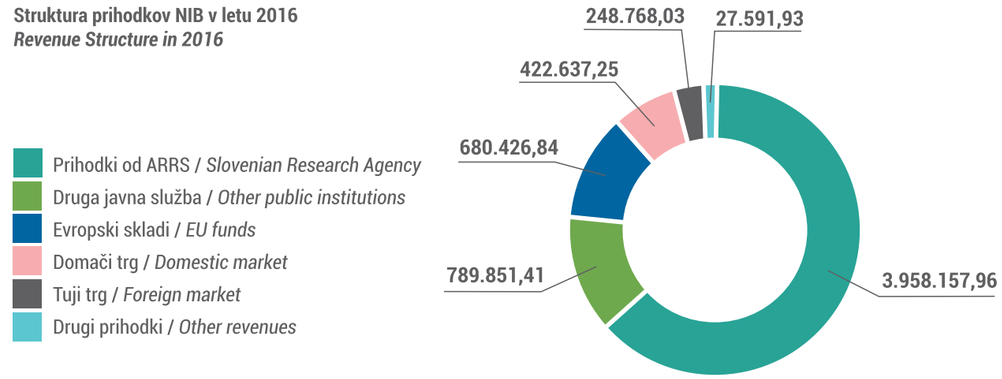
In comparison to 2015, the most significant revenue growth in 2016 was reached in the Foreign markets category (126,276.00 EUR or 103.09%) – a result of a major project involving laboratory analyses and our expertise commissioned by an American client, and in the Slovenian Research Agency research projects category (101,678,00 EUR or 18.54%) as a result of success of our projects in Slovenian Research Agency calls in 2015. The largest drop in revenue in comparison to the year 2015 was recorded in the Domestic market category (159,100.00 EUR or 52.05%) which is primarily due to the termination of financing of some developmental projects by the Ministry of the Environment and Spatial Planning and in the Other revenues category comprising of various programmes like INTERREG, LIFE+, ERA-NET etc. (99,206,00 EUR or 20.93%) due to fewer new projects financed from these programmes.

In 2016 NIB successfully performed basic research (over 80 published original research papers in journals with an impact factor, 46 in those of the best quartile) as well as applied research where notable growth was recorded in the foreign market.

2016 was also characterised by intensive collaborations in the preparation of project proposals for various calls with successful applications to:

-ARRS call for (co)financing of research projects for 2017 – as the leading partner NIB entered the call with 17 project proposals and received funding for three (3);
-Horizon 2020 calls – NIB cooperated with 17 project proposals and received funding for five (5);
-INTERREG programme calls – NIB entered with 25 projects and received funding for five (5).

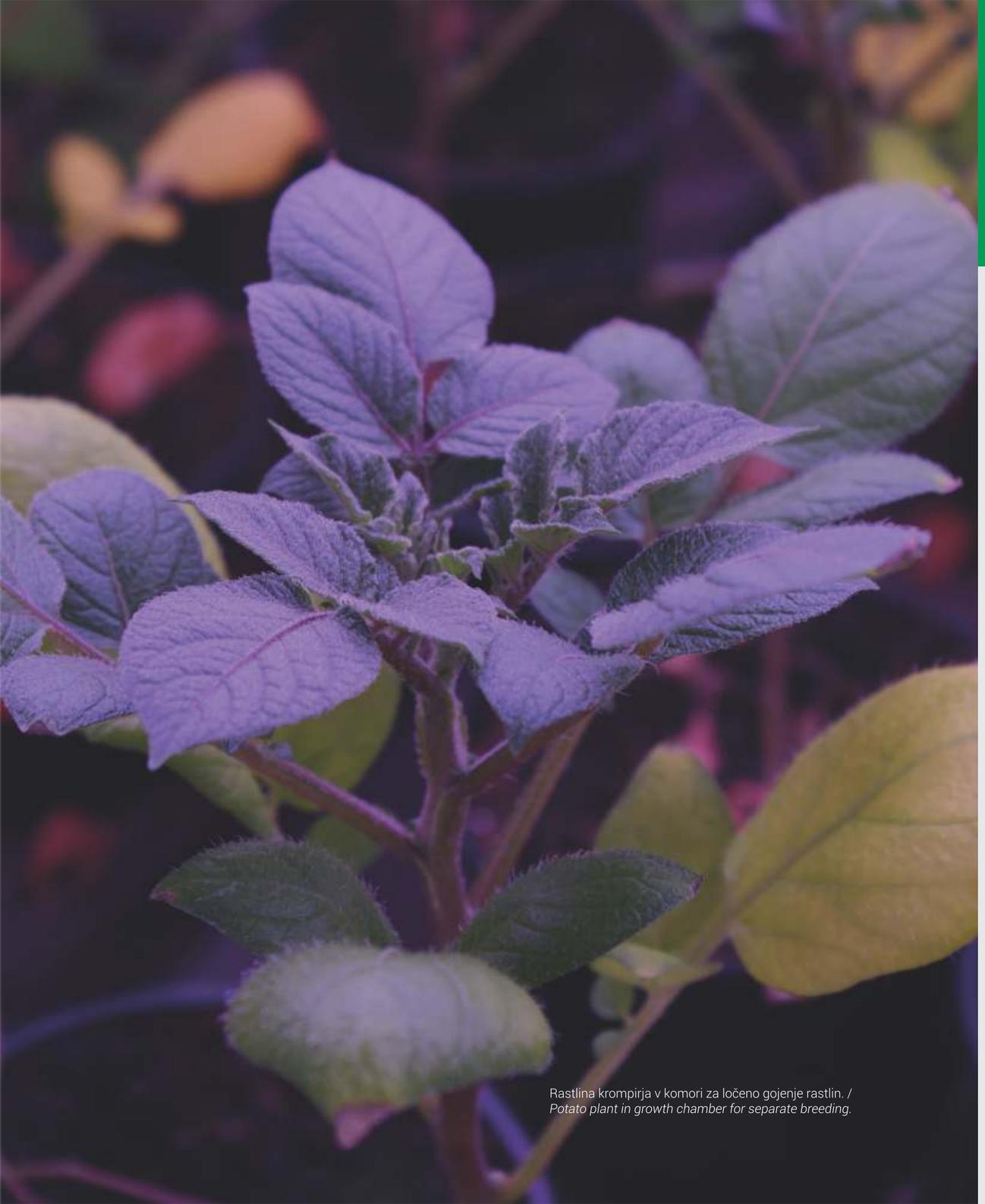
Struktura prihodkov NIB v letu 2016
Revenue Structure in 2016



PRIHODKI V EUR / REVENUES IN EUR	2016	2015	STRUKTURA 2016 (%) STRUCTURE (%)	INDEKS 2016/15 INDEX 2016/15
Prihodki od ARRS / *Slovenian Research Agency*	3.958.157,96	3.956.610,48	64,14	100,04
Druga javna služba / *Other public institutions*	789.851,41	738.614,41	11,97	106,94
Evropski skladi / *EU funds*	680.426,84	746.104,05	12,09	91,20
Domači trg / *Domestic market*	422.637,25	563.500,36	9,13	75,00
Tuji trg / *Foreign market*	248.768,03	122.492,42	1,99	203,09
Drugi prihodki / *Other revenues*	27.591,93	41.777,67	0,68	66,04
Skupaj prihodki / *Total revenues*	**6.127.433,42**	**6.169.099,39**	**100,00**	**99,32**

ODHODKI V EUR / EXPENSES IN EUR	2016	2015	STRUKTURA 2016 (%) STRUCTURE (%)	INDEKS 2016/15 INDEX 2016/15
Stroški dela / Labour	3.806.068,99	3.657.506,23	62,89	104,06
Stroški amortizacije / Amortization	441.793,05	435.607,30	7,30	101,42
Stroški materiala / Material	641.090,48	630.943,27	10,59	101,61
Stroški storitev / Services	1.078.892,93	1.303.839,09	17,82	82,75
Drugi stroški in odhodki / Other	84.739,55	113,241,93	1,40	74,83
Skupaj odhodki / *Total expenditure*	**6.052.585,00**	**6.141.137,82**	**100,00**	**98,56**

REZULTAT POSLOVANJA / *BUSINESS RESULT*	**74.848,42**	**27.961,57**



Rastlina krompirja v komori za ločeno gojenje rastlin. /
Potato plant in growth chamber for separate breeding.

IZVAJANJE RAZISKOVALNIH PROGRAMOV IN PROJEKTOV V LETU 2016

Kot nosilec je NIB leta 2016 izvajal naslednje raziskovalne programe:

- **P1-0237 – Raziskave obalnega morja**, ki poteka v organizacijski enoti MBP (7,78 FTE), obdobje financiranja 2015–2019;
- **P4-0165 – Biotehnologija in sistemska biologija rastlin**, ki poteka v organizacijski enoti FITO (4,7 FTE), obdobje financiranja 2015–2020;
- **P1-0255 – Združbe, interakcije in komunikacije v ekosistemih**, ki poteka v organizacijski enoti EKOS (6,59 FTE) ter v soizvajalski organizaciji Prirodoslovnega muzeja Slovenije (0,19 FTE), obdobje financiranja 2017–2022;
- **P1-0245 – Ekotoksikologija, toksikološka genomika in karcinogeneza**, ki se ga izvaja v organizacijski enoti GEN (3,35 FTE), obdobje financiranja 2015–2018.

Poleg teh štirih raziskovalnih programov je organizacijska enota MBP sodelovala še pri izvajanju programa **P1-0143 – Kroženje snovi v okolju, snovna bilanca in modeliranje okoljskih procesov ter ocena tveganja**, katerega nosilec je Institut Jožef Stefan v obsegu FTE 0,32 za NIB.

NIB je leta 2016 izvajal tudi infrastrukturni program v obsegu 6 FTE.

NIB je leta 2016 izvajal 21 projektov ARRS v skupnem obsegu 18.285 raziskovalnih ur, in sicer:

- 11 temeljnih (4 kot nosilec),
- 7 aplikativnih (1 kot nosilec),
- 2 podoktorska projekta in
- 1 projekt, sofinanciran po komplementarni shemi (kot nosilec).

Obseg projektov, ki jih je financiral ARRS, je bil leta 2016 za 47,87 % večji v primerjavi s preteklim letom.

NIB je leta 2016 izvajal 7 projektov v sklopu CRP »Zagotovimo si hrano za jutri« in 1 projekt v okviru »CRP 2016« v skupni vrednosti 37.292 EUR, in sicer:

- 3 kot nosilec in
- 4 kot sodelujoča raziskovalna organizacija.

RESEARCH PROGRAMMES AND PROJECTS IN 2016

In 2016 NIB acted as coordinator of the following research programmes:

- ***P1-0237 – »Coastal sea research«** (7.78 FTE), carried out in MBS organisation unit, duration 2015-2019;,*
- ***P4-0165 – »Biotechnology and system biology of plants«** (4.7 FTE), carried out in FITO organisation unit, duration 2015-2020;*
- ***P1-0255 – »Communities, interactions and communications in ecosystems«** (6.59 FTE), carried out in EKOS organisation unit in cooperation with Natural History Museum of Slovenia (0.19 FTE), duration 2017–2022;*
- ***P1-0245 – »Ecotoxicology, toxicogenomics and carcinogenesis«** (3.35 FTE), carried out in GEN organisation unit, duration 2015-2018.*

In addition to the four programmes listed above, MBS department acted as partner in P1-0143 »Cycling of substances in the environment, mass balances, modelling of environmental processes and risk assessment« programme with Jožef Stefan Institute as coordinator and NIB as partner organisation with 0.32 FTE. In addition, an infrastructure programme (6 FTE) was carried out at NIB in 2016.

In 2016, 21 projects funded by the Slovenian Research Agency were carried out at NIB, with research time amounting in total to 18,285 working hours in the scope of:

- *eleven (11) basic research projects (four (4) as coordinator)*
- *seven (7) applicative research projects (one (1) as coordinator)*
- *two (2) postdoctoral projects*
- *one (1) project co-financed in an ERC Complementary Scheme (as coordinator)*

In 2016 the financing of NIB projects by the Slovenian Research Agency was 47.87% higher in comparison to the previous year.

Six (6) projects in the scope of the target research project »Ensuring food for tomorrow« and one (1) project in the scope of the target research project »CRP 2016«, with total

Obseg projektov CRP se je po obsegu sredstev leta 2016 v primerjavi s preteklim letom zvečal za 49,18 %.

Leta 2016 je NIB izvajal 7 projektov 7. Okvirnega programa EU in programa Obzorje 2020, od katerih se je v tem letu eden zaključil, trije pa so se začeli izvajati. Vrednost ustvarjenih prihodkov pri teh projektih je znašala 305.672 EUR, kar pomeni 4,99 % vseh prihodkov NIB.

Leta 2016 je NIB izvajal 9 projektov iz drugih mednarodnih shem financiranja (Adriatic IPA, EMPIR-EURAMET, INTERREG EUROPE, LIFE+ in drugih). Vrednost ustvarjenih prihodkov s temi projekti je bila 374.754 EUR in je pomenila 6,12 % vseh prihodkov NIB.

funds amounting to 37,292 EUR, were carried out at NIB in 2016. In three (3) NIB acted as coordinator and in four (4) as participating research organisation.

The scale of financing from target research projects was 49.18% higher in comparison to that in the previous year.

In 2016 NIB carried out seven (7) projects in the scope of the EU 7th Framework Programme and Horizon 2020, 2016 was the concluding year for one (1) of those projects and three (3) had started. The income from this segment amounted to 305,672 EUR and represented 4.99% of total NIB yearly income.

Nine (9) NIB projects were financed by other international funding schemes (Adriatic IPA, EMPIR-EURAMET, INTERREG EUROPE, LIFE+ etc.). The income from this segment amounted to 374,754 EUR and represented 6.12% of total NIB yearly income.

Načrtovana investicija Biotehnološko stičišče NIB. /
Planned investment of the Biotechnological Junction NIB.

INVESTICIJE

Leta 2016 je NIB realiziral investicijska vlaganja v vrednosti 778.606 EUR. Razen 1.500 € investicijskega transferja od Ministrstva za obrambo so bila vsa vlaganja pokrita iz lastnih sredstev. Iz obračunane amortizacije tekočega leta in nerazporejenih amortizacijskih sredstev preteklih let je zagotovil investicijska vlaganja v višini 455.222 € (pretežno v raziskovalno opremo), iz nerazporejenih presežkov prihodkov nad odhodki preteklih let na podlagi odobritve Vlade RS pa 321.884 € za potrebe pridobitve gradbenega dovoljenja za načrtovano investicijo Biotehnološko stičišče NIB (plačilo komunalnega prispevka).

Med novimi pridobitvami raziskovalne opreme višje vrednosti sodita predvsem:

- pretočni citometer, ki s pomočjo treh laserjev omogoča spremljanje emitirane fluorescence na kar 10 optičnih kanalih ter enostavno obdelavo pridobljenih podatkov s programsko opremo;
- avtomatski robot za pipetiranje, ki omogoča hitro in natančno pipetiranje v območju med 2 in 1000 µl.

INVESTMENTS

In 2016 NIB invested a total of 778,606 EUR. All except a 1.500 EUR transfer from the Ministry of defense originated from internal funds. The amortization cost for the running year and unallocated amortization funds from previous years amounted to 455.222 EUR; they were invested mostly into research equipment. Unallocated surplus from previous business years amounting to 321,884,00 EUR was invested, after an approval from RS Government, into acquiring a building permit for the Biotechnological Junction NIB (land development fee paid to the municipality).

Major investments into research equipment, newly acquired in 2016, include:

- *flow cytometer with three lasers enabling recording emitted fluorescence on 10 optical channels and straightforward software manipulation of acquired data;*
- *automated pipetting robot enabling fast and accurate pipetting of volumes between 2 and 1000 µl.*

ZAPOSLENI V LETU 2016

Inštitut je bil v letu 2016 sestavljen iz štirih raziskovalnih enot in Skupnih služb. Zaposleni v največjih dveh enotah predstavljajo 59 % vseh zaposlenih na NIB. Oddelek za biotehnologijo in sistemsko biologijo (FITO) zaposluje 36 sodelavcev, enota Morska biološka postaja Piran (MBP) 28 sodelavcev, Oddelek za genetsko toksikologijo in biologijo raka (GEN) 17 sodelavcev, Oddelek za raziskave organizmov in ekosistemov (EKOS) 17 sodelavcev, Skupne službe pa 15 sodelavcev.

Na dan 31. 12. 2016, je bilo na NIB zaposlenih 113 oseb, od tega 60 raziskovalcev, 18 mladih raziskovalcev ter 35 strokovno-tehničnih in administrativnih sodelavcev.

V letu 2016 se je na novo zaposlilo 7 sodelavcev, 12 je delovno razmerje na NIB prenehalo.

V letu 2016 je doktoriralo 7 mladih raziskovalcev, z usposabljanjem so pričeli 3 mladi raziskovalci.

Na dan 31. 12. 2016 je bilo na inštitutu zaposlenih 53 % delavcev z doktoratom znanosti, 7 % z magisterijem znanosti, 29 % s VII. stopnjo izobrazbe, 11 % zaposlenih je imelo nižjo izobrazbo od VII. stopnje.

HUMAN RESOURCES IN 2016

In 2016 NIB consisted of four (4) research departments and Joint Services. 59 % of all NIB employees worked in the largest two (2) departments; Department of Biotechnology and Systems Biology (FITO) employed 36 employees and Marine Biology Station Piran (MBS) had 28 employees. Other departments had a smaller number of employees: 17 at the Department of Genetic Toxicology and Cancer Biology (GEN), 17 at the Department of Organisms and Ecosystems Research (EKOS) and 15 at Joint Services.

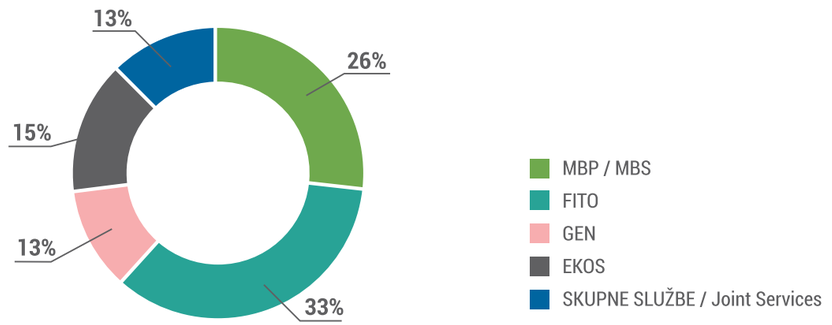
On 31. 12. 2016 at NIB worked 113 people. Among them, 60 worked as researchers, 18 as early-stage researchers and 35 as technicians and administrative staff.

In 2016 seven (7) employees were newly hired and 12 finished their career at the Institute.

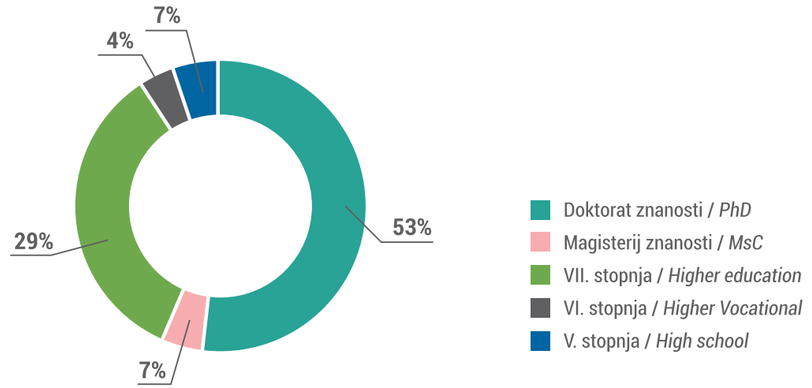
Seven (7) early-stage researchers finished their PhDs and three (3) early-stage researchers started their training in 2016.

On 31. 12. 2016 the number of employees with a PhD was 60, eight (8) held a MSc, 33 completed higher education, three (3) had higher vocational education and nine (9) had finished secondary school.

Nacionalni inštitut za biologijo. /
National Institute of Biology.



Stanje po organizacijskih enotah na 31. 12. 2016/
Number of staff by units on 31. 12. 2016



Izobrazbena struktura na 31. 12. 2016
Educational structure on 31. 12.2016

DOKTORATI, MAGISTRSKE IN DIPLOMSKE NALOGE V LETU 2016

DOCTORAL DISSERTATIONS, MASTER'S THESES AND UNDERGRADUATE THESES IN 2016

Svojo doktorsko disertacijo so pripravili pod (so)mentorstvom raziskovalcev z NIB in jo zagovarjali v letu 2016:

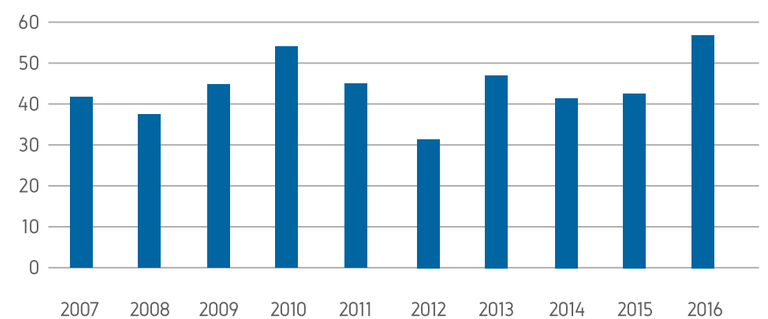
Doctoral dissertations under the (co)supervision of NIB researchers in 2016:

ŠTUDENTI / STUDENT	MENTOR, SOMENTOR / (SUPERVISOR, CO-SUPERVISOR)
Cvetković, Martina	prof. dr. Boris Kompare, (prof. dr. Franc Steinman, prof. dr. Valentina Turk)
Jaklič, Martina	prof. dr. Anton Brancelj
Jamnikar, Uroš	prof. dr. Kristina Gruden
Klun, Katja (NIB)	prof. dr. Jadran Faganeli, (doc. dr. Ingrid Falnoga)
Kološa, Katja (NIB)	prof. dr.Tamara Lah Turnšek, (prof. dr. Stevens Kastrup Rehen)
Kutnjak, Denis (NIB)	izr. prof. dr. Maja Ravnikar
Ličer, Matjaž (NIB)	prof. dr. Rado Riha
Pitacco, Valentina	prof. dr. Lovrenc Lipej
Raspor Dall'Olio, Lucija	doc. dr. Andreja Ramšak, prof. dr. Alenka Malej
Stare, Tjaša (NIB)	prof. dr. Kristina Gruden
Verbovšek, Urška	prof. dr. Tamara Lah Turnšek, (prof. dr. Cornelis J.F. Van Noorden)
Žagar, Anamarija	doc. dr. Al Vrezec, (dr. Miguel A. Carretero)

Dan odprtih vrat NIB v sklopu Evropske noči raziskovalcev, 30. 9. 2016./
NIB Open Day as part of the European Researchers' Night, 30. 9. 2016.

Število diplomskih, magistrskih in doktorskih nalog pod (so)mentorstvom raziskovalcev z Nacionalnega inštituta za biologijo v obdobju 2007–2016:

Number of Undergraduate Theses, Master's Theses and Doctoral Dissertations under (co)supervision of NIB researchers in years 2007-2016:



Število zagovarjanih magistrskih in doktorskih nalog ter mentorstev in somentorstev s strani zaposlenih na NIB v letu 2016:

Number of Master's Theses, Doctoral Dissertations, supervisions and co-supervisions by NIB employees in 2016:

magistska naloga / *Master's Thesis*	**2**
doktorska disertacija / *Doctoral Dissertation*	**4**
mentor pri doktorskih disertacijah / *Supervisor for Doctoral Dissertations*	**10**
mentor pri magistrskih delih / *Supervisor for Master's Thesis*	**11**
mentor pri diplomskih delih / *Supervisor for Undergraduate Theses*	**32**
somentor pri doktorskih disertacijah / *Co-Supervisor for Doctoral Dissertations*	**1**
somentor pri magistrskih delih / *Co-Supervisor for Master's Thesis*	**4**
mentor pri diplomskih delih / *Co-Supervisor for Undergraduate Theses*	**2**

OBJAVE IN CITIRANOST V LETU 2016

PUBLICATIONS AND CITATIONS IN 2016

Objavljeni članki (izvirni in pregledni znanstveni članki, kratki znanstveni prispevki) po letu objave, povprečnem faktorju vpilva po JCR (Journal Citation Reports), povprečni umeščenosti revije, v kateri so bili objavljeni, v področne četrtine ("kvartile") po JCR ter število čistih citatov po Web of Science/Scopus:

Published articles (Original Scientific Articles, Review Articlees and Short Scientific Articles) by year, average Impact Factor (JCR), average journal quarter position (JCR) and number of pure citations in Web of Science/Scopus:

LETO	ŠT. OBJAVLJENIH ZNANSTVENIH ČLANKOV	POVPREČNI IF (JCR)	POVPREČNA UMEŠČENOST REVIJE V ČETRINE PO JCR	ŠTEVILO ČISTIH CITATOV
YEAR	NO. OF PUBLISHED SCIENTIFIC ARTICLES	AVERAGE IF (JCR)	AVERAGE JOURNAL QUARTER POSITION (JCR)	NO. OF PURE CITATIONS
2012	102	2,511	2	1644
2013	90	2,682	2	1780
2014	92	2,735	2	2313
2015	98	2,604	2	2363
2016	98	2,908	2	2468

Zbirka NIB "Vse živo"/*NIB "All alive" Collection*, znanstvena monografija/*scientific monograph, prof. dr. Bojan Sedmak: Cyanobacteria and Their Toxins: what are they, where can we find them, why are they able to prevail and how do they behave?*

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IF (JCR)= 4,495

BIBLIOGRAFIJA INŠTITUTA V LETIH 2007 – 2016 (ANALITIČNI PODATKI)
NIB BIBLIOGRAPHY 2007 – 2016 (ANALYTICAL DATA)

ZVRST DOKUMENTA TYPE OF DOCUMENT	LETA / YEARS 2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	SKUPAJ
znanstveni članki z IF *scientific papers with IF*	46	58	71	58	72	86	83	**79**	**80**	**82**	**715**
znanstveni članki brez IF *other scientific papers*	28	24	25	21	9	16	7	**13**	**18**	**16**	**177**
strokovni in poljudni članki *professional and popular articles*	64	63	76	56	69	66	62	**45**	**43**	**62**	**606**
objavljeni prispevki s kongresov *published conference papers*	25	25	40	40	39	18	24	**16**	**17**	**16**	**260**
povzetki s kongresov *published conference paper abstracts*	140	115	161	145	159	101	166	**166**	**156**	**149**	**1458**
poglavja v knjigah *book chapters*	3	9	12	13	10	14	28	**11**	**9**	**7**	**116**
knjige *books*	5	5	1	3	4	4	3	**6**	**1**	**6**	**38**
poročila *reports*	23	31	30	30	27	28	34	**23**	**35**	**38**	**299**
doktorska dela *dissertation theses*	6	3	4	7	8	7	9	**8**	**4**	**4**	**60**
magistrska dela *master's theses*	2				1	1		**2**	**1**	**2**	**9**
patenti *patents*				2	4	3	2	**2**	**2**	**0**	**15**
razno *other*	53	76	73	93	128	121	207	**138**	**161**	**151**	**1201**
SKUPAJ	**395**	**409**	**493**	**468**	**530**	**465**	**625**	**509**	**527**	**533**	**4954**

Prispevki soavtorjev z različnih oddelkov NIB so šteti enkrat.
Papers are counted according to affiliation of the first author.

USPEHI, NAGRADE IN PRIZNANJA V LETU 2016

ACHIEVEMENTS, AWARDS AND ACKNOWLEDGMENTS IN 2016

ZOISOVO PRIZNANJE

Ljubljana, 21. 11. 2016

Znanstvena svetnica in vodja Oddelka za genetsko toksikologijo in biologijo raka, **prof. dr. Metka Filipič** je prejela **Zoisovo priznanje za pomembne dosežke na področju raziskav okoljskih onesnažil in njihovih škodljivih vplivov na okolje in zdravje ljudi.** Njeno raziskovalno delo obsega proučevanje molekularnih mehanizmov genotoksičnega in karcinogenega delovanja naravnih in antropogeno vnesenih onesnažil v okolje. Priznanje je podeljeno za vodenje in izredno uspešno zaključen projekt 7. Okvirnega programa EU – CYTOTHREAT z naslovom »Usoda in učinki citostatskih farmacevtikov v okolju in določitev biomarkerjev za izboljšano oceno tveganja izpostavljenosti okolja«. Kot koordinatorka je povezovala raziskave osmih priznanih znanstvenih skupin iz šestih držav. Rezultati projekta so nove analitske metode za določevanje ostankov citostatikov v okolju ter podatki o njihovih škodljivih učinkih na vodne organizme. Pri zasnovi ekotoksikoloških raziskav je uvedla inovativne eksperimentalne pristope, ki so dali povsem nove podatke za oceno nevarnosti ostankov citostatikov za okolje in zdravje ljudi.

ZOIS AWARD

Ljubljana, 21. 11. 2016

***Prof. Metka Filipič**, Scientific Councillor and Head of Department of Genetic Toxicology and Cancer Biology, received the **Zois Award for important achievements in research of environmental pollutants and their harmful effects on the environment and human health**. Her work in research concerns the study of molecular mechanisms in genotoxic and carcinogenic processes caused by natural and anthropogenic environmental pollutants. The Zois award is awarded for achievements in leadership and for a very successful conclusion of the project entitled "Fate and effects of cytostatic pharmaceuticals in the environment and the identification of biomarkers for and improved risk assessment on environmental exposure« within the 7th Framework EU Programme – CYTOTHREAT. As a coordinator she interconnected the research of eight (8) renowned scientific groups from six (6) countries. The results of the project include new analytic methods for determining the residues of cytostatic drugs in the environment and data on the harmful effects they have on water organisms. Her conception of ecotoxicological research is marked by the introduction of innovative experimental approaches, which have provided an original dataset that can be used to assess the threat that remains of cytostatic drugs represent to the environment and human health.*

Nagrajenke Miroslava Zeia za leto 2016: prof. dr. Kristina Sepčić (druga z desne), doc. dr. Meta Virant-Doberlet (prva z desne) in dr. Urška Verbovšek (prva z leve). /
The 2016 Miroslav Zei Prize Winners: Prof. Dr. Kristina Sepčić (second from the right), Assist. Prof. Dr Meta Virant-Doberlet (second from the right) and Dr. Urška Verbovšek (first from the left).

NAGRADA MIROSLAVA ZEIA ZA IZJEMNE DOSEŽKE

Ljubljana, 9. 11. 2016

Nagrado Miroslava Zeia za izjemne dosežke na področju dejavnosti NIB sta za leto 2016 prejeli prof. dr. Kristina Sepčić in doc. dr. Meta Virant-Doberlet.
Izjemno uspešno znanstveno kariero **dr. Mete Virant-Doberlet**, znanstvene svetnice na NIB, je bistveno zaznamovalo intenzivno mednarodno sodelovanje, vzpostavljeno z zgodnjim odhodom v tujino, kjer je v daljših obdobjih sodelovala v raziskovalnih programih vrhunskih znanstveno-raziskovalnih ustanov. Dr. Meta Virant-Doberlet je v samem vrhu svetovno priznanih raziskovalcev komunikacije in vedenja žuželk. To dokazuje tudi nagrada »Insect Drummer Lifetime Achievement Award«, ki jo je prejela lansko leto. Vrhunska kakovost raziskovalnega dela dr. Mete Virant-Doberlet v zadnjem petletnem obdobju se odraža v 24 izvirnih znanstvenih člankih v visoko rangiranih znanstvenih revijah in 4 poglavjih v monografskih publikacijah, izdanih pri mednarodni založbi.

Prof. dr. Kristina Sepčić je redna profesorica na Oddelku za biologijo, Biotehniške fakultete, Univerze v Ljubljani. Glavno področje njenih raziskav so naravne spojine in njihova biološka vloga. Na tem področju skoraj neomejenih možnosti jo še posebej zanimajo glivni proteini egerolizini, naravne spojine iz morskih organizmov in interakcije nanomaterialov s proteini. Njeno raziskovalno delo je vselej prežeto tudi z morebitno uporabo izsledkov v biotehnoloških in medicinskih aplikacijah, na kar kaže soavtorstvo mednarodnega patenta. V zadnjih petih letih je prof. Sepčićevi uspelo ustvariti bogat znanstveni opus, ki ga sestavlja 47 izvirnih in preglednih znanstvenih člankov, 1 strokovni članek in 2 sestavka v znanstvenih monografijah. Njena znanstvena dela so bila v zadnjih 10 letih več kot 1100-krat citirana.

NAGRADA ZA IZJEMNO DOKTORSKO DELO

Ljubljana, 9. 11. 2016

Nagrado za izjemno doktorsko delo na področju dejavnosti NIB za leto 2016 je prejela **dr. Urška Verbovšek** za svoje izjemno doktorsko delo z naslovom »Cathepsin K as a potential tumor marker in glioblastoma multiforme«, ki govori o potencialnem označevalcu najpogostejšega in najagresivnejšega primarnega možganskega tumorja pri človeku – glioblastomu. Raziskava je imela toliko zanimivih rezultatov, da jih je Urška v soavtorstvu objavila kar v 7 znanstvenih člankih, od katerih je eden uvrščen v kategorijo A" po kategorizaciji SICRIS in je bil objavljen v reviji z visokim dejavnikom vpliva 9.955. Članki so bili že 11-krat citirani.

MIROSLAV ZEI SPECIAL ACHIEVEMENTS AWARD

Ljubljana, 9. 11. 2016

The 2016 NIB Miroslav Zei Special Achievement Awards were awarded to Prof. Dr. Kristina Sepčić and Assist. Prof. Dr Meta Virant-Doberlet.
*A notable feature of the remarkably successful science career of **Assist. Prof. Dr Meta Virant-Doberlet**, a science advisor at the NIB, has been her intensive international work, which began with an early stint abroad, where she spent lengthy periods participating in research programmes at elite scientific institutions. Dr Virant-Doberlet is at the very top of globally recognised researchers into insect communication and behaviour. Evidence of her status came in the form of the Insect Drummer Lifetime Achievement Award, which she received last year. The supreme quality of Dr Virant-Doberlet's research work over the last five years has been reflected in 24 original scientific papers in prestigious journals, and four chapters in internationally published monographs.*

***Prof. Dr. Kristina Sepčić** is a Full Professor at the Department of Biology of the University of Ljubljana's Biotechnical Faculty, whose principal field of research are natural compounds and their biological role. In this field of almost unlimited possibilities, her three main research foci are the aegerolysin family of fungal proteins, natural products from marine organisms, and nanomaterial-protein interactions. Her research has always been oriented towards potential biotechnological and biomedical applications, to which her co-authorship of an international patent bears testimony. Over the last five years Prof. Sepčić has succeeded in creating a rich body of scientific work, consisting of 47 original and review scientific papers, one professional paper, and two contributions in scientific monographs.*

OUTSTANDING DOCTORAL DISSERTATION AWARD

Ljubljana, 9. 11. 2016

In 2016 the NIB Outstanding Doctoral Dissertation awards were awarded to Dr Urška Verbovšek who received the award for her outstanding doctoral thesis entitled Cathepsin K as a potential tumour marker in glioblastoma multiforme, which talks about a potential marker for glioblastoma, the most common and aggressive form of primary brain tumour in humans. The research has yielded so many interesting results that Dr Verbovšek has co-authored seven scientific papers, one of which was rated A in SICRIS, and was published in a journal with a high impact factor of 9,955. The papers have been cited 11 times.

PRIZNANJA SLOVENSKE ZNANSTVENE FUNDACIJE

Ljubljana, 16. 1. 2016

Slovenska znanstvena fundacija (SZF) je na slavnostni akademiji Zahvalnega dneva donatorjem, sponzorjem in komunikatorjem znanosti 16. januarja 2017 podelila priznanja za odlične komunikatorje znanosti v 2016 in priznanja Prometej znanosti. Med nagrajenci je bila **prof. dr. Marina Dermastia**, ki je prejela listino **finalist izbora častnega naslova Komunikator/-ica znanosti leta 2016**. Med prejemniki priznanja **»Prometej znanosti za odličnost v komuniciranju za leto 2016«** so bili tudi sodelavci Morske biološke postaje Piran, in sicer **prof. dr. Lovrenc Lipej, dr. Martina Orlando Bonaca, dr. Borut Mavrič in mag. Domen Trkov**, ki tvorijo skupino za raziskave morske biodiverzitete na MBP. Nagrado so prejeli za dolgoletno spodbujanje razumevanja naravnih procesov v morju in vpliva človeka na okolje ter za izdajo znanstvene monografije Biogenic formations in the Slovenian Sea (Biogene formacije v slovenskem morju) v založbi Nacionalnega inštituta za biologijo [COBISS.SI-ID 284112896].

PRIZNANJE OBČINE IG ZA LETO 2016

Znanstveni svetnik prof. **dr. Anton Brancelj** je na predlog župana Občine Ig Janeza Cimpermana prejel **priznanje Občine Ig za leto 2016 za pomembne dosežke pri raziskovanju in ohranjanju jame Velika Pasica**. V jami deluje stalni laboratorij za izvajanje jamskih raziskav. Leta 2015 je v so-založbi ZRC SAZU in NIB izšla njegova znanstvena monografija Jama Velika Pasica – zgodovina, okolje in življenje v njej, kjer so predstavljene tako zgodovinske in morfološke zanimivosti jame kot tudi rezultati ekoloških, taksonomskih in biodiverzitetnih študij.

MEDNARODNI USPEH PODJETJA BIOSISTEMIKA D.O.O.

Podjetje Biosistemika je bilo leta 2010 ustanovljeno kot spin-out Nacionalnega Inštituta za Biologijo in je danes v svetu uveljavljeno kot eno vodilnih podjetij za razvijanje programske opreme za laboratorije, ki delujejo na področju ved o življenju. Leta 2015 je Biosistemika na platformi Kickstarter prvič predstavila svoj elektronski laboratorijski dnevnik sciNote in tam dobila želeno podporo. Lansko leto pa so skupaj z ameriškim podjetjem Gilson Inc. ustanovili podjetje sciNote LLC in februarja 2016 produkt tudi uradno lansirali na globalnem trgu.

NOVA SPLETNA APLIKACIJA ”TRAJEKTORIJA IN HODOGRAF PRI BOJI VIDI“

V okviru delovanja NO IOC v letu 2016, ki med drugim vsebuje tudi ohranjanje, razvoj in integracijo opazovalnega

THE SLOVENIAN SCIENCE FOUNDATION AWARD

Ljubljana, 16. 1. 2016

At the solemn academy in honour of donators, sponsors and communicators, the Slovenian Science Foundation awarded the awards to excellent scientific communicators in 2016 and the Prometheus of Science awards. ***Prof. Marina Dermastia*** *was a* ***Finalist in the selection for scientific communication for 2016****. The winners of the* ***“Prometheus of Science”*** *award include our colleagues from the Marine Biology Station Piran (MBS), namely* ***Prof. Lovrenc Lipej, Dr. Martina Orlando Bonaca, Dr. Borut Mavrič and MSc. Domen Trkov,*** *members of the group for biodiversity research at the MBS. The award was presented for their continuous contributions to our understanding of marine natural processes and their impact on the environment and human health as well as for publishing a scientific monograph entitled Biogenic formations in the Slovenian Sea, published by NIB [COBISS.SI-ID 284112896].*

THE IG MUNICIPALITY AWARD IN 2016

Scientific Councillor ***Prof. Anton Brancelj*** *received* ***the Ig Municipality Award for achievements in research and conservation of the Velika Pasica cave****. The cave is home to a permanent cave research laboratory. In 2015 Brancelj published a scientific monograph Velika Pasica cave – history, environment and life. The monograph was co-published by NIB and ZRC SAZU, it contains a presentation of the cave's historical and morphological particularities as well as the results of ecological, taxonomic and biodiversity studies.*

INTERNATIONAL SUCCESS OF BIOSISTEMIKA LTD.

Biosistemika Ltd. Company was established in 2010 as a spin-off of NIB *and is currently one of the leading companies developing software for laboratories active in life sciences. In 2015 Biosistemika Ltd. presented its electronic laboratory diary sciNote on Kickstarter and attracted sufficient support. Last year they co-founded a company sciNote LLC in cooperation with the American company Gilson Inc. and officially launched the product on the global market.*

NEW WEB-BASED APPLICATION “BUOY TRAJECTORY AND HODOGRAPH”

A web-based application for illustration of water-mass movement as recorded by the oceanographic buoy Vida,

in informacijskega sistema, so na Morski biološki postaji Piran razvili spletno aplikacijo za prikaz gibanja vodnih mas na lokaciji oceanografske boje Vida. S pomočjo aplikacije z meritvami morskih tokov na oceanografski boji Vida predstavimo kratkotrajno gibanje vodnih mas na lokaciji boje. Uporabnik lahko pri trajektoriji namišljenega delca v izbrani višini nad dnom izbira začetni in končni datum ter čas trajektorije oz. trajanje potovanja namišljenega delca, največ v trajanju 24 ur. Pri hodografu pa lahko uporabnik izbere datum in čas, s čimer se prikaže vertikalna porazdelitev tokov v danem trenutku.

has been developed in 2016 by MBS Piran in the scope of the National Board of the Intergovernmental Oceanographic Commission, which includes, among other things, the preservation, development and integration of monitoring and information system. The application presents the short-term movements of water-masses at the site of the Vida buoy, based on the measurements it records. The user can choose the position in the water column, the start and end date and the duration of lasting up to 24 hours and is presented with the trajectory of an ideal particle in the selected range. Hodograph allows the user to pick a date and time to observe the vertical distribution of currents at a given moment.

Zoisovi nagrajenci 2016,
prof. dr. Metka Filipič peta z desne v drugi vrsti. /
Zois's award winners 2016, Prof. Dr Metka Filipič the fifth from the right in the second row.

IZUMI IN INOVACIJE

INVENTIONS AND INNOVATIONS

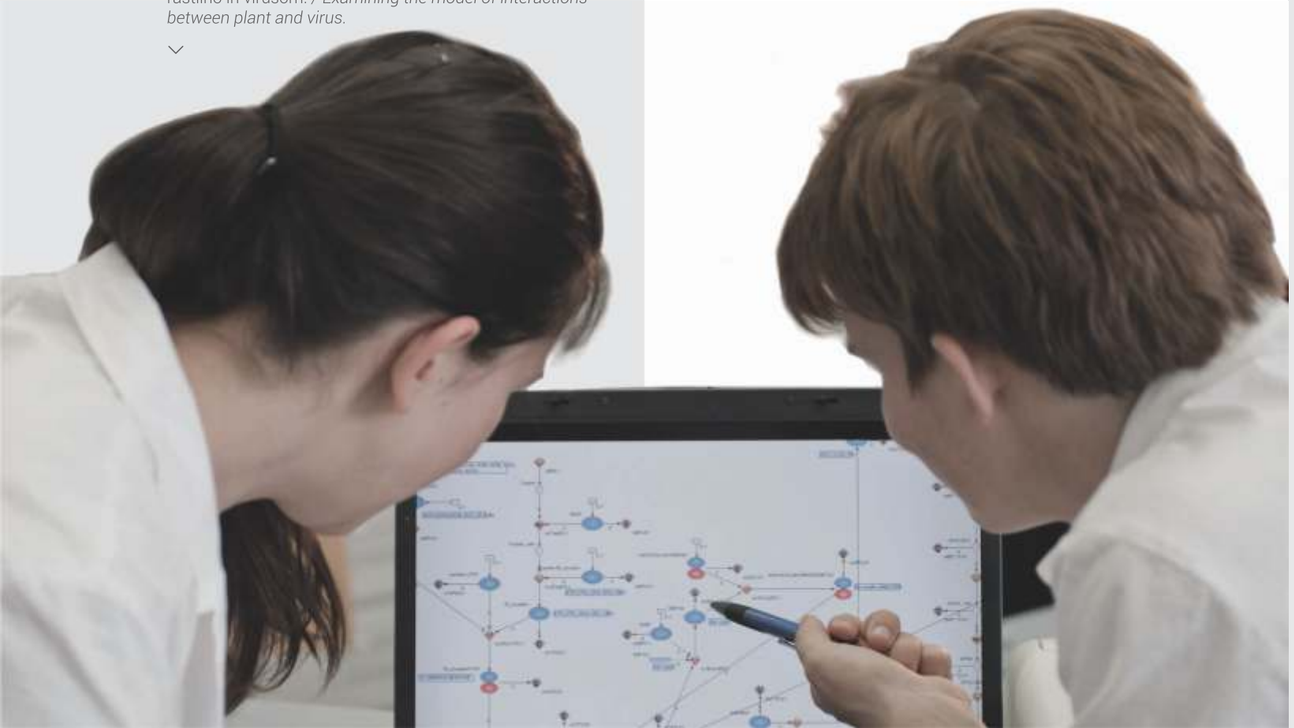
Izumi in inovacije so za NIB velikega pomena, saj predstavljajo steber sodelovanja z gospodarstvom, kar je eden od dolgoročnih ciljev NIB-a, opredeljenih v Programu dela NIB za obdobje 2014–2018. Na NIB-u se z izumi in inovacijami ukvarja Komisija za izume, ki jo vodi dr. David Dobnik ter Pisarna za prenos tehnologij, ki jo vodi mag. Mirjana Oblak.

V letu 2016 je bil na World Intellectual Property Organization po PCT sistemu prijavljen patent za izum Metoda in sistem za sočasno zaznavanje koncentracije mikrodelcev v suspenziji in njihovih morfoloških in fizioloških značilnosti, ki ga je ustvaril dr. Bojan Sedmak v sodelovanju s partnerji iz Arhela d.o.o., Biotehniške fakultete Univerze v Ljubljani in Envita d.o.o. Poleg tega je NIB v 2016 podaljšal zaščito za četrto leto na URSIL-u za patent, ki ga je prijavil skupaj z Inštitutom Jožef Stefan.

Inventions and innovations are of crucial importance to NIB as they represent the core of our collaboration with economic subjects. This pillar is one of the long-term goals of our NIB as determined in the 2014 – 2018 NIB Programme. A special Committee for Innovation lead by Dr. David Dobnik and a Technology Transfer Office (TTO) lead by MSc. Mirjana Oblak operate within NIB.

In 2016 we applied for a patent at the World Intellectual Property Organization in accordance with the PCT system for an invention which allows simultaneous detection of concentration of microparticles in suspension and of their morphological and physiological characteristics called Method and System. The patented system was created by Dr. Bojan Sedmak in cooperation with partners from Arhela Ltd. Company of the Biotechnical Faculty in Ljubljana and Envita Ltd. Company. Additionally in 2016 NIB prolonged the patent protection at the URSIL for the fourth consecutive year, for a patent developed in cooperation with the Jožef Stefan Institute.

Pregledovanje izdelanega modela interakcij med rastlino in virusom. */ Examining the model of interactions between plant and virus.*



PRENOS ZNANJA V GOSPODARSTVO

TRANSFERING TECHNOLOGY INTO INDUSTRY

S trženjem produktov in storitev na NIB-u se sistemsko ukvarja v 2010 ustanovljena Pisarna za prenos tehnologij. NIB na področju prenosa tehnologij sodeluje s pisarnami za prenos tehnologij na Inštitutu Jožef Stefan, Kemijskem inštitutu, Univerzi v Ljubljani, Univerzi v Mariboru ter Univerzi na Primorskem. V letu 2016 so tekla dogovarjanja predstavnikov Pisarn o vsebinah in načinih sodelovanja v kontekstu načrtovanega razpisa MIZŠ/MGRT za financiranje dejavnosti prenosa tehnologij in znanj v javnih raziskovalnih organizacijah.

V letu 2016 se je prenos znanj in tehnologij NIB-a najbolj intenzivno udejanjal v sodelovanju pri dveh projektih iz razpisa MIZŠ »RRI v verigah in mrežah vrednosti« v okviru Operativnega programa za izvajanje evropske kohezijske politike v obdobju 2014–2020 (Strategija pametne specializacije). Prvi, Nova generacija bioloških zdravil (BioPharm.Si, koordinator COBIK), se osredotoča na razvoj novih bioloških zdravil, drugi, Funkcionalna živila prihodnosti (F4F, koordinator Žito), pa želi povezati najboljša prebojna znanja v Sloveniji na področju raziskav in razvoja novih funkcionalnih prehranskih izdelkov ter zagotavljati trajnostno pridelavo hrane.
Poleg tega je NIB izvajal razvoj molekularnih metod za kvantifikacijo virusov za gensko terapijo za ameriško biofarmacevtsko podjetje, storitve GSO analiz za Norwegian Veterinary Institute ter analizo učinkovitosti bioloških molekul za podjetje Lek d.d.

V letu 2016 so z NIB-om kontakt vzpostavili trije strokovnjaki z idejo o sodelovanju v novoustanovljenem biotehnološkem inkubatorju CellForm. V NIB-u so namreč prepoznali partnerja, ki bi podjetjem, vključenim v inkubator, lahko nudil ekspertne storitve s svojega področja delovanja pri njihovem razvoju produktov. NIB je predlog ocenil kot zelo zanimiv, saj bi sodelovanje z inkubatorjem pomenilo krepitev prenosa lastnih znanj in tehnologij, poleg tega pa bi neposredne izkušnje pri delu z inkubiranimi podjetji lahko bile spodbuda za NIB-ove raziskovalce (zlasti mlajše), da se odločijo za podjetniško pot. Zato je bila v letu 2016 sklenjena pogodbo o poslovnem sodelovanju, ki se ga bo operativno začelo izvajati v letu 2017.

Marketing products and goods at NIB is systematically handled by the NIB TTO established in 2010. The NIB TTO collaborates with TTOs at Jožef Stefan Institute, National Institute of Chemistry, University of Ljubljana, University of Maribor and University of Primorska. In 2016 the representatives of all TTOs held a series of meetings to coordinate the contents and means of cooperation in the scope of the upcoming MESS/Ministry of Economic Development and Technology call for financing the activity of transferring technologies and knowledge from public research institutions.

In 2016 the transfer of knowledge and technologies at NIB has been most intensively enacted in the scope of two projects financed by the MESS within the "R&R in Value Chains" of the Operational Programme for the Implementation of the EU Cohesion Policy 2014-2020 (Smart Specialisation Strategy). The first project - New generation biological drugs (BioPharm Si, coordinated by COBIK) – focuses on the development of new biological medicines, while the other - Functional Future Aliments (F4F, coordinated by Žito Inc.) – strives to associate the best breakthrough knowledge in Slovenia in the field of research and development of new functional alimentary products and ensure sustainability of food production.

In addition, NIB developed molecular methods for virus quantification and gene therapy for an American bio-pharmaceutical company, performed GSO analyses for the Norwegian Veterinary Institute and an efficiency analysis of biological molecules for Lek Inc.
In 2016, three experts established contact with NIB to discuss cooperation with the newly-established biotechnological incubator CellForm. They see NIB as a partner, which can offer services within its area of expertise to companies, included into the incubator, associated with development of products. NIB evaluated their proposal as most interesting; cooperation within the incubator would enhance the transfer of our knowledge and technologies, furthermore, direct experience with cooperating with companies could entice the researchers (particularly the young) working at NIB to choose a career path of an entrepreneur. We signed a contract regulating our professional cooperation in 2016, work will begin in 2017.

SKUPNE SLUŽBE

Skupne službe izvajajo posamezne poslovne funkcije inštituta, kot so finance in računovodstvo, kadrovske zadeve, javna naročila, splošne zadeve, vodenje informacijskega sistema, administrativna podpora organom NIB-a in podobno. Poleg tega izvajajo podporne dejavnosti za raziskovalne organizacijske enote, zlasti administrativno-tehnično podporo vodenju projektov in podporo prenosu znanja in tehnologij.

V sklopu Skupnih služb deluje tudi Biološka knjižnica, ki jo upravljata NIB in tudi Oddelek za biologijo Biotehniške fakultete. Deluje na dveh lokacijah: v Biološkem središču v Ljubljani in na Morski biološki postaji Piran.

JOINT SERVICES

Joint Services perform some individual business functions such as finance and accounting, managing human resources, public procurement, general services, managing the information system, support to governing bodies of NIB and similar activities. They are also in charge of providing support to research departments, mainly administration support for project management and support to knowledge and technology transfer.

Biological Library, part of the Joint Services, is managed jointly by the National Institute of Biology and the Biology Department of the Biotechnical Faculty, University of Ljubljana.

OSEBJE / STAFF

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HUMAN RESOURCES

Goršič, Dunja

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PUBLIC RELATIONS OFFICE AND PROJECT ASSISTANCE

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Petja, Orlena

PISARNA ZA PRENOS TEHNOLOGIJ
TECHNOLOGY TRANSFER OFFICE

Oblak, Mirjana

PRAVNA PISARNA
LEGAL DEPARTMENT

Tomšič, Alenka

KNJIŽNICA
LIBRARY

Černač, Barbara
Glavač, Lučka

Vodja: Doc. dr. Andreja Ramšak
Head: Assist. Prof. Andreja Ramšak

Doc. dr. Andreja Ramšak je od leta 2016 vodja Morske biološke postaje Piran, katere delovanje je posvečeno izključno raziskavam morja. Njeno raziskovalno delo je osredotočeno na primerjalno genomiko morskih organizmov, filogenetske odnose med ožigalkarji in odziv morskih organizmov na onesnaževala. Je članica v odborih domačih in mednarodnih združenj LifeWatch.SI (ERIC), LTER, Evropska mreža morskih inštitutov in postaj MARS, EUROMARINE in Mreže za onesnažila MSFD. Sodeluje pri pedagoškem delu na Univerzi na Primorskem.

Assist. Prof. Andreja Ramšak has been the Head of the Marine Biology Station Piran, dedicated solely to the research of the sea, since 2016. Her research focuses on comparative genomics of marine organisms, phylogenetic relationships among the cnidarians and the response of marine organisms to pollutants. She is a member of the committees of national and international associations LifeWatch.SI (ERIC), LTER, MARS-European Network of Marine Institutes and Stations, EUROMARINE and the MSFD Network of Contaminants. She participates in pedagogical work at the University of Primorska.

(slika zgoraj desno)
Morske vetrnice na oceanografski boji Vida. /
Sea anemones on the Oceanographic Buoy Vida.

MORSKA BIOLOŠKA POSTAJA PIRAN

SPREMENLJIVOST IN ODZIVNOST MORSKIH EKOSISTEMOV

V letu 2016 je Morska biološka postaja Piran (MBP) kot vodilna enota za raziskave morskih ekosistemov v Sloveniji nadaljevala temeljne in uporabne raziskave v okviru dveh raziskovalnih programov ter več mednarodnih in nacionalnih projektov. Multidisciplinarne raziskave v okviru programov zagotavljajo temeljna znanja o zgradbi in delovanju ekosistemov ter biogeokemičnih procesih v obalnih morskih območjih, kjer so organizmi in ekosistemi izpostavljeni kombinaciji številnih dejavnikov, ki delujejo v različnih prostorskih in časovnih merilih.

KLJUČNE DEJAVNOSTI

- Raziskujemo različne ravni biološke raznolikosti od genoma do vrstne sestave in raznovrstnosti življenjskih okolij (plankton, bentoški nevretenčarji, makroalge, obrežne ribje združbe, podvodni travniki, biogene formacije). V raziskave vključujemo pristope primerjalne genomike ter evolucijske vidike;

- Raziskujemo vlogo fitoplanktona in kroženje ogljika, fotosintetske značilnosti in procese fotoaklimacije, analiziramo časovne serije in režime za razumevanje vpliva podnebnih sprememb in evtrofikacije. Raziskujemo vpliv organske in anorganske snovi na delovanje in raznolikost morskih mikrobnih združb ter spremembe na fizikalne in kemijske okoljske parametre;

- Raziskujemo vplive na organizme in okolje, ki so posledica podnebnih sprememb in človekovih dejavnosti v morju. Osredotočeni smo na kroženje in razgradnjo onesnažil, na oksidacijske procese v odpadnih vodah in v morskem okolju, ki so pomembni za razgradnjo. Učinke onesnažil preučujemo v različnih vrstah (školjke, ribe), predvsem na subceličnem nivoju;

MARINE BIOLOGY STATION PIRAN

VARIABILITY AND RESILIENCE OF MARINE ECOSYSTEMS

In 2016 the Marine Biological Station Piran (MBS) was the leading unit for marine ecosystem research in Slovenia working in basic and applied research in the scope of two research programmes and several national and international applied projects. Multidisciplinary research performed within the two programmes produces basic knowledge on the structure and functioning of marine ecosystems and on biogeochemical processes in coastal sea where organisms are exposed to a combination of many factors effective at different spatial and temporal scales.

KEY ACTIVITIES

- *Research on different levels of biodiversity from genome to species composition and diversity of habitats (plankton, benthic invertebrates, macroalgae, seagrass meadows, coastal fish assemblage and biogenic formations). Research topics include comparative genomics and evolutionary issues.*

- *Research on role of phytoplankton and carbon cycle, photosynthetic characteristics and photoacclimation processes, analysing of time series and regime to understand impact of climate changes and eutrophication. Research on impact of organic and inorganic matter onrole and diversity of marine microbial communities as well changes in physical and chemical environmental parameters.*

- *Research of impact on organisms and environment, as consequences of climate changes and anthropogenic activities in the sea. Focus on cycling and degradation of pollutants, oxidation processes in wastewaters and importance of marine environment in substance degradation. We study effects of pollutants on several*

- Razvijamo metodologijo za spremljanje stanja morja, ki vključujejo biološke elemente in fizikalne ter kemijske parametre v skladu z državno in evropsko okoljsko zakonodajo (MSFD in WFD). Izvajamo različne programe monitoringa morja za vrednotenje dobrega okoljskega stanja (GES);

- Raziskujemo dinamiko vodnih mas in modeliranje v obalnem morju in razvijamo avtomatizirano obdelavo podatkov, krepimo razvoj infrastrukture na morju. S svojim znanjem in izkušnjami lahko ponudimo rešitve za različne gospodarske subjekte in dejavnosti na morju in v obalnem pasu. Razvijamo inovacije na področju opazovanja morja in uporabljamo moderno tehnologijo (HF radar) za opazovanje in napovedovanje tokovanja;

- Nadaljujemo tradicijo morskih postaj, ki so vedno ponujale svoje zmogljivosti tudi drugim raziskovalcem. Zainteresiranim raziskovalcem in študentom ponujamo bivanje v dormitoriju in delo v sodobnih laboratorijih ter na morju.

Raziskovalni program P1-0237 »Raziskave obalnega morja«

V sodelovanju s tujimi partnerji smo s pomočjo modela, ki sloni na Bayesovih nevronskih mrežah, ovrednotili rezultate raziskav interakcij mikroorganizmov in organsko snovjo v pelaškem ekosistemu. Namen uporabe modela je napovedovanje sprememb v okolju. Fitoplanktonska časovna serija je bila uporabljena v obsežni analizi različnih ekoloških skupin, v kateri so avtorji želeli ugotoviti, kako razširjanje razvojnih stadijev morskih organizmov oblikuje biodiverzitetne vzorce. V okviru pretekle španske raziskovalne ekspedicije Malaspina 2010 smo objavili članek, ki opisuje biodiverziteto fitoplanktona v tropskih in subtropskih oceanih in dejavnike, ki oblikujejo podobne združbe v na videz geografsko ločenih vodnih masah. Članek je bil predstavljen v rubriki TOP objave na spletnem portalu Metina lista.

Zaključili smo modelne raziskave disperzije meduz, opravljene z ROMS-AGRIF modelom, in analize enostavnega populacijskega modela za oceno variabilnosti populacije polipov. Dokončali smo filogenetsko analizo rodov iz družine Pelagiidae ter na podlagi morfoloških značilnosti in filogenetske analize opisali nov rod *Mawia* v tej družini, kar smo objavili skupaj z italijanskimi raziskovalci. V sodelovanju z ruskimi raziskovalci smo spremljali mikrobno razgradnjo meduz in lastnosti bakterijskih združb v Črnem morju, kjer se masovno pojavlja uhati klobučnjak. Rednim opazovanjem bakterijske združbe smo dodali spremljanje abundance najštevilčnejših delcev v morju, virusov.

marine species (mussels, fish) mostly on subcellular level.

- *Developing programmes for sea monitoring, which include biological elements, and physical and chemical parameters, harmonised with national and European environmental legislation (MSFD and WFD). We implement different sea monitoring programs to assess good environmental status (GES).*

- *Research on dynamics of water masses and modelling in the coastal marine environment, developing automated processing of data, augmentation of infrastructure development at sea. Our knowledge and experience enable us to offer solutions for a variety of companies and a range of activities at sea and the coastal area. We are developing innovations in the area of sea observation and use state-of-the-art technology (HF radar) for observing and forecasting currents.*

- *In accord with the tradition of marine stations we offer our capacities to other researchers as well. The interested researchers and students are invited to stay at our dormitory and work in state-of-the-art laboratories and in the field.*

Research programme P1-0237 "Coastal Marine Research"

In collaboration with foreign partners, we performed a study of microorganisms – carbon interactions in the pelagic ecosystem - by applying the Bayesian network (BN) approach to both field and experimental data. The potential of BN model in forecasting environmental changes was discussed. Phytoplankton time-series data were used in an extensive analysis of different ecological groups, explaining how dispersal maintains and generates regional biodiversity. In 2010 we participated in the Spanish research expedition 'Malaspina 2010'. In 2016 we co-authored a paper, which describes the biodiversity of phytoplankton in tropical and subtropical oceans and factors that shape similar communities in apparently geographically separated water masses. The article was presented on the online portal Metina lista in the column 'Top publications'.

The study on jellyfish dispersion using ROMS-AGRIF model and the analyses of the simple population model for the assessment of the variability of the polyp population are in their final stages. In collaboration with Italian researchers, we described Mawia, a new genus of the family Pelagiide, based on morphological and phylogenetic analyses. Together with Russian scientists we investigated microbial decomposition of jellyfish,

Velik del programa predstavljajo raziskave biodiverzitete obrežnih ribjih združb ter bentoške favne, flore in vegetacije. Objavili smo rezultate o prvih opažanjih vrst v našem morju, o tujerodnih vrstah, povezanih s procesi bioinvazije in tropikalizacije, in članke, ki prispevajo k boljšemu poznavanju prehranjevalne ekologije različnih organizmov. Objavljen je bil upravljavski vidik problematike balastnih voda ladij, ki so prepoznani kot eden od vektorjev vnosa tujerodnih vrst. Avtorji so predstavili metodo hidravlične kavitacije za uničevanje organizmov v balastnih vodah. Ena od posledic klimatskih sprememb je tudi dvigovanje gladine morja ter poplavljanje nižje ležečih obalnih območij. Učinke dvigovanja morske gladine na štiri vrste ptic gnezdilk v KP Sečoveljske soline smo preučevali v študiji, kjer so bili upoštevani različni scenariji globalnega segrevanja. Rezultati so ključnega pomena za načrtovalce prostora zavarovanih območij in naravovarstvenike.

Raziskave onesnaževanja slovenskega morja so usmerjene v detekcijo onesnažil v sedimentih ter akumulacijo kovin in organokositrovih spojin v različnih vrstah rib. Preučevali smo kumulativni učinek onesnažil, ki modulirajo encime oksidativnega stresa, in učinke organofosfatnih pesticidov v morju na izbran tarčni organizem (Mytilus galloprovincialis). Posledice evtrofikacije, sklopljene z naravnimi značilnostmi obalnega morja, se kažejo v obliki pridnenih hipoksij in anoksij. V luči razumevanja zdržnosti ekosistema smo spremljali zmožnost združbe nematodov za okrevanje po ponovnemu dovajanju kisika na mehkem dnu Tržaškega zaliva.

Raziskave v hipersalinem okolju v Sečoveljskih solinah imajo poleg znanstvene odličnosti tudi veliko gospodarsko uporabnost. S slovenskimi in španskimi partnerji smo objavili izsledke študije mobilnosti težkih kovin v sistemu solinsko blato/slanica ter zaključili raziskave mineraloških, geokemičnih in termofizikalnih lastnosti solinskega blata. Rezultati obeh študij so bistvenega pomena za praktično uporabo solinskega blata kot zdravilnega blata.

V sodelovanju z ARSO in raziskovalci iz tujine smo razložili prednost operativno sklopljenega modela cirkulacije Jadranskega morja z atmosferskim modelom, ki je bolje napovedal ohlajanje morja v obdobju ekstremne burje. S to simulacijo smo prispevali k poznavanju klimatskih dejavnikov, ki vplivajo na variabilnost obalnega ekosistema, kar je ena od vsebinskih točk raziskovalnega programa. Prvič so bili na območju Tržaškega zaliva pridobljeni podatki o turbulenci v različnih atmosferskih in oceanografskih pogojih.

which can affect the cycling of biogenic elements and the characteristics of bacterial communities in the Black Sea, where Aurelia aurita occurs en-mass. We started to monitor the abundance of the most numerous particles in the sea – viruses.

Biodiversity studies are usually focused on littoral fish assemblages and benthic fauna, flora and vegetation. Several articles were published regarding first sightings of species in Slovenian sea, alien species related to the processes of bioinvasions and tropicalisation. The management of ballast waters, which are recognised as one of the vectors of introduction of non-indigenous species, was addressed in one paper. Authors assessed the efficiency of a hydrodynamic cavitation pilot system, which could be used in ballast water treatment. One of the consequences of climate change is the sea level rise and inundation of low-lying coastal areas. We modelled the effects of different global warming scenarios on four bird species breeding in Sečovlje Salina Nature Park. The results are crucial for conservation biologists and landscape planners working in protected areas.

Pollution oriented research of the Slovenian sea comprised of detecting pollutants in sediments and accumulation of metals and organotin compounds in different fish species. We investigated the cumulative effect of pollutants, enzymes that modulate oxidative stress, and the effects of organophosphate pesticides on the sentinel organism (Mytilus galloprovincialis). To study the ecosystem resilience under the stress, induced by hypoxia and anoxia, we investigated the potential of benthic nematode communities for recovery after re-oxygenation of the soft bottom in the Gulf of Trieste.

We continued to research the hypersaline environment in the Sečovlje Salina. In collaboration with Slovenian and Spanish partners, we described seasonal heavy metal signature and microbial mat variations, as well as mineralogical, geochemical and thermophysical properties of saline mud. Aside from their scientific merit the results of both studies are essential to determine the potential use of saltpan mud for therapeutic purposes.

In cooperation with the Slovenian Environmental Agency and researchers from abroad we explained the advantage of the coupled atmosphere–ocean modelling system, which predicted the cooling of the sea during an extreme bora wind event most accurately. This simulation contributed to a better understanding of climatic factors that affect coastal ecosystem variability. For the very first time we collected turbulence data in the Gulf of Trieste in moderate wind and heat flux conditions and published our observations in a scientific journal.

GLAVNI DOSEŽKI V LETU 2016

Od številnih publikacij, ki smo jih objavili v letu 2016, bomo izpostavili dve, ki sta bili tudi predlagani za izbor Odlični v znanosti 2017. Prvi članek je Enhanced detection of pathogenic enteric viruses in coastal marine environment by concentration using methacrylate monolithic chromatographic supports paired with quantitative PCR. Objavljen je bil v reviji Water research [COBISS.SI-ID 4037967], ki je vodilna na tem področju (A'') in je plod sodelovanja dveh inštitutskih OE, MBP (V. Turk kot avtorica) in FITO, v okviru raziskovalnih programov in evropskega projekta INTERFACES (FP7-PEOPLE). Članek opisuje testiranje nove metode za koncentriranje in detekcijo patogenih enteričnih virusov v morski vodi, kjer je njihova koncentracija zelo nizka. Za koncentracijo virusov smo uporabili monolitske kromatografske kolone, ki jih proizvaja slovensko podjetje BIAseparations, za detekcijo pa metodo kvantitativnega PCR v realnem času (RT-qPCR).

Drugi predlog pa je članek Redescription of Pelagia benovici into a new jellyfish genus, Mawia, gen. nov., and its phylogenetic position within Pelagiidae (Cnidaria: Scyphozoa: Semaeostomeae) avtorjev M. Avian, A. Ramšak et al., ki je bil objavljen v reviji Invertebrate systematics [COBISS.SI-ID 3971407. Na podlagi podrobnih morfoloških opisov in filogenetske analize z uporabo genetskih markerjev smo opisali nov rod Mawia, ki je monotipski z vrsto Mawia benovici. S tem smo obogatili znanje o raznolikosti življenja v morju ter razrešili uganko o natančni taksonomski razvrstitvi neznane meduze. Natančno razločevanje vrst in populacij je pomembno zaradi preseljevanja in izumiranja vrst, vdora tujerodnih, invazivnih vrst, izlova in posledic klimatskih sprememb ter onesnaževanja, ki vplivajo na spreminjanje genskega sklada in evolucijo.

Pomemben dosežek je tudi priznanje Slovenske znanstvene fundacije Prometej znanosti za odličnost v komuniciranju za leto 2016 raziskovalcem, ki tvorijo skupino za raziskave morske biodiverzitete na MBP (L. Lipej, M. Orlando Bonaca, B. Mavrič in D. Trkov). Nagrado so prejeli za dolgoletno spodbujanje razumevanja naravnih procesov v morju in vplivov človeka na okolje ter za popularizacijo področja naravoslovnih ved s poudarkom na biološki vrstni pestrosti našega morja v poljudnih medijih. Eden večjih dosežkov skupine v letu 2016 je znanstvena monografija Biogene formacije v slovenskem morju v založbi NIB-a, ki je rezultat projekta MedKeyHabitats Project o kartiranju ključnih morskih habitatov v Sredozemskem morju.

MAIN ACHIEVEMENTS IN 2016

Among several articles that we have published in 2016, we would like to draw attention to two achievements, which were shortlisted for the selection of 'Excellent in Science in 2017' by the Slovenian Research Agency. The first one is the article "Enhanced detection of pathogenic enteric viruses in coastal marine environment by concentration using methacrylate monolithic chromatographic supports paired with quantitative PCR" which was published in Water Research [COBISS.SI-ID 4037967], the leading journal in its field (A'' category). The article is the result of collaboration between two NIB departments, MBP (V. Turk as author) and FITO in the scope of their respective research programmes and EU project INTERFACES (FP7-PEOPLE). The concentration of pathogenic enteric viruses in seawater is low; therefore, their detection depends upon a suitable concentration method. In a published article, authors describe the testing and optimization of a concentration method based on monolith columns, developed by the Slovenian company BIAseparations, using qPCR as method of detection.

The second article is entitled "Redescription of Pelagia benovici into a new jellyfish genus, Mawia, gen. nov., and its phylogenetic position within Pelagiidae (Cnidaria: Scyphozoa: Semaeostomeae)", written by M. Avian, A. Ramšak et al. and published in the journal Invertebrate Systematics [COBISS.SI-ID 3971407. The article provides an exact morphological description of the newly described species of Scyphozoans and neutral genetic markers used for its phylogenetic placement within the family Pelagiidae. Description of the new genus (Mawia) and species (Mawia benovici) contributes new knowledge to scyphozoan taxonomy. Exact determination of species and populations is important due to migration and extinction of species, invasion of alien, invasive species, harvesting, and consequences of climate change and pollution, which all cause changes in the gene pool and affect the course of evolution.

Another important achievement of our department is receiving 'The Prometheus of Science for Excellence in Communication' award from the Slovenian Science Foundation for the year 2016. The award was conferred to researchers of the scientific team dealing with research of marine biodiversity at the Marine Biology Station (L. Lipej, M. Orlando Bonaca, B. Mavrič and D. Trkov). They received the award for their contribution in promoting the understanding of natural processes in the sea and human impact on the environment but especially for the popularization of natural science in popular media from the aspect of biological species richness. One of the biggest achievement of this team in 2016 is the publication of the monograph "Biogenic formations in the Slovenian Sea", published by NIB. The book is the result of the project 'MedKeyHabitats Project', which dealt with mapping of the key marine habitats in the Mediterranean Sea.

Mali morski ježek (Psammechinus microtuberculatus) na rjavi algi (Cystoseira sp.). / *A Green sea urchin (Psammechinus microtuberculatus) on a brown alga (Cystoseira sp.)*

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27	Izvirni znanstveni članek / *Original Scientific Article*
2	Strokovni članek / *Professional Article*
22	Poljudni članek / *Popular Article*
2	Objavljeni znanstveni prispevek na konferenci / *Published Scientific Conference Contribution*
17	Objavljeni povzetek znanstvenega prispevka na konferenci / *Published Scientific Conference Contribution Abstract*
1	Objavljeni povzetek strokovnega prispevka na konferenci / *Published Professional Conference Contribution Abstract*
2	Samostojni strokovni sestavek ali poglavje v monografski publikaciji / *Independent Professional Component Part or a Chapter in a Monograph*
3	Intervju / *Interview*
10	Drugi sestavni deli / *Other Component Parts*
4	Znanstvena monografija / *Scientific Monograph*
3	Drugo učno gradivo / *Other Educational Material*
2	Doktorska disertacija / *Doctoral Dissertation*
1	Magistrsko delo / *Master's Thesis*
9	Končno poročilo o rezultatih raziskav / *Final Research Report*
1	Elaborat, predštudija, študija / *Treatise, Preliminary Study, Study*
1	Projektna dokumentacija (idejni projekt, izvedbeni projekt) / *Project Documentation (preliminary design, working design)*
6	Radijska ali televizijska oddaja / *Radio or Television Broadcast*
1	Druge monografije in druga zaključena dela / *Other Monographs and Other Completed Works*
9	Radijski ali TV dogodek / *Radio or Television Event*
1	Predavanje na tuji univerzi / *Invited Lecture at Foreign University*
4	Prispevek na konferenci brez natisa / *Unpublished Conference Contribution*
2	Vabljeno predavanje na konferenci brez natisa / *Unpublished Invited Conference Lecture*
5	Druga izvedena dela / Other Performed Works
10	Uredništvo / *Editorship*

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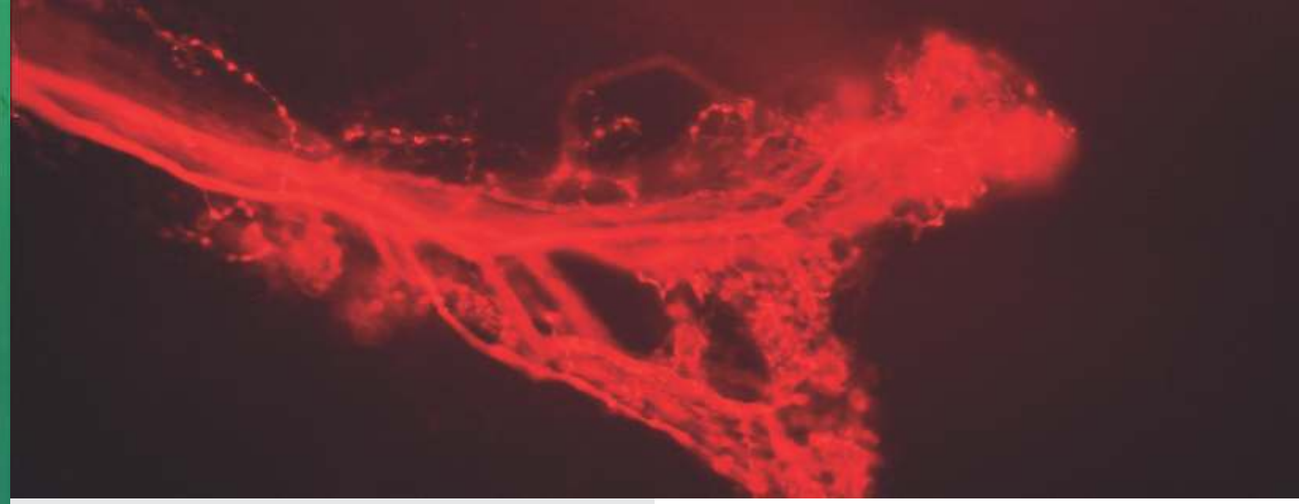
Dr. Meta Virant-Doberlet, znanstvena svetnica, je vodja Oddelka za raziskave organizmov in ekosistemov, ki je bil ustanovljen leta 2016. Je ena od vodilnih svetovnih avtoritet na področju vibracijske komunikacije nevretenčarjev. Njeno raziskovalno delo je usmerjeno v procese, ki so ključnega pomena ne le za evolucijo vibracijske komunikacije, temveč tudi za razumevanje splošnih osnovnih procesov sporazumevanja. Ima tudi pomembno vlogo pri razvoju in uporabi vibracijskih signalov kot novega, okolju prijaznega pristopa za nadzor žuželčjih škodljivcev. Kot priznanje za njene prelomne raziskave je prejela mednarodno nagrado Insect Drummer Lifetime Achievement Award ter nagrado Miroslava Zeia za izjemne znanstvene dosežke na področju dejavnosti NIB-a.

Dr Meta Virant-Doberlet, Scientific Councillor, is the Head of the Department of Organisms and Ecosystems Research established in 2016. She is the leading authority on arthropod vibrational communication; her research is focused on processes that not only shape the evolution of vibrational communication, but are also central to understanding communication in general. She also played an important role in developing the exploitation of vibrational signals as a new, alternative, environmentally-friendly approach to managing insect pests. In recognition of her ground-breaking studies she has been awarded the international 'Insect Drummer Lifetime Achievement Award' and the Miroslav Zei award for Exceptional Scientific Achievements within the fields of research she engages in at NIB.

(slika zgoraj desno)

Obarvane presinaptične razvejitve snopa vibroreceptorskih nevronov v centralnem živčevju jamske kobilice. / *Stained presynaptic branches of a vibroreceptor axon bundle in the central nervous system of a cave cricket.*



ODDELEK ZA RAZISKAVE ORGANIZMOV IN EKOSISTEMOV

NEOKRNJENI NARAVNI EKOSISTEMI SO NAŠE BOGASTVO

KLJUČNE DEJAVNOSTI

Temeljne in aplikativne raziskave na Oddelku za raziskave organizmov in ekosistemov so osredotočene na biološke procese od nivoja celice do ekosistemov. Ustvarjamo vrhunsko znanje potrebno za celostno razumevanje organizmov in njihove vloge v okolju, od nevronalnih mehanizmov zaznavanja okolja in komunikacije med celicami do interakcij v ekosistemih. Naše interdisciplinarno znanje in izkušnje uporabljamo za predloge učinkovitejših in bolj trajnostnih posegov v okolje.

Specifična področja, ki se jim posvečajo svetovno priznani strokovnjaki na oddelku, so sledeča:

raziskave biodiverzitete kopenskih in sladkovodnih ekosistemov, vključno s podzemnimi ekosistemi;

-

raziskave vibracijske komunikacije, ki vključujejo analizo naravne vibracijske zvočne krajine, proučevanje komunikacijskih omrežij, analiza vibracijskih signalov in vedenjskih odzivov ter nevrobiološke in ekofiziološke študije;

-

določanje prilagojenosti izbranih vrst na spremembe dejavnikov v okolju na osnovi ekofizioloških študij;

-

raziskave odnosov med tujerodnimi in domorodnimi vrstami s podobnimi ekološkimi nišami;

-

raziskave hroščev s seznama vrst evropskega varstvenega pomena, vključno z raziskavami njihovih vrstno-specifičnih feromonov;

DEPARTMENT OF ORGANISMS AND ECOSYSTEMS RESEARCH

PRISTINE NATURAL ECOSYSTEMS ARE OUR CAPITAL

TOPIC AREAS

Basic and applied research activities at the Department of Organisms and Ecosystems Research are focused on biological processes at different levels – from cells to ecosystems. We create state-of-the-art knowledge needed for in-depth understanding of organisms and their role in the environment, from neuronal mechanisms of environment sensing and communication between cells to interactions within ecosystems. We use our interdisciplinary knowledge and expertise to propose more efficient solutions for biodiversity conservation and sustainable use of renewable natural resources.

Specific research areas of world-class authorities at the Department include:

biodiversity; study of terrestrial and freshwater ecosystems, including subterranean ecosystems;

-

vibrational communication, with focus on analysis of natural vibrational soundscape, studies of communication networks, analysis of vibrational signals and behavioural responses, as well asneurobiological and ecophysiological studies;

-

adaptability of model species to changes in various environmental factors, where we use ecophysiological approach;

-

relations between invasive and native species with similar ecological niches;

-

beetles included in the EU Habitat Directive, including species-specific pheromones;

študije ekosistemskih storitev, ki vključujejo raziskave procesov v vodonosnikih ter ekologijo opraševanja s poudarkom na divjih opraševalcih;
-
raziskave vpliva rabe prostora na ekosistemske procese v vodotokih;
-
študije interakcije človeka z okoljem v travniškem in mestnem okolju;
-
razvoj alternativnih pristopov za nadzor žuželčjih škodljivcev in monitoring ogroženih vrst.

GLAVNI DOSEŽKI V LETU 2016

Z objavo v reviji Science of the Total Environment smo pomembno prispevali k boljšemu razumevanju, kako toleranca na termalni stres in na izpostavljenost težkim kovinam vpliva na potencial invazivnosti tujerodih vrst. Rezultati so pokazali, da se invazivna školjka *Sinanodonta woodiana* bolje spopada z neugodnimi abiotskimi razmerami kot domorodna vrsta *Anadonta anatina*. To je lahko pomembna fiziološka prednost pri nadaljnjem širjenju vrste *S. woodiana* v evropskih celinskih vodah, ki so izpostavljene izrazitim klimatskim spremembam.

V prispevku, objavljenem v reviji Computers and Electronics in Agriculture, smo predstavili avtonomni sistem za razpoznavanje pozivnih napevov samcev škržatka *Aphrodes bicincta* Dragonja in reprodukcijo odgovorov samice v realnem času. Uspešnost avtonomnega sistema smo preverili z vedenjskimi poskusi, v katerih je ta sistem uspešno privabil samce do vira odgovorov samice. Tak sistem omogoča nadaljnji razvoj vibracijske pasti kot alternativni, okolju prijazen pristop nadzora škodljivcev.

Znanstveno raziskovalni svet ARRS za naravoslovne vede je članek Manipulating behaviour with substrate-borne vibrations - potential for insect pest control, objavljen v reviji Pest Management Science, kot vrhunski dosežek na področju biologije uvrstil v izbor Odlični v znanosti 2016. Delo je bilo v okviru projekta »Znanost na cesti« 12. decembra 2016 javno predstavljeno v Kavarni Union v Ljubljani.

Dr. Meta Virant-Doberlet je prejela nagrado Miroslava Zeia za izjemne znanstvene dosežke v zadnjih petih letih na področju dejavnosti NIB-a.

ecosystem services including studies of processes in aquifers and pollination ecology with special emphasis on wild pollinators;
-
impact of land use on river ecosystems;
-
human interactions with the environment in hay meadows and urban areas;
-
development of alternative approaches in insect pest management and monitoring endangered species.

IMPORTANT ACHIEVEMENTS IN 2016

We published a paper in the journal Science of the Total Environment that significantly contributes to better understanding of the role of tolerance to thermal stress and to heavy metal pollution stress in the invasion potential of alien species. The results demonstrate that overall the invasive bivalve species Sinanodonta woodiana coped much better with unfavourable conditions than the native species Anodonta anatina. This is an important physiological advantage supporting the further spreading of the invasion of S. woodiana in European freshwaters, especially in the context of climate change.

In the paper published in the journal Computers and Electronics in Agriculture we described the autonomous system capable of recognizing the male call of the leafhopper Aphrodes bicincta "Dragonja" and generating female replies in real time. We tested the efficiency of the autonomous system in behavioural experiments with live males and successfully attracted them to the source of the female reply. Such a system enables the development of a vibrational trap as an alternative, environmentally friendly, approach to pest management.

The article »Manipulating behaviour with substrate-borne vibrations - potential for insect pest control«, published in the journal Pest Management Science, was chosen by the Scientific Research Committee at the Slovenian Research Agency to represent the field of biology at the 2016 Excellent in Science project. The work was publicly presented on 12 December in the Café of the Grand Hotel Union in the scope of the "Science on the Street" project.

Meta Virant-Doberlet received the Miroslav Zei award for Exceptional Scientific Achievements in research during the past five years working at NIB.

Rogač. / *Stag Beetle (Lucanus cervus).*

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19	Strokovni članek / *Professional Article*
2	Poljudni članek / *Popular Article*
1	Objavljeni znanstveni prispevek na konferenci (vabljeno predavanje) / *Published Scientific Conference Contribution (invited lecture)*
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22	Objavljeni povzetek znanstvenega prispevka na konferenci / *Published Scientific Conference Contribution Abstract*
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3	Samostojni strokovni sestavek ali poglavje v monografski publikaciji / *Independent Professional Component Part or a Chapter in a Monograph*
1	Predgovor, spremna beseda / *Preface, Afterword*
2	Intervju / *Interview*
5	Drugi sestavni deli / *Other Component Parts*
2	Strokovna monografija / *Professional Monograph*
5	Končno poročilo o rezultatih raziskav / *Final Research Report*
3	Elaborat, predštudija, študija / *Treatise, Preliminary Study, Study*
2	Radijska ali televizijska oddaja / *Radio or Television Broadcast*
2	Druge monografije in druga zaključena dela / *Other Monographs and Other Completed Works*
6	Radijski ali TV dogodek / *Radio or Television Event*
5	Razstava / *Exhibition*
1	Predavanje na tuji univerzi / *Invited Lecture at Foreign University*
6	Prispevek na konferenci brez natisa / *Unpublished Conference Contribution*
1	Vabljeno predavanje na konferenci brez natisa / *Unpublished Invited Conference Lecture*
11	Druga izvedena dela / *Other Performed Works*
13	Uredništvo / *Editorship*

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Vodja: izr. prof. dr. Maja Ravnikar
Head: Assoc. Prof. Dr Maja Ravnikar

Prof. dr. Maja Ravnikar, znanstvena svetnica, je vodja Oddelka za biotehnologijo in sistemsko biologijo ter izredna profesorica biotehnologije na Univerzi v Ljubljani, Univerzi Nova Gorica in na mednarodni Podiplomski šoli Instituta Jožef Stefan. Njene raziskave so odmevne predvsem na področju virologije, kjer proučuje raznolikost in diagnostiko ter epidemiologijo virusov, razvoj metod za nekemično eliminacijo mikrobov ter karakterizacijo virusov, ki so razviti za različne biotehnološke aplikacije.

Prof. Maja Ravnikar, Scientific Councillor, is the Head of the Department of Biotechnology and Systems Biology and Professor of Biotechnology at the University of Ljubljana, University of Nova Gorica and Josef Stefan Postgraduate School. Her research was met with affirmative response within the field of virology, especially in virus diversity, diagnostics and epidemiology studies, development of non-chemical methods for microbe elimination and characterisation of viruses, developed for different biotechnological applications.

(slika zgoraj desno)

Test preobčutljivostne reakcije na tobaku. / *Testing of the hypersensitive response in tobacco.*

ODDELEK ZA BIOTEHNOLOGIJO IN SISTEMSKO BIOLOGIJO

KLJUČNE DEJAVNOSTI

Ustvarjanje vrhunskega znanja za celostno razumevanje bioloških procesov s poudarkom na interakcijah med rastlinami in škodljivimi organizmi s pomočjo uporabe kvantitativne in kvalitativne molekulske biologije ter razvijanja pristopov sistemske biologije;

-

boljše razumevanje biologije, raznolikosti, patogenosti in epidemiologije mikroorganizmov ter na osnovi novega znanja razvoj boljših pristopov za njihovo detekcijo in zatiranje;

-

razvoj novih biotehnoloških metodoloških pristopov za bolj učinkovito identifikacijo in detekcijo gensko spremenjenih organizmov glede na njihovo pričakovano povečano uporabo v prihodnjih letih;

-

nadgrajevanje tehnološke platforme, ki podpira raziskave sistemske biologije in meroslovno naravnane raziskave tarčnih organizmov;

-

prenos ustvarjenega znanja o biologiji patogenih in gensko spremenjenih organizmov ter razvite metode za njihovo določanje na področja kmetijstva, farmacije, medicine in varovanja okolja (v okviru oddelka FITO delujeta uradna diagnostična laboratorija za dokazovanje gensko spremenjenih organizmov in rastlinskih patogenih mikroorganizmov);

-

partnersko sodelovanje z drugimi raziskovalnimi skupinami na NIB-u ali izven njega v Sloveniji in po svetu pri komplementarnih raziskavah za pridobivanje vrhunskega znanja;

-

partnersko povezovanje z državnimi in evropskimi institucijami, visokošolskimi organizacijami in industrijo za skupni prispevek k reševanju aktualnih problemov s področja delovanja oddelka.

DEPARTMENT OF BIOTECHNOLOGY AND SYSTEMS BIOLOGY

TOPIC AREAS

Generating scientific knowledge of the highest quality, concerning biological processes with an emphasis on interactions between plants and harmful organisms with the use of quantitative and qualitative molecular biology and development of systems biology approaches;

-

gaining better insight into the biology of microorganisms in order to understand their diversity, pathogenicity and epidemiology that can lead to the development of better approaches for their detection and control;

-

development of new methodological approaches in biotechnology as the background for more efficient identification and detection of GMOs in light of their expected increase on the world market in the coming years;

-

upgrading the technology platform supporting systems biology research as well as metrologically orientated research of target organisms;

-

transferring newly created knowledge on the biology of pathogenic and genetically modified organisms along with new methods for their determination to the fields of agriculture, pharmacy, medicine and environment conservation (FITO includes two official diagnostics laboratories for detection of GMOs and pathogenic microorganisms);

-

establishing a partnership with other research groups at NIB, in Slovenia, Europe and the world, for complementary research leading to scientific excellence;

-

establishing a partnership with governmental and European organizations, academic institutions and industry, working together in solving practical problems related to the FITO fields of expertise.

GLAVNI DOSEŽKI V LETU 2016

Ekohidrološka stičišča so najpomembnejše vroče točke, na katerih v ekosistemih prihaja do sprememb v izmenjavah med tokovi. Raziskave teh stičišč so tematika evropske mreže Marie Curie Initial Training Network za izobraževanje raziskovalcev na začetku karierne poti – INTERFACES: "Development of methods for detection of viruses in aquatic environments and their interactions with bacteria in biofilms". V projektu je eden od 12 partnerjev tudi NIB z oddelkoma FITO in MBP. V okviru projekta je bilo na NIB-u zaključeno podoktorsko izobraževanje, izobraževanje doktorskega študenta pa še poteka. Sodelavci na projektu so svoje rezultate objavili v reviji Water Research, ki ima dejavnik vpliva 5,9 in je po metodologiji ARRS uvrščena v kategorijo A''. Članek opisuje razvoj metode za sočasno koncentriranje rotavirusov in norovirusov iz vzorcev morske vode z uporabo monolitnih kromatografskih nosilcev, povezanih s qPCR, kar omogoča popolnoma nov pristop k uspešnemu zaznavanju patogenih virusov v morju.

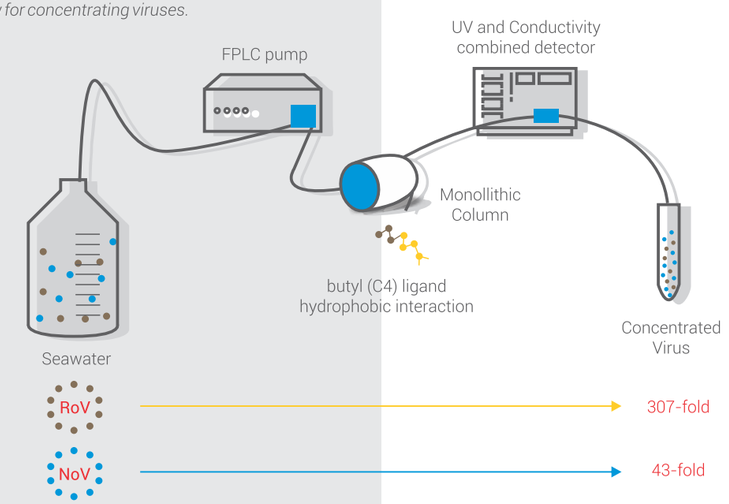
Sodobne analitske tehnologije na področju kvantifikacije nukleinskih kislin omogočajo izjemno občutljivost in specifičnost, ki sta sklopljeni z natančnostjo in ponovljivostjo. Npr. z uporabo digitalnega PCR lahko izmerimo absolutno število tarč v vzorcu. Razmerje med

IMPORTANT ACHIEVEMENTS IN 2016

Ecohydrological interfaces are critical hotspots for transformations of ecosystem exchange fluxes. Their research is the topic of the Marie Curie Initial Training Network INTERFACES: "Development of methods for detection of viruses in aquatic environments and their interactions with bacteria in biofilms", funded by the European Union for the duration of four years. The project consortium consists of 12 full partners, including NIB departments FITO and MBP. To date, one (1) related postdoctoral project has been finished and one (1) doctoral study is on-going at NIB. The project researchers have published their results in the journal Water Research, with an impact factor of 5.9, which is listed as an A'' achievement according to the SRA methodology. The paper describes the development of a method for simultaneous concentration of rotaviruses and noroviruses from saline water samples by using monolithic chromatographic supports with hydrophobic interaction chemistry paired with qPCR. This new system allows new efficient monitoring of pathogenic viruses in seawater.

The advents of modern analytical technologies provided the field of nucleic acid quantification with unprecedented level of sensitivity and specificity, coupled with high

Delotok koncentriranja virusov. /
The workflow for concentrating viruses.



Medsebojna inhibicija bakterij. /
Inhibition of the bacterial growth.

ceno in učinkovitostjo metode lahko še izboljšamo z uporabo multipleksnih strategij. V članku, objavljenem v reviji Scientific Reports z dejavnikom vpliva 5,228, smo objavili razvoj dveh takih testov skupaj z evalvacijo številnih parametrov. Testa sta primerna za kvantifikacijo gensko spremenjene koruze v živilih, krmi in drugih vzorcih. Isti pristop pa se lahko uporabi povsod, kjer je nujna natančna in zanesljiva kvantifikacija multiplih tarč DNA.

Na osnovi posebnih znanj, pridobljenih z dolgoletnim razvijanjem novih pristopov in orodij sistemske biologije, so raziskovalci oddelka FITO vključeni v številne raziskave drugih raziskovalnih laboratorijev pri nas in v tujini. S svojim znanjem sistemske biologije so tako prispevali tudi k analizi zorenja semen kakavovca. Rezultati raziskave so bili objavljeni v vrhunski reviji s področja rastlinske biologije The Plant Journal z dejavnikom vpliva 5,4.

Patogene bakterije fitoplazme povzročajo številne bolezni na poljščinah. Za preprečitev njihovega širjenja je ključna zelo hitra detekcija, po možnosti že na polju. V okviru uspešno zaključenega evropskega projekta GRAFDEPI2, ki ga je vodil oddelek FITO, smo izdelali protokol za hitro detekcijo fitoplazem na vinski trti, ki temelji na metodi LAMP (okrajšava za ang. loop –mediated-isothermall amplification). Protokol je bil objavljen v reviji European Journal of Plant Pathology. Pomemben del raziskave je opravila Anja Pugelj, ki je pod mentorstvom/ somentorstvom Marine Dermastia in Polone Kogovšek izdelala svojo magistrsko nalogo. Zanjo je prejela Prešernovo nagrado Biotehniške fakultete.

V letu 2016 smo v sodelovanju z odcepljenim podjetjem BioSistemika pripravili webinar o digitalnem PCR. Organizirali smo tudi praktično izobraževalno delavnico s področja PCR v realnem času in LAMP za predstavnike Ruskega uradnega diagnostičnega laboratorija za viruse in fitoplazme ter delavnico o digitalni PCR za domače in tuje udeležence. Skupaj s Sekretariatom konvencije o biološki raznovrstnosti (SCBD), ki deluje pod okriljem Programa Združenih narodov za okolje (UNEP), in z Ministrstvom za okolje in prostor smo organizirali delavnico za Centralno in Vzhodno Evropo na temo določanja in identifikacije živečih gensko spremenjenih organizmov. Delavnice so se udeležili predstavniki 12 držav. Za udeležence iz tujine smo pripravili tudi več individualnih izobraževanj s področja določanja GSO. Oddelek je organiziral strokovni del 16. srečanja Sekcije za virologijo Evropskega združenja za raziskave krompirja (EAPR) in 8. srečanja organizacije PVYwide. Kot soorganizatorji smo sodelovali na slovenskem delu 5. svetovnega dne očarljivih rastlin.

accuracy and reproducibility. One of the most exciting developments after real-time PCR is the digital PCR (dPCR) with the possibility of measuring an absolute number of targets present in the samples. One way to achieve better cost efficiency of the technique is to use it in a multiplexing strategy. In the paper, published in a journal Scientific Reports with the impact factor of 5.228, we reported a development of two such assays, together with an evaluation of several parameters. Both assays are suitable for quantification of GMO maize events and the same approach can be used in any other field with a need for accurate and reliable quantification of multiple DNA targets.

Based on the specific knowledge sourced during the long term development of new approaches and tools of systems biology, researchers of the FITO department are involved in various studies of several other research laboratories from Slovenia and abroad. Their knowledge of systems biology has thus contributed to the analysis of ripening in the cacao seeds. The results were published in one of the top journals from the field of plant biology – The Plant - with an impact factor of 5.4.

Phytoplasmas are phytopathogenic bacteria that cause several diseases of in economically important plants. A key component in prevention of their spreading is fast detection in the field. In the scope of the recently finished EU project GRAFDEPI2, in which FITO was the leading partner, we developed a protocol for fast detection of phytoplasmas in grapevine based on LAMP technology. The protocol has been published in one of the leading journals in the field – European Journal of Plant Pathology. An important part of the research was performed by a master student Anja Pugelj under the supervision of Marina Dermastia and Polona Kogovšek. For her master thesis she received the Prešeren Award of the Biotechnical Faculty.

In 2016 we executed a webinar on digital PCR together with our spin-off company Biosistemika. We also organized hands-on workshops on a real-time PCR and LAMP for the representatives of the official Russian diagnostic laboratory for viruses and phytoplasmas, as well as an international workshop on digital PCR. Together with the Secretariat of the Convention on Biological Diversity, which works within the United Nations Environment Program, and with the Ministry of the Environment and Spatial Planning we organized a Central and Eastern Europe workshop on detection and identification of living modified organisms in 2016. The workshop was attended by representatives of 12 countries. GMO detection was also a topic of several individual training courses for foreign participants.

Najmlajši udeleženci Dneva očarljivih rastlin, 27. 5. 2016 /
The youngest participants of the Fascination of Plants Day, 27. 5. 2016

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12	Poljudni članek / *Popular Article*
5	Objavljeni znanstveni prispevek na konferenci / *Published Scientific Conference Contribution*
4	Objavljeni povzetek znanstvenega prispevka na konferenci (vabljeno predavanje) / *Published Scientific Conference Contribution Abstract (invited lecture)*
48	Objavljeni povzetek znanstvenega prispevka na konferenci / *Published Scientific Conference Contribution Abstract*
26	Objavljeni povzetek strokovnega prispevka na konferenci / *Published Professional Conference Contribution Abstract*
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3	Drugo učno gradivo / *Other Educational Material*
2	Magistrsko delo / *Master's Thesis*
2	Doktorska disertacija / *Doctoral Dissertation*
11	Končno poročilo o rezultatih raziskav / *Final Research Report*
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4	Druga izvedena dela / *Other Performed Works*
8	Uredništvo / *Editorship*

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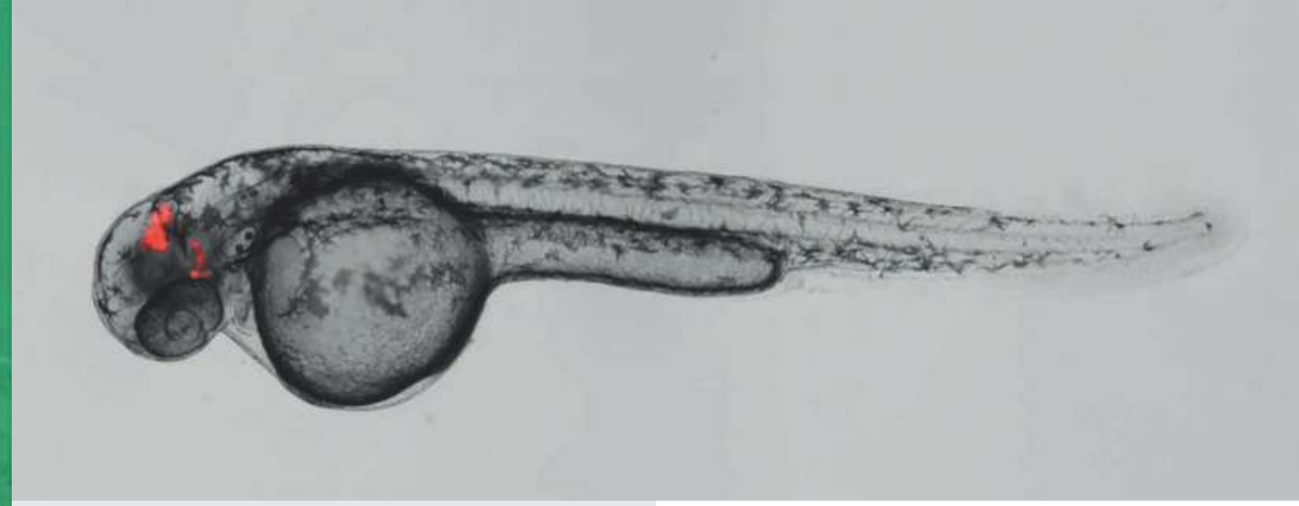
Vodja: prof. dr. Metka Filipič
Head: Prof. Dr Metka Filipič

Prof. Metka Filipič, znanstvena svetnica, je od leta 2005 vodja Oddelka za genetsko toksikologijo in biologijo raka ter redna profesorica toksikološke kemije na Fakulteti za farmacijo Univerze v Ljubljani. Njeno raziskovalno področje so raziskave mehanizmov genotoksičnega in potencialno karcinogenega delovanja antropogenih in naravnih onesnažil okolja in hrane, raziskave potencialnih antigenotoksičnih snovi ter razvoj novih *in vitro* testnih sistemov za proučevanje genotoksičnosti. Njene raziskave so izrednega pomena tudi za področje znanosti o okolju, predvsem za razumevanje škodljivih vplivov ostankov zdravil na okolje in zdravje ljudi, za kar je prejela Zoisovo priznanje za pomembne dosežke.

Prof. Metka Filipič, Scientific Councillor, is the Head of the Department of Genetic Toxicology and Cancer Biology since 2005 and Professor of Toxicological chemistry at the Faculty of Pharmacy, University of Ljubljana. Her research is focused on mechanisms of genotoxicity and potential carcinogenicity of man-made and natural pollutants in the environment and food, studies of potential anti-genotoxic substances and development of new in vitro test systems in genetic toxicology. She is also recognised for her important contribution in the field of environmental sciences particularly in understanding the adverse effects of residues of pharmaceuticals on the environment and human health for which she received the national Zois award for important achievements.

(slika zgoraj desno)

Glioblastomske celice, ki izražajo fluorescentni protein dsRed, v možganih zarodka ribe cebrice (Danio rerio). / *Glioblastoma cells expressing fluorescent protein DsRed, in the brain of the zebrafish embrio (Danio rerio).*



ODDELEK ZA GENETSKO TOKSIKOLOGIJO IN BIOLOGIJO RAKA

KAKOVOST OKOLJA IN ZDRAVJE LJUDI STA NELOČLJIVA

KLJUČNE DEJAVNOSTI

Področje genetske toksikologije vključuje:

- Raziskave molekularnih mehanizmov genotoksičnega delovanja okolijskih in prehranskih onesnažil;
- Razvoj novih in vitro testnih sistemov v genetski toksikologiji.

Področje raziskav mehanizmov razvoja in napredovanja raka vključuje:

- Raziskave nastanka možganskih tumorjev – gliomov, glioblastomskih matičnih celic in njihove vloge pri napredovanju in odpornosti na zdravljenje;
- Mehanizmi delovanja proteolitičnih encimov v patobioloških procesih rakavih celic;
- Raziskave mezenhimskih matičnih celic kot del tumorskega mikrookolja in vektorjev za vnos zdravil.

Področje okolijskih raziskav obsega:

- Raziskave in razvoj metod nadzora in preprečevanja pojavljanja strupenih cianobakterijskih cvetov;
- Monitoring fitoplanktona in fitobentosa za potrebe upravljanja s celinskimi vodami.

Na vseh področjih sodelujemo s partnerji iz gospodarstva, državnih institucij in visokošolskimi organizacijami.

DEPARTMENT FOR GENETIC TOXICOLOGY AND CANCER BIOLOGY

QUALITY OF ENVIRONMENT AND HUMAN HEALTH ARE INSEPARABLE

TOPIC AREAS

Research in genetic toxicology includes:

- *molecular mechanisms of genotoxicity of environmental and foodborne contaminants;*
- *development of new in vitro test systems in genetic toxicology.*

Research in the mechanisms of cancer development and progression includes:

- *brain tumour research – glioma initiation, glioblastoma stem cells and their role in progression and resistance to therapy;*
- *mechanisms of functioning of proteolytic enzymes in pathobiological processes in cancer;*
- *mesenchymal stem cells as part of tumour microenvironment and as vectors for drug delivery.*

Environmental research includes:

- *studies and development of methods for surveillance and prevention of toxic cyanobacterial blooming;*
- *monitoring phytoplankton and phytobenthos as part of inland water management.*

Collaboration with partners and stakeholders from industry, governmental institutions and academia.

GLAVNI RAZISKOVALNI DOSEŽKI V LETU 2016

V okviru raziskav toksičnega in genotoksičnega delovanja cianobakterijskih toksinov smo proučevali neurotoksin β-N-methylamino-L-alanine (L-BMAA), za katerega so nedavno ugotovili, da je močno razširjen v vodnem in kopenskem okolju ter predstavlja zdravstveno tveganje za ljudi in živali. Povezujejo ga z nastankom in razvojem številnih nevrodegenerativnih bolezni, medtem ko so podatki o morebitni genotoksičnosti zelo skopi. V reviji Toxicon smo objavili raziskavo, v kateri smo prvi pokazali, da L-BMAA ni mutagen za bakterije. Vendar pa so nadaljnje raziskave genotoksičnosti tega toksina pokazale, da pri človeških jetrnih celicah HepG2 povzroči poškodbe DNA.

V reviji Journal of Hazardous Materials (A") ter reviji Chemosphere smo objavili rezultate raziskav **genotoksičnega delovanja dveh vrst modificiranih glin**, ki se ju uporablja pri proizvodnji nanokompozitnih materialov za embaliranje živil. Ugotovili smo, da obe glini pri celicah HepG2 povzročata nastanek genomske nestabilnosti in vplivata na spremembe izražanja genov, vpletenih v presnovo telesa tujih snovi, zgodnje signalne poti, odziv na poškodbe DNA, odziv na oksidativni stres in apoptozo. Te podatke bo potrebno upoštevati pri oceni varnosti uporabe teh materialov za embaliranje živil in morebitne druge uporabe, pri katerih pride do izpostavljenosti ljudi.

Na področju razvoja novih *in vitro* testnih sistemov v genetski toksikologiji smo raziskave usmerili v **razvoj novih, stabilnih, metabolno-aktivnih celičnih linij človeških jeter** kot modelov za raziskovanje genotoksičnosti in potencialne karcinogenosti. Optimizirali smo postopek diferenciacije mezenhimskih matičnih celic (MSC) v hepatocitam podobne celice (HepLC), ki so sposobne zaznavati genotoksično aktivnost posredno delujočih modelnih genotoksinov, kot sta benzo(a)piren (BaP) in aflatoksin B1 (AFB1). HepLC celice smo imortalizirali s transfekcijo s hTERT in so osnova za nadaljnji razvoj stabilne metabolno-aktivne celične linije.

Na področju kancerogeneze je bilo najbolj izvirno delo Neže Podergasj in sod. (2016), kjer smo prvi v svetu opisali odkrili **nov biološki označevalec glioblastomskih matičih celic (GSC)**, membranski protein tetraspanin CD9, in ugotovili njegov vpliv v invaziji celic GSC, vzdrževanju njihove matičnosti in dovzetnosti za terapijo. Funkcionalnost tega proteina smo preverili z utišanim izražanjem gena CD9 in dokazali, da so GBM matične celice manj invazivne od kontrolnih celic, izražajo manj genov, ki so potrebni za matični celični fenotip in so bolj dovzetne na tretma s kemoterapevtiki. **To je pomemben korak v prizadevanjih znižati odpornost glioblastoma na sevanje in kemoterapijo** zaradi rakavih matičnih celic.

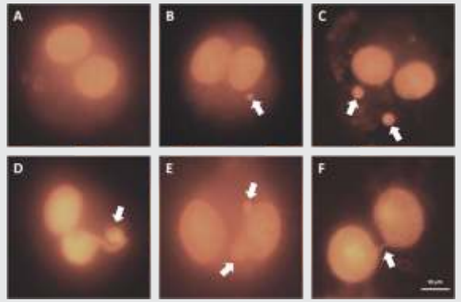
MAIN ACHIEVEMENTS IN 2016

In the scope of our research of toxic and genotoxic activities of cyanobacterial toxins, we studied the neurotoxin β-N-methylamino-L-alanine (L-BMAA) which has recently been demonstrated to be very widespread in water and terrestrial environments and represents a health risk for people and animals. It is involved in the development of numerous neurodegenerative diseases, whereas data on its potential genotoxic activity are scarce. In the journal Toxicon we published a paper presenting the first evidence that L-BMAA is not mutagenic to bacteria. However, further genotoxicity studies revealed that it induces DNA damage in human hepatic cells HepG2.

We published the results of genotoxicity studies of two types of modified clays that are used in the production of nanocomposite materials used for food packaging in the Journal of Hazardous Materials (A") and in Chemosphere. We found that both types of clays induce genomic instability in HepG2 cells and affect the expression of genes involved in xenobiotic metabolism, early signalling pathways, DNA damage response, response to oxidative stress and apoptosis. These data should be taken into account in ***safety assessments of these materials for food packaging*** *as well as other applications where human exposure may occur.*

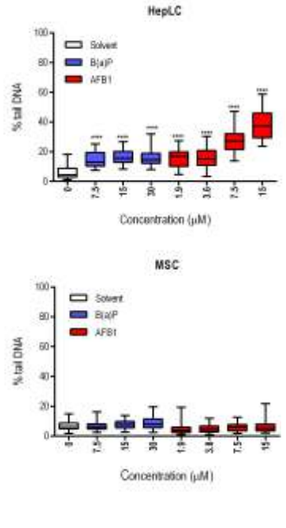
Developing new in vitro test systems in genetic toxicology we focus on the ***development of new, stable, metabolically active hepatic cell lines*** *as models for genotoxicity and, potentially, carcinogenicity studies. We optimized the procedure for differentiation of mesenchymal stem cells (MSC) to hepatocyte like cells (HepLC) that are able to detect model indirect acting genotoxins such as benzo(a)pyrene (BaP) in aflatoxin B1 (AFB1). HepLC were immortalized by hTERT transfection and represent the basis for further development of a stable metabolically active cell line.*

In the field of carcinogenesis, our most original work was performed by Neža Podergajs and her co-workers (2016) who first described the membrane ***protein tetraspanin CD9 as a new biological marker of glioblastoma stem cells (GSC)****. We found that CD9 is involved in the invasion of GSC, maintenance of their stemness and their sensitivity to therapy. The functionality of this protein was verified by down-regulation of its expression. It has been proven that GSCs with down-regulated CD9 are less invasive than control cells, they express lower levels of genes that are needed for stem-like phenotype and are more sensitive to chemotherapeutics. This is an important step in our efforts to reduce the resistance of glioblastomas to radiation and chemotherapy due to cancerous stem cells.*



Izpostavitev benzo(a)pirenu (BaP) ali aflatoksinu B1 (AFB) povzroči nastanek poškodb DNA pri diferenciranih HepLC celicah, nediferencirane MSC pa so neobčutljive. / *Exposure to benzo(a)payrene (BaP) or aflatoxin B1 (AFBA) induces DNA damage in differentiated HepLC cells, while non-differentiated MSC are insensitive.*

Indukcija genomske nestabilnosti HepG2 po izpostavitvi modificirani glini (Cloisite®Na+). / *Induction of genomic instability in HepG2 cells exposed to modified clay (Cloisite®Na+).*

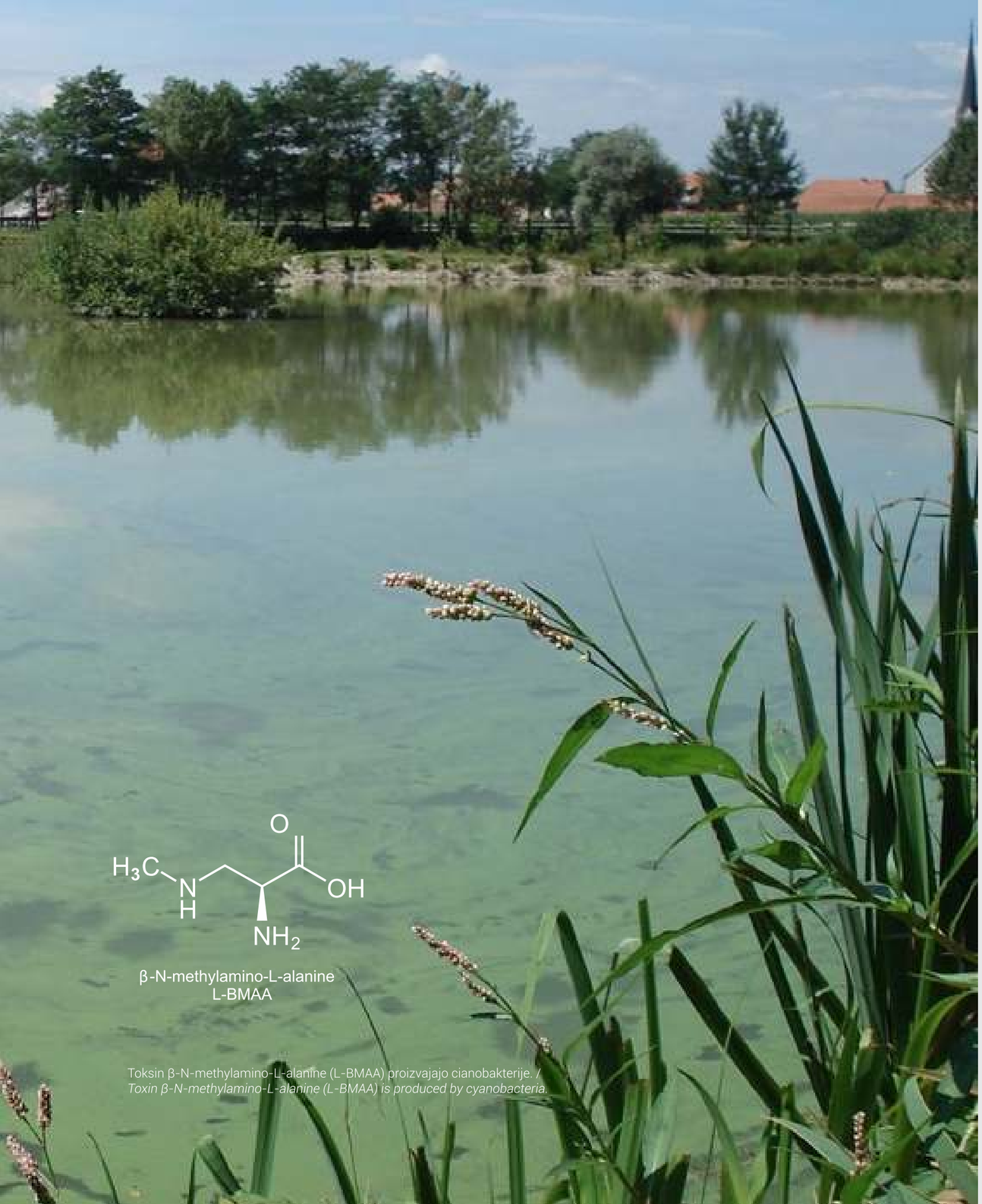


Mezenhimske matične celice (MSC) niso le del tumorskega mikrookolja, ampak lahko **služijo kot vektor za vnos zdravil** v naprednih celičnih zdravljenjih. V povezavi z možno uporabnostjo v zdravljenju raziskujemo tudi mezenhimske matične celice izolirane iz maščobnega tkiva (AT-MSC), ki so se izkazale za bolj dolgožive kot tiste, izolirane iz maščevja trebuha, zatem stegen in najmanj z bokov. Zanimiv dosežek na tem področju so živalski poizkusi, ki smo jih izvedli v sodelovanju s Kliniko za nefrologijo, UKC v poizkusnem modelu na miših. Ugotovili smo, da so MSC pomembne tudi pri zdravljenju imunskih bolezni. Izkazalo se je, da dodajanje MSC celic, ki smo jih pripravili iz popkovnice človeka, močno pospeši zdravljenje akutne poškodbe ledvic z imunsko terapijo z anti-timusnim globulinom (ATG). Gre torej za sinergistično imunosupresijo MSC in standardne imunoterapije. To prinaša **nove obete zdravljenja odpovedi ledvic** tudi pri človeku.

Eksperimentalni modeli z ribami cebricami (Danio rerio) postajajo vse pomembnejše **orodje pri raziskavah procesov, povezanih z rakom**. Pri študiju invazije možganskega tumorja glioblastoma (GBM) smo uporabili ksenotransplantacijo fluorescentnih GMB celic v zarodke rib cebric in opazovali njihovo porazdelitev v možganih in živčnem sistemu. Ugotovili smo, da celice po injiciranju invadirajo osrednji živčni sistem, pri čemer je izrazito hitra invazija vzdolž hrbtenjače. V možgane rib cebric smo vnesli tudi direktne sokulture človeških mezenhimskih

Mesenchymal stem cells (MSC) are not only part of the tumor microenvironment, they can also serve as vectors for administration of drugs in advanced cell therapies. Examining the possible use of MSC in treatment, fat tissue MSC (AT-MSC) were also investigated. AT-MSC, isolated from abdominal fat have been proven to be more long-lived than those isolated from thighs and hips. An interesting achievement in this area are animal experiments, which were carried out in cooperation with the Department of Nephrology at the University Medical Centre Ljubljana. In experimental mouse model we found that MSC are also important in treatment of immune diseases. It turned out that ***the addition of MSC isolated from the human umbilical cord improved renal function parameters reduced after acute renal injury by immune therapy with Antithymocyte Globulin (ATG)****. This is a case of synergistic immunosuppression by MSC and standard immunotherapy which opens new prospects for treatment of renal impairment also in humans.*

Experimental models with zebrasih *(Danio rerio) are* ***becoming an increasingly important tool in cancer research****. In the study of glioblastoma (GBM) invasion, xenotransplantation of fluorescent GBM cells into zebrafish embryo brain was performed and their distribution in the brain and nervous system was studied. It was observed that injected cells invade in the central nervous system along the spinal cord in an extremely rapid manner. The frequency of invasion is different in both cell*



Toksin β-N-methylamino-L-alanine (L-BMAA) proizvajajo cianobakterije. /
Toxin β-N-methylamino-L-alanine (L-BMAA) is produced by cyanobacteria.

matičnih celic (MSC) kostnega mozga in GBM ter ugotovili, da injiciranje skupkov teh celic spodbudi invazijo tumorskih celic GBM. **To je prva objava transplantacije celičnih sokultur v možgane rib cebric**, ki odpira pot v bolj kompleksne raziskave **možganskih tumorjev v tem živalskem modelu, ki ga vpeljujemo edini v Sloveniji.**

Evtrofikacija voda in posledično cvetenje cianobakterij je tako v Evropi kot v preostalem svetu pereč problem. Prave razsežnosti problema se po navadi pokažejo šele takrat, ko zaradi pojavljanja toksičnih cianobakterij postanejo vodni viri neuporabni za pitje, poleg tega pa škodljivo vplivajo na zdravje okolja, živali in ljudi. Pomembno je zasledovanje pojavljanja in rasti predstavnikov tistih rodov cianobakterij, ki so sposobne cvetenja, ter onemogočanje njihove prekomerne rasti. V letu 2016 smo zaključili EU LIFE+ projekt, pri katerem smo sodelovali v optimizaciji prav teh ukrepov. Podjetje ARHEL je v sodelovanju z NIB-om v okviru projekta LIFE Stop Cyanobloom izdelalo dve robotizirani plovili, ki delujeta na dveh površinskih vodnih telesih v Sloveniji (Blejsko jezero in Koseški bajer v Ljubljani). Njihov namen je monitoring rastlinskega in bakterijskega planktona, zaznavanje prekomerne razrasti cianobakterij in preprečevanje tega pojava z elektrokemijsko oksidacijo (patent št. 23987 (A), 2013-08-3). Rezultati, pridobljeni s pomočjo našega fluorimetričnega sistema za zaznavanje, so pokazali visoko korelacijo s podatki, pridobljenimi s tradicionalnimi metodami. Metoda pa ima več prednosti, kot so nizki stroški obratovanja, veliko prostorsko in časovno ločljivost ter posredovanje informacij o spremembah v planktonskih populacijah v realnem času.

Monitoringi površinskih voda so bili več desetletij družbeno pomembna dejavnost, ki smo jo izvajali za Ministrstvo RS za okolje. Le na podlagi kakovostnega biološkega monitoringa lahko dobro ocenimo ekološko stanje naših voda. Temeljne raziskave na področju vodnih teles so bile osnova za razvoj naprednih biosenzorskih tehnologij, ki smo jih uporabili za razvoj plovila. Na temo bioloških monitoringov površinskih voda smo uspešno zaključili monitoringe za različne javne naročnike (ARSO, Inštitut RS za vode) in podjetje Cinkarna Celje, kar je znaten družbeno-ekonomski dosežek.

NAGRADE IN AKREDITACIJE

Prof. dr. Metka Filipič je prejela Zoisovo priznanje na področju raziskav okolijskih onesnažil in njihovih škodljivih vplivov na okolje in zdravje ljudi.

Urad Republike Slovenije za kemikalije Ministrstva za zdravje je julija 2016 Oddelku za Gensko toksikologijo in biologijo raka podelil potrdilo o skladnosti za izvajanje študij mutagenosti v skladu z OECD načeli Dobre Laboratorijske Prakse (DLP).

*lines, with U87 cells being more invasive. We also co-injected the human bone marrow MSC and GBM cells U373 into zebrafish embryo brain and found that the MSC boosted GBM cell invasion. This is the **first publication on xenotransplantation of cellular co-culture into the brain of the zebrafish embryo**, it paves the way towards a more complex mode of brain tumor research in this animal model, which is established as the only one in Slovenia.*

Water eutrophication and subsequent blooming of cyanobacteria is a problem recognized in Europe and the rest of the world. The real dimensions of this problem are shown when toxic cyanobacteria blooms destroy potable water sources and endanger the environment, animals and human health. This is why it is important to monitor the emergence of toxic cyanobacteria that may flourish and overcome other species by excessive growth. In 2016 we successfully finished the EU LIFE+ project, conclusions concerning the optimization of these actions were presented at the last meeting. In collaboration with ARHEL in the scope of the "LIFE Stop Cyanobloom" project we have developed two robotized vessels, used in two surface water bodies in Slovenia (Lake Bled and Koseze Pond in Ljubljana). Their purpose is to monitor cyanobacteria and bacterial-plankton and prevent the occurrence of blooms with electrochemical oxidation (Patent no. 23987 (A), 2013-08-3). The results gained by using our fluorimetric sensor system have shown a high correlation with data gained by employing traditional methods. Our method has several advantages, such as low operation cost, high spatial and temporal resolution and transmitting information on changes in plankton populations in real time.

Surface water monitoring has been carried out for a few decades as a service to the Ministry of Environment and Spatial Planning in Slovenia. Basic research on water bodies represented the basis for the development of biosensor technologies. In the field of biological monitoring of surface waters we have successfully concluded water monitoring for different partners from the public and private sectors (Agency of Environment, Water Institute, Cinkarna Celje company).

AWARDS AND ACCREDITATIONS

Prof. Metka Filipič was awarded the Zois recognition award in the field of "environmental pollutants and their devastating effects on the health of environment and people".

The Ministry of Health, Chemical Office of the Republic of Slovenia, granted the Department of Genetic Toxicology and Cancer Biology a certificate for conducting mutagenicity studies in accordance with the OECD Principles of Good Laboratory Practices (GLP) in July 2016.

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24	Izvirni znanstveni članek / *Original Scientific Article*
2	Pregledni znanstveni članek / *Review Article*
1	Kratki znanstveni prispevek / *Short Scientific Article*
2	Strokovni članek / *Professional Article*
2	Poljudni članek / *Popular Article*
2	Objavljeni znanstveni prispevek na konferenci (vabljeno predavanje) / Published Scientific Conference Contribution (invited lecture)
4	Objavljeni znanstveni prispevek na konferenci/ *Published Scientific Conference Contribution*
5	Objavljeni povzetek znanstvenega prispevka na konferenci (vabljeno predavanje) / *Published Scientific Conference Contribution Abstract (invited lecture)*
28	Objavljeni povzetek znanstvenega prispevka na konferenci / *Published Scientific Conference Contribution Abstract*
6	Polemika, diskusijski prispevek, komentar / *Polemic, Discussion, Commentary*
2	Intervju / *Interview*
2	Drugi sestavni deli / *Other Component Parts*
1	Doktorska disertacija / *Doctoral Dissertation*
1	Magistrsko delo / *Master's Thesis*
7	Končno poročilo o rezultatih raziskav / *Final Research Report*
1	Elaborat, predštudija, študija / *Treatise, Preliminary Study, Study*
12	Radijski ali TV dogodek / *Radio or Television Event*
2	Predavanje na tuji univerzi / *Invited Lecture at Foreign University*
2	Prispevek na konferenci brez natisa / *Unpublished Conference Contribution*
3	Druga izvedena dela / *Other Performed Works*
10	Uredništvo / *Editorship*

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INFRASTRUKTURNI CENTER NIB

Vodja: izr. prof. dr. Maruša Pompe Novak

Infrastrukturni center NIB (IC NIB) sestavljata dva programsko in organizacijsko zaključena centra: Infrastrukturni center Planta (IC Planta), ki deluje pod okriljem Oddelka za biotehnologijo in sistemsko biologijo, in Infrastrukturni center MBP (IC MBP) na Morski biološki postaji Piran (MBP). IC NIB sofinancira Agencija za raziskovalno dejavnost RS prek infrastrukturnega programa NIB (IP NIB). Vsak del IC NIB nudi uporabo opreme in storitve javnemu in zasebnemu sektorju.

Veliko infrastrukturno opremo IC Planta sestavljajo:

- presevni elektronski mikroskop (Philips CM100) s CCD kamerama (Gatan Orius SC200 in Gatan BioScan 792), ki je v solastništvu Nacionalnega inštituta za biologijo (NIB) in Oddelka za biologijo Biotehniške fakultete (BF) Univerze v Ljubljani (UL),
- kriomikrotom (Leica EM FC6) in ultramikrotom (Leica),
- konfokalni stereomikroskop (Leica TCS LSI),
- aparature za PCR v realnem času (ABI 7900HT Fast, Roche Light Cycler 480 in ABI PRISM ViiA7),
- aparature za digitalni PCR (Biorad QX100, Biorad QX200 in Fluidigm BioMark HD),
- robot za pipetiranje (Hamilton Microlab STARlet),
- komore za gojenje rastlin in tkivnih kultur (Kambič),
- komore za ločeno gojenje rastlin (Kambič) ter
- dva karantenska rastlinjaka.

Raziskovalno plovilo PI-800 »Sagita« in oceanografska boja »Vida« za meritve oceanografskih, meteoroloških in ekoloških parametrov. / *Research vessel Pi-800 »Sagita« and oceanographic buoy »Vida« for measuring oceanographic, meteorologica and ecological parameters.*

NIB INFRASTRUCTURAL CENTRE

Head: Assoc. Prof. Dr Maruša Pompe Novak

The Infrastructural Centre at NIB comprises two integrated centres: the Infrastructural Centre Planta (IC Planta), which is part of the Department of Biotechnology and Systems Biology, and the Infrastructural Centre MBS (IC MBS) as part of the Marine Biology Station Piran in Piran (MBS). The Infrastructural Centre NIB is co-financed by the Slovenian Research Agency (SRA) through the Infrastructural Programme NIB (IP NIB). Each part of IC NIB offers services and equipment to the public and private sector.

The major infrastructural equipment of IC Planta consists of:

- *Transmission electron microscope (Philips CM100) with a CCD camera co-owned by NIB and the Department of Biology at the Biotechnical Faculty (BF), University of Ljubljana (UL),*
- *Cryo-ultramicrotome (Leica EM FC6) and ultramicrotome (Leica),*
- *Confocal stereomicroscope (Leica TCS LSI), (Leica),*
- *Real-time PCR instruments (ABI 7900HT Fast, Roche Light Cycler 480 and ABI PRISM ViiA7),*
- *Digital PCR instruments (Biorad QX100, Biorad QX200 and Fluidigm BioMark HD),*
- *Pipetting robot (Hamilton Microlab STARlet),*
- *Growth chambers for plant and tissue culture breeding*
- *Plant growth chambers for separate breeding (Kambič),*
- *Two quarantine greenhouses and*
- *Supplementary equipment, essential for the functioning of major infrastructural equipment.*

Poleg tega je mogoča uporaba tudi:

- spektrofluorimetrov (SynergyMx, BioTek) in
- sistema za identifikacijo bakterij z analizo celičnih maščobnih kislin s plinsko kromatografijo (Sherlock Microbial Identification System), ki je trenutno lociran na Biotehniški fakulteti (BF) Univerze v Ljubljani (UL).

Veliko infrastrukturno opremo IC MBP sestavljajo:

- raziskovalno plovilo PI-800 Sagita s sodobno navigacijsko in raziskovalno opremo, različnimi vzorčevalniki, akustičnim tokomerjem in sodobno, multiparametrično sondo,
- oceanografska boja Vida z meteorološkimi merilnimi instrumenti, multiparametričnimi sondami in akustičnim tokomerjem ter
- manjše plovilo
- visoko frekvenčni radar Wera

IC Planta služi kot podpora raziskovalni dejavnosti, ministrstvom, inšpektoratom in drugim državnim organom, podjetjem in pedagoški dejavnosti. Vsa velika infrastrukturna oprema IC Planta je tehnološko izjemno zahtevna ter skrbno, redno in strokovno vzdrževana. Veliko infrastrukturno opremo IC Planta uporabljajo tudi uporabniki iz drugih organizacij. Za pogoste uporabnike so organizirani tečaji za uporabo opreme, možna pa je tudi uporaba opreme v obliki storitev in naročil analiz.

IC MBP služi kot podpora raziskovalni in aplikativni dejavnosti za ministrstva in druge državne organe ter izvajanju pedagoških aktivnosti MBP. Tehnološko napredna oprema omogoča najsodobnejše raziskave na morju in uvršča IC MBP med vodilne raziskovalne centre na območju Sredozemlja. MBP je tudi Nacionalni podatkovni center za morske podatke (NODC). Infrastruktura IC MBP zagotavlja visoko kakovost podatkov o stanju na morju, ki so na voljo v skoraj realnem času.

V letu 2016 je veliko infrastrukturno opremo IP NIB uporabljalo 98 različnih uporabnikov, s čemer je IP NIB dosegel cilj, da ohranja izjemno veliko število uporabnikov svoje velike infrastrukturne opreme.

Additionally, it is possible to use:

- *Spectrofluorimeters (SynergyMx, BioTek) and*
- *System for identification of microorganisms using fatty acid methyl ester analysis by Gas Chromatography (Sherlock Microbial Identification System) currently located at BF, UL.*

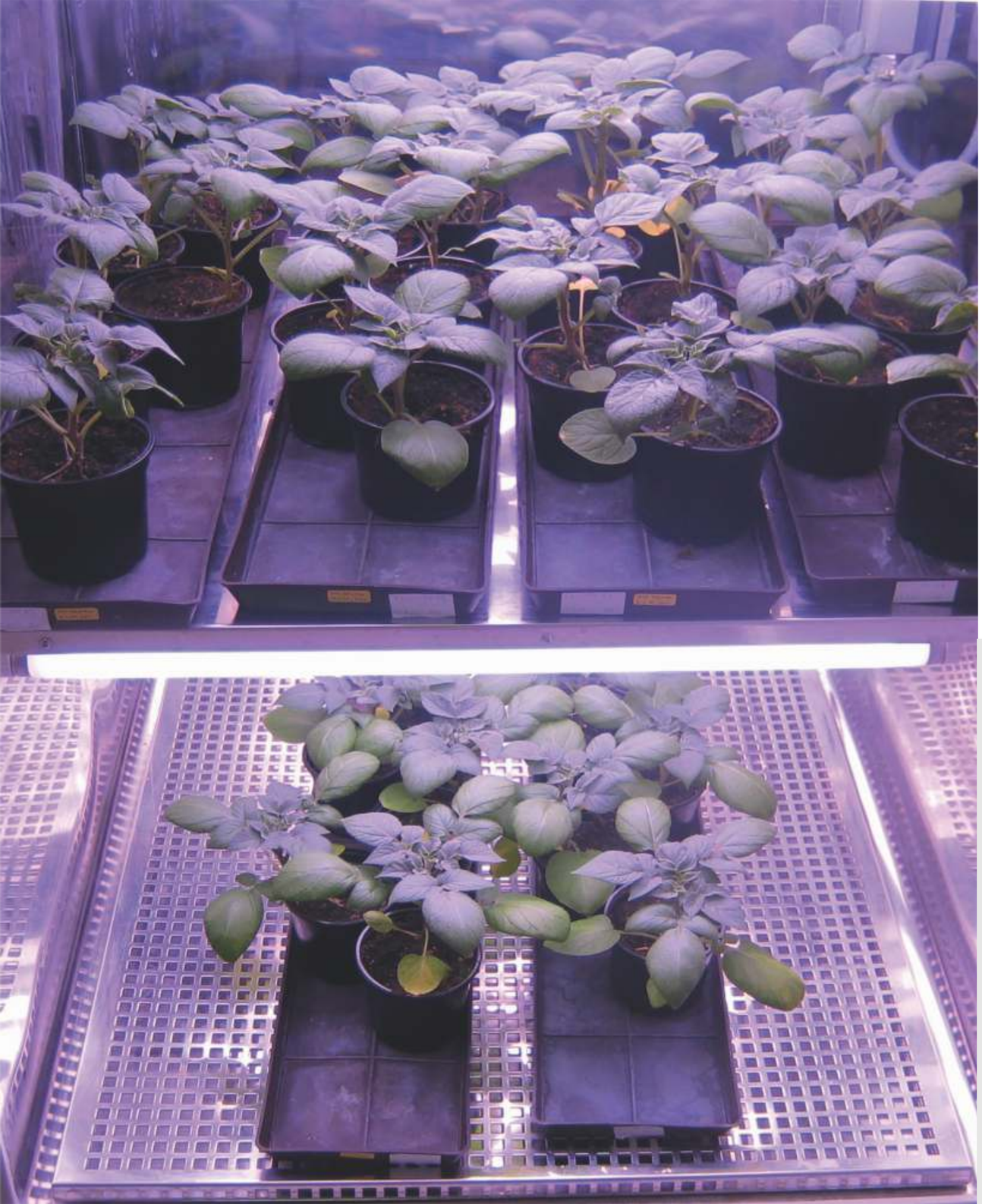
The major infrastructural equipment of IC MBS consists of:

- *PI-800 Sagita research vessel equipped with sophisticated navigation and marine research equipment,*
- *Vida Oceanographic Buoy equipped with meteorological and oceanographical instruments (multiparametric CTD and current meter),*
- *smaller vessel*
- *HF radar WERA.*

IC Planta's equipment supports research activities, ministries and their inspection bodies, enterprises and educational activities. All major equipment of IC Planta is technologically advanced and carefully, regularly and professionally maintained. Our major equipment is also used by other organizations. Training courses are organised for frequent users, services involving major equipment are offered to customers who prefer to order analyses.

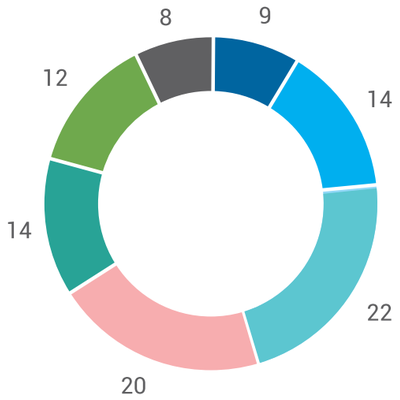
IC MBS supports research and applicative activities for ministries and other public institutions as well as educational activities at MBP. Technologically advanced and sophisticated infrastructure enables state of the art research at sea and place IC MBS among the leading research centres in the Mediterranean. MBP serves as the National Oceanographic Data Centre. When recording conditions at sea, IC MBS infrastructure assures high quality of data which are available in near to real time.

In 2016, IC NIB's infrastructural equipment was used in the scope of research activities of 98 different users. The goal to retain a large number of users was achieved.



Infrastrukturni program NIB 2016 / NIB Infrastructural Programmes in 2016

Število uporabnikov / *Number of users*



- Raziskovalni programi / *Research Programmes* Financed by ARRS
- Raziskovalni projekti / *Research Projects Financed by ARRS*
- Mladi raziskovalci / *Young Researchers*
- Mednarodni projekti / *International Research Projects*
- Državni in drugi vladni organi in resorji / *Projects for bodies of ministries*
- Razvojni projekti / *Developmental Projects*
- Pedagoško delo / *Educational activities*

Skupaj 98 uporabnikov / *Total 98 users*

Tematike raziskav in analiz, za katere se je uporabljala velika infrastrukturna oprema IP NIB, so bile izjemno raznolike. Tako veliko število uporabnikov in raznolikost tematik kaže na izjemen pomen vsebine IP NIB za slovenski prostor in sicer na zelo raznovrstnih področjih raziskovalnega dela ter aplikacij v delo za podjetja, državne in vladne organe in resorje ter za pedagoško delo.

Velik prispevek IP NIB k izkoriščenosti infrastrukturne opreme se kaže tudi skozi podatek, da je v letu 2016 kar 27% uporabnikov IP NIB prihajalo iz drugih RO.

IP NIB svojo veliko infrastrukturno opremo stalno dopolnjuje in posodablja. V letu 2016 je IC Planta zamenjal dotrajan Robot za pipetiranje (PerkinElmer MultiProbe II) z novim robotom za pipetiranje (Hamilton Microlab STARlet).

Poleg tega je v letu 2016 IC Planta izvedel tudi nadgradnjo Konfokalnega stereomikroskopa (Leica TCS LSI).

<

Komora za ločeno gojenje rastlin. /
Plant growth chamber for separate breeding.

Subjects of research and analyses, carried out at IC NIB, were extremely diverse. A large number of users underlines the importance of IC NIB research equipment for Slovenia in a wide range of research areas, for various enterprises, bodies of ministries and educational activities.

In 2016, 73% of IC NIB's major infrastructural equipment users were from our own research organization (RO) and 27% from other ROs.

IC NIB carefully, regularly and professionally maintains its major infrastructural equipment. Special care is devoted to perpetual modernization of equipment. In 2016 IC Planta replaced an old pipetting robot (PerkinElmer MultiProbe II) with a new one (Hamilton Microlab STARlet).

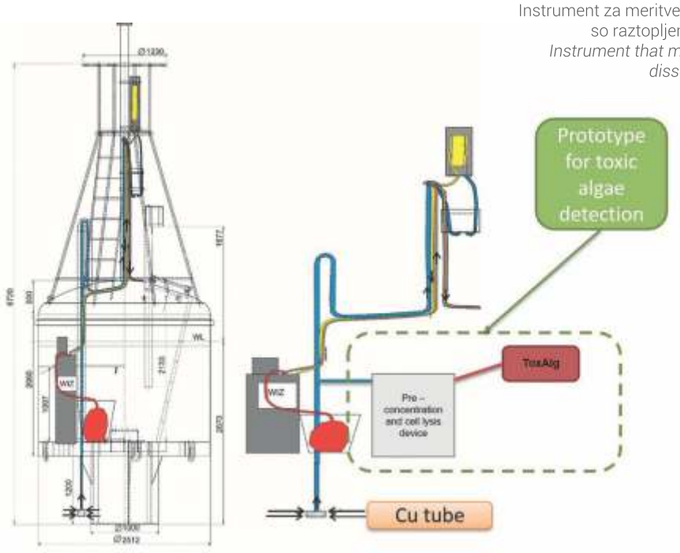
In addition, IC Planta upgraded the Confocal stereomicroscope (Leica TCS LSI).

Od splovitve v letu 2008 je Oceanografska boja "VIDA" (**IC MBP**) s podatki, ki jih zagotavlja, osrednja ploščad informacijskega sistema o stanju morja v Tržaškem zalivu. V letu 2016 smo opremo nadgradili z avtonomnim instrumentom za meritve hranilnih snovi, ki so raztopljene v morski vodi. Postavitev instrumenta je potekala v okviru evropskega projekta: "**S**ensing toxicants in **M**arine waters using biosensors make **S**ense– SMS". Zajemanje vzorcev vode in predpriprava vzorcev za meritve sta plod lastnega znanja in izkušenj sodelavcev IC MBP, postavitev merilnega instrumenta je bila opravljena v sodelovanju z italijanskim podjetjem SYSTEA iz Rima.

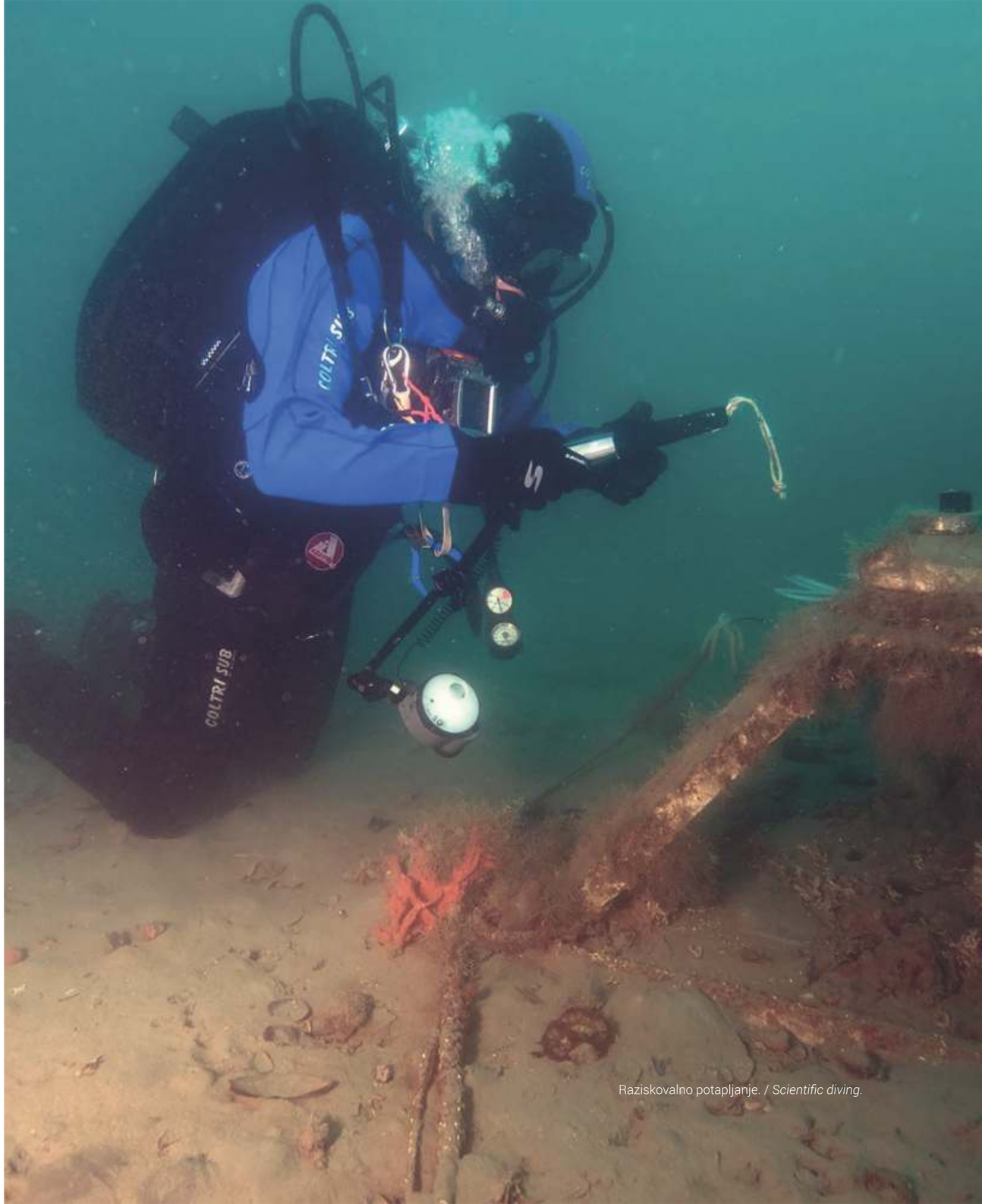
IP NIB je tudi v letu 2016 zagotavljal sodelovanje med raziskovalci različnih raziskovalnih programov, projektov in institucij, kakor tudi povezovanje raziskovalcev z uporabniki raziskav iz vrst drugih proračunskih uporabnikov in industrije ter stik s pedagoškim procesom. IP NIB je tudi v letu 2016 pomenil osnovo za sodelovanje v evropskih in drugih mednarodnih projektih. Z moderno in dobro vzdrževano (v skladu z ISO 17025) raziskovalno opremo IP NIB so se izvajali tudi projekti, katerih naročniki so bili podjetja, ki pričakujejo dokazila o kontroli kvalitete za izvajanje uslug. Oprema IP NIB pa je služila tudi za podporo tehnološkemu razvoju ter za razvoj metod in za izvajanje specializiranih analiz.

*Since being launched in 2008, the "VIDA" buoy (**IC MBS**) has provided a massive amount of data and became the central platform of the information system concerning marine environment in the Gulf of Trieste. In 2016, the equipment was upgraded by an autonomous instrument that measures nutrients dissolved in seawater. The instrument was set up in the scope of the European project "**S**ensing toxicants in **M**arine waters using biosensors makes **S**ense – SMS". The process of capturing water samples and pre-processing them for measurements is based on knowledge and experience of our co-workers at IC MBP, while the setting up of the measuring instrument was performed in collaboration with SYSTEA, an Italian company from Rome.*

The equipment at IC NIB supports research activities, bodies of ministries, enterprises and educational activities. IC NIB ensures collaboration between researchers active in different research programmes, projects and institutions. It facilitates connections between researchers and the users of research results that include other budget users and various industries; it also facilitates the association of research activities and educational processes. IC NIB possesses state-of-the art and well maintained research equipment (in accordance with the ISO/IEC 17025 system) which is an essential prerequisite for competitive research performance in life sciences and applicative projects in collaboration with enterprises.



Instrument za meritve hranilnih snovi, ki so raztopljene v morski vodi. / *Instrument that measures nutrients dissolved in seawater.*



Raziskovalno potapljanje. / *Scientific diving.*

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2 ODDELEK ZA RAZISKAVE ORGANIZMOV IN EKOSISTEMOV / DEPARTMENT OF ORGANISMS AND ECOSYSTEMS RESEARCH

Izvirni znanstveni članek / Original Scientific Article

1 **BEVK, Danilo, TREVEN, Vinko, VREZEC, Al, ČOKL, Andrej.** Uporaba medonosne čebele (Apis mellifera) za izboljšanje opraševanja vrtne jagode in raznos organizmov za biotično zatiranje sive plesni (Botrytis cinerea). Acta entomologica slovenica, ISSN 1318-1998, jun. 2016, vol. 24, št. 1, str. 5-13, ilustr. [COBISS.SI-ID 3925583]

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Objavljeni znanstveni prispevek na konferenci (vabljeno predavanje) / Published Scientific Conference Contribution (invited lecture)

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Urednik/ Editor

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3 ODDELEK ZA BIOTEHNOLOGIJO IN SISTEMSKO BIOLOGIJO - FITO / DEPARTMENT OF BIOTECHNOLOGY AND SYSTEMS BIOLOGY – FITO

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1 **BALASUBRAMANIAN, Mukundh Narayanan, RAČKI, Nejc, GONÇALVES, José, KOVAČ, Katarina, TUŠEK-ŽNIDARIČ, Magda, TURK, Valentina, RAVNIKAR, Maja, GUTIÉRREZ-AGUIRRE, Ion.** Enhanced detection of pathogenic enteric viruses in coastal marine environment by concentration using methacrylate monolithic chromatographic supports paired with quantitative PCR. Water research, ISSN 0043-1354. [Print ed.], 2016, vol. 106, str. 405-414, doi: 10.1016/j.watres.2016.10.020. [COBISS.SI-ID 4037967]

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4 ODDELEK ZA GENETSKO TOKSIKOLOGIJO IN BIOLOGIJA RAKA / DEPARTMENT OF GENETIC TOXICOLOGY AND CANCER BIOLOGY

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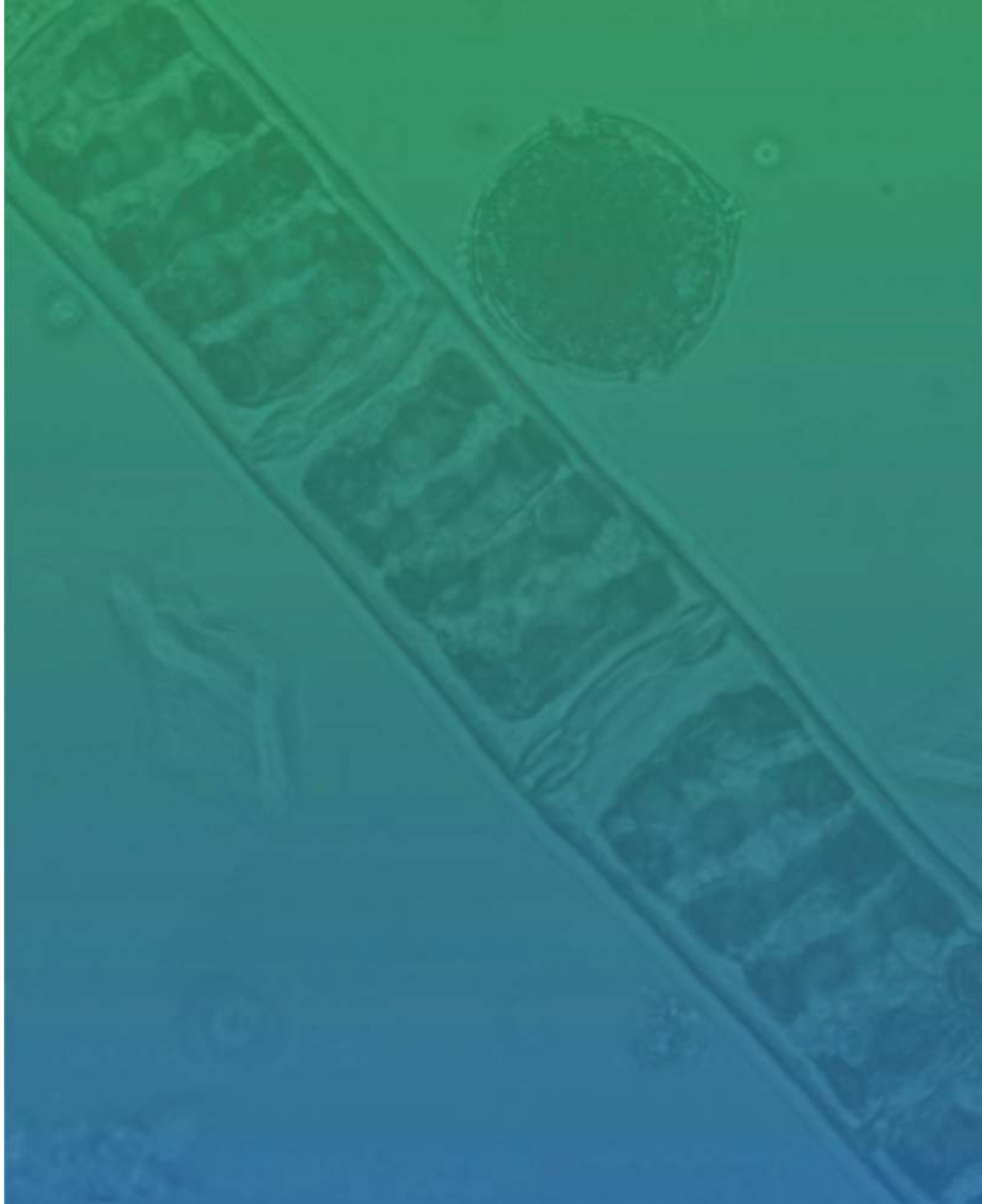

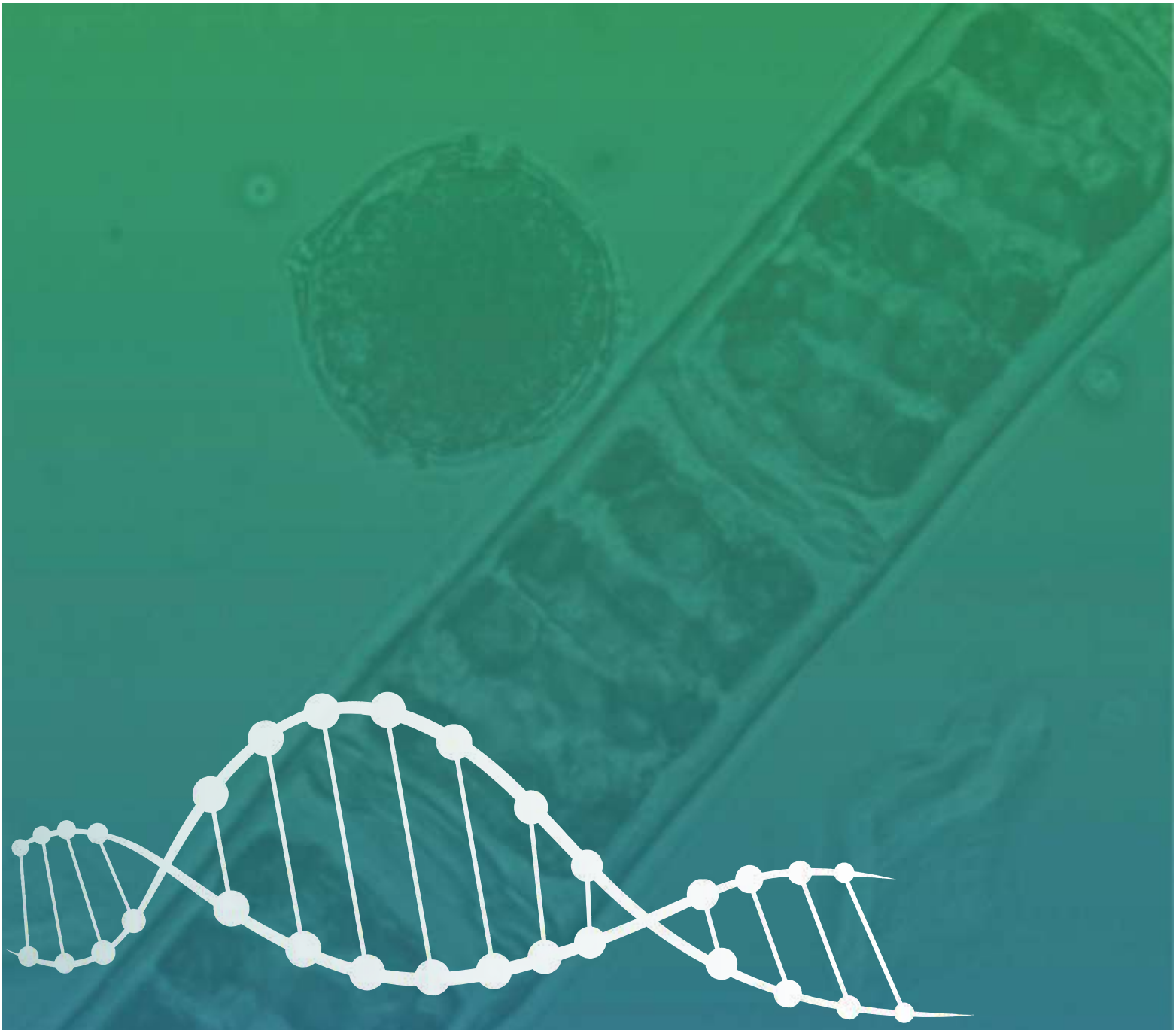

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