

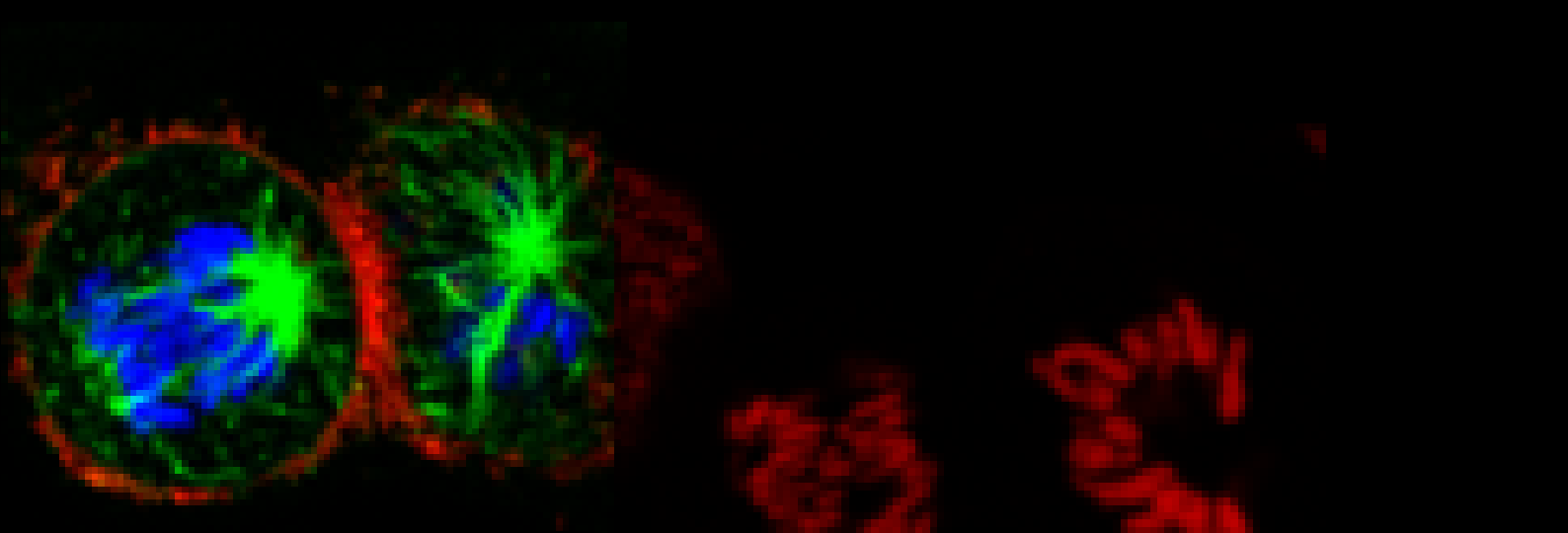
**2020 Annual Summary**

# Institute for Biophysics

*Department of Nanobiotechnology*

University of Natural Resources and Life Sciences

Vienna, Austria



# 2020 Annual Summary

## Institute for Biophysics

Department of Nanobiotechnology  
University of Natural Resources and Life Sciences, Austria

### Foreword

2020. Covid-19. Lock down. I could finish already.

However, I will continue. We had many difficulties to be able to work but still we managed following the rules to maintain a decent level of work.

It was important to get back our students in the laboratory to make sure that they could finish their projects and get their degrees (approximately 5 PhD, 5 MSc and 1 BSc).

Teaching was a particular hard experience, but very productive in the end. Due to the lock down, we have learned how to teach on-line. In this sense, I could teach 6 ECTS on colloids and interfaces at the University of Science and Technology without going to Krakow. Also, most of the internal meetings (at institute or university level) were taking place on-line. Such trend has arrived, and I think it will be part of our future work culture.

(Actually, the university could save sitting place and money by permitting senior people who do not do experiments to work mainly from home.)

Very important was the preparation of the whole bureaucracy needed for the evaluation of the department (to be held in January 2021). Such evaluations take place every 10 years. Here, I had to make compromises with Erik Reimhult and Eva Ehmoser since it was not clear what type of department we have and where we would like to go. I have no place here to report on everything we discussed. Brief. "Biophysics" is represented with professorships in the main Austrian universities and research institutes. There is even an Austrian Biophysical Society (whose members are doing research well ranked internationally). Thus, if we want to reinforce "biophysics" at BOKU we should get at least a tenure track position for the institute working on modern biophysical topics (physical biology, cell and cancer physics, advanced optics, etc.). Topics related to microbiology, glycobiology, genetics, raw materials, wood, etc. are already very well represented at other departments of BOKU. No need to reinforce them at DNBT. Another issue was to rename the department. "Nanobiotechnology" does not describe what we are/do. It could also be understood as part of the Department of

Biotechnology. Would you have a Department of Chemistry and a Department of Nanochemistry next door? Probably not!

More. 2020 has been a good year in quantitative terms (even though we could not attend conferences physically). Brief: 18 articles (here Notburga shines with articles in the highest rank journals), 1 book chapter, and 2 contributions on-line to conferences. I hope 2021 will be better in this respect.

As usual we still have the same week points (compared to other institutes and departments): supervision of BSc and MSc students, and mandatory (fundamental) teaching visibility. I think it is a structural problem with a very difficult solution. I could put some hope in the international evaluation of the department, but to change old routines at the university takes long. Sometimes longer than the life-time of a professor.

Still we have managed laboratories that are constantly used by DNBT coworkers and “external” researches (mainly BOKU people), and participated in BOKU commissions (DLK, DokStuko, FachStuko, Forschungssprecher, ethics platform).

A pleasant news was the award of the ERC grant to Marti Duocastella, who was a visiting professor at the institute in 2017 (he offered a course in optics). The success of our alumni and visitors is something that should make us proud. This is part of our job as “educators”.

I would like to thank all the members of the institute for their work during this rare and difficult year. I hope 2021 will be better. As usual, I wish all the best to the coworkers/alumni who left the institute to continue a professional career somewhere else.

Thank you.

*José L. Toca-Herrera*

# 1. Institute members and visitors

Univ. Prof. Dr. José L. Toca-Herrera (director)  
Ao. Univ. Prof. Dr. Dietmar Pum (deputy director, group leader)  
Assoc. Prof. Dr. Notburga Gierlinger (group leader)  
Dr. Andreas Breitwieser (post-doctoral research assistant)  
Dr. Peter Bock (post-doctoral research assistant)  
Dr. Jessica Huss (post-doctoral research assistant)  
Dr. Jagoba J. Iturri (senior scientist)  
Dr. Juan Carlos Gil-Redondo (Univ. assistant)  
Dr. Med. Michael Handler (PhD student, collaboration with Sports University Innsbruck, Austria)  
Mag. Amsatou Andorfer-Sarr (techn. assistant)  
Mag. Jacqueline Friedmann (tech. assistant)  
MMSc Sebastian Antreich (PhD student)  
MSc. Martin Felhofer (PhD student)  
MSc. Ana Gonzalez (PhD student, collaboration with the University of Malaga)  
MSc Oriane Morel (PhD student, collaboration with the University of Lille)  
MSc. Andreas Weber (PhD student)  
MSc. Nadia Sasani (PhD student)  
MSc. Nannan Xiao (PhD student)  
BSc Jakob Bachmayr (MSc student)  
BSc. Victoria Beneder (MSc student)  
BSc. Tobias Eder (MSc student)  
BSc Ulrich Fuchs (MSc student)  
BSc Lukas Krismer (MSc student)  
BSc Nora Korb (MSc student)  
BSc Konrad Mayer (MSc student)  
BSc Martin Niedermayer (MSc student)  
BSc. Barbara Zbiral (MSc student)  
BSc. Julia Bock (researcher)  
BSc. Veronika Pavlovska (BSc student)  
Hannah Blaschka (apprentice)  
Walter Klug (IT technician)

## 2. Articles, books and book chapters

### Publications (SCI articles)

- 1. A millennium-long 'Blue Ring' chronology from the Spanish Pyrenees reveals severe ephemeral summer cooling after volcanic eruptions**  
*Piermattei A. Crivellaro, P. J. Krusic, J. Esper, P. Vitek, C. Oppenheimer, M. Felhofer, N. Gierlinger, F. Reinig, O. Urban, A. Verstege, H. Lobo, U. Buntgen*  
Environ Res Lett 15 (2020) 124016;  
DOI: 10.1088/1748-9326/abc120
- 2. Topological Interlocking and Geometric Stiffening as Complementary Strategies for Strong Plant Shells**  
*J.C. Huss, S.J. Antreich, J. Bachmayr, N. Xiao, M. Eder, J. Konnerth, N. Gierlinger*  
Advanced Materials 32 (2020) 2004519;  
DOI: 10.1002/adma.202004519
- 3. Winter Nights during Summer Times: Stress Physiological Response to Ice and the Facilitation of Freezing Cytorrhysis by Elastic Cell wall Components in the leaves of a Nival Species**  
*M. Stegner, B. Lackner, T. Schäfermolte, O. Buchner, N. Xiao, N. Gierlinger, A. Holzinger, G. Neuner*  
International Journal of Molecular Sciences 21 (2020) 7042;  
DOI: 10.3390/ijms21197042
- 4. From the Soft to the Hard: Changes in Microchemistry During Cell Wall Maturation of Walnut Shells**  
*N. Xiao, P. Bock, S.J. Antreich, A. M. Staedler, J. Schönenberger, N. Gierlinger*  
Frontiers in Plant Science 11 (2020) 466;  
DOI: 10.3389/fpls.2020.00466
- 5. Wood Deformation Leads to Rearrangement of Molecules at the Nanoscale**  
*M. Felhofer, P. Bock, A. Singh, B. Prats-Mateu, R. Zirbs, N. Gierlinger*  
Nano Letters 20 (2020) 2647;  
DOI: 10.1021/acs.nanolett.0c00205
- 6. Structure and electrical resistivity of individual carbonised natural and man-made cellulose fibres**  
*W. Gindl-Altmutter, I. Czabany, C. Unterweger, N. Gierlinger, N. Xiao, S.C. Bodner, J. Keckes*  
Journal of Materials Science 55 (2020) 10271;  
DOI: 10.1007/s10853-020-04743-y
- 7. Atypical lignification in eastern leatherwood (*Dirca palustris*)**  
*Y. Mottiar, N. Gierlinger, D. Jeremic, E. R. Master, S.D. Mansfield*  
New Phytologist 226 (2020) 704, DOI: 10.1111/nph.16394
- 8. Infrared and Raman spectra of lignin substructures: Dibenzodioxocin**

*P. Bock, P. Nousiainen, T. Elder, M. Blaukopf, H. Amer, R. Zirbs, A. Potthast, N. Gierlinger*  
Journal of Raman Spectroscopy 51 (2020) 422, DOI: 10.1002/jrs.5808

9. **Reaction and Diffusion Kinetics during Hydrothermal Carbonization by Means of SEM-EDX Analysis**  
*G. Tondl, C. Hammerl, C. Pfeifer, D. Pum*  
Industrial and Engineering Chemistry Research 59 (2020) 1829;  
DOI: 10.1021/acs.iecr.9b05643
10. **UV-Laser Interference Lithography for Local Functionalization of Plasmonic Nanostructures with Responsive Hydrogel**  
*N. Quilis, S. Hageneder, S. Fossati, S. Auer, P. Venugopalan, A. Bozdogan, C. Petri, A. Moreno-Cencerrado, J. L. Toca-Herrera, U. Jonas, J. Dostalek*  
Journal of Physical Chemistry C 124 (2020) 3297;  
DOI: 10.1021/acs.jpcc.9b11059
11. **Analysis of Binding Interactions of Ramipril and Quercetin on Human Serum Albumin: A Novel Method in Affinity Evaluation**  
*Z. Vanekova, L. Hubčík, J. L. Toca-Herrera, P. G. Furtmüller, P. Mučaji, M. Nagy*  
Molecules, 25 (2020) 547, DOI: 10.3390/molecules25030547
12. **Survival analysis of author keywords: An application to the Library and Information Sciences area**  
*F. Peset, F. Garzón-Farinós, L. M. González, X. García-Massó, A. Ferrer-Sapena, J. L. Toca-Herrera, E. A. Sánchez-Pérez*  
Journal of the Association for Information Science and Technology 71 (2020) 462, DOI: 10.1002/asi.24248
13. **Protein-Lipid Interaction of Cytolytic Toxin Cyt2Aa2 on Model Lipid Bilayers of Erythrocyte Cell Membrane**  
*S. Tharad, B. Promdonkoy, J. L. Toca-Herrera*  
Toxins 12 (2020) 226, DOI:10.3390/toxins12040226
14. **Single-Cell Probe Force Studies to Identify Sox2 Overexpression-Promoted Cell Adhesion in MCF7 Breast Cancer Cells**  
*J. Iturri, A. Weber, M. d.M. Vivanco, J. L. Toca-Herrera*  
Cells 9 (2020) 935, DOI: 10.3390/cells9040935
15. **Local conformations affect the histidine tag-Ni<sup>2+</sup> binding affinity of BinA and BinB proteins**  
*Sudarath Tharad, Chontida Tangsongcharoen, Panadda Boonserm, José L. Toca-Herrera, Kanokporn Srisucharitpanit*  
AIMS Biophysics 7 (2020) 133, DOI: 10.3934/biophy.2020011
16. **Assessment of a long-term in-vitro model to characterize the mechanical behaviour and cell-mediated degradation of a new designed biodegradable vascular graft material**  
*M. Enayati, S. Puchhammer, J. Iturri, C. Grasl, C. Kaun, S. Baudis, I. Walter, H. Schima, R. Liska, J. Wojta, J.L. Toca-Herrera, B. K. Podesser, H. Bergmeister*  
Journal of the Mechanical Behavior of Biomedical Materials 112 (2020) 104077; DOI: 10.1016/j.jmbbm.2020.104077

17. **Time- and zinc-related changes in biomechanical properties of human colorectal cancer cells examined by atomic force microscopy**  
*M. Maares, C. Keil, L. Löher, A. Weber, A. Andorfer-Sarr, H. Haase, J. Iturri, J.L. Toca-Herrera*  
Biology 9 (2020) 468, DOI: 10.3390/biology9120468
18. **Measuring biological materials mechanics with atomic force microscopy. 2. Influence of the loading rate and applied force (colloidal particles)**  
*A. Weber, B. Zbiral, J. Iturri, R. Benitez, J.L. Toca-Herrera*  
Microscopy Research and Technique, online;  
DOI: 10.1002/jemt.23643

## Books and book chapters

19. **Measuring Mechanical Properties of Breast Cancer Cells with Atomic Force Microscopy**  
*B. Zbiral, A. Weber, J.L. Toca-Herrera*  
In Mammary Stem Cells: Methods and Protocols (Ed.: Maria Vivanco),  
Methods in Molecular Biology, Humana Press, NY, 2020

## 3. Conferences, seminars, workshops and schools

**TITLE: Single-Cell Probe Force studies to identify Sox2 overexpression-promoted Cell adhesion variations in MCF7 Breast Cancer Cells (oral)**

**AUTHOR:** *J. Iturri, A. Weber, M. Vivanco, J.L. Toca-Herrera*

**CONFERENCE:** Imaginenano

**PLACE, YEAR:** Bilbao (Spain; conference on-line due to Covid 19), 2020

**TITLE: Influence of tamoxifen resistance on the mechanical properties of breast cancer epithelial cells (Poster with flash talk)**

**AUTHOR:** *A. Weber, B. Zbiral, J. Iturri, M. Vivanco, J.L. Toca-Herrera*

**CONFERENCE:** 11th Annual Symposium Physics of Cancer

**PLACE, YEAR:** Leipzig, (Germany, conference on-line due to Covid 19), 2020

## 4. Ongoing projects, national and international collaborations

### Outgoing projects (and research)

Please visit:

<https://boku.ac.at/nano/biophysics/forschung>

### National and international collaborations

- Prof. Peter Lieberzeit, Univ. of Vienna, Inst. of Anal. Chem., Vienna, Austria
- Prof. Carole C. Perry, Nottingham Trent University, Nottingham, UK
- Dr. Rafael Benítez, Univ. of Extremadura, Dept. of Mathematics, Spain
- Dr. Luis Millán González, Univ. of Valencia, Dept. of Physical Education and Sport, Spain
- Dr. Chartchai Krittanai, Mahidol University, Institute of Molecular Biosciences, Thailand
- Prof. M. Schneider, Institute biopharmacy and pharmaceutical technology, University of Saarland
- Prof. Georg Papastavrou, Faculty of Biology, Chemistry, and Earth Sciences, University of Bayreuth, Germany
- Dr. Maria Vivanco, CICbioGUNE, Spain
- Prof. Longjian Xue, Wuhan University, China
- Dr. Felipe Ortega, Universidad Complutense, Madrid, Spain
- Prof. Ronald F. Ziolo, CIQA – Conacyt, Mexico
- Dr. Spela Zemljic, University of Ljubljana, Slovenia
- Prof. Hajo Haase / Dr. Claudia Keil, TU-Berlin, Germany
- Dr. Anders Lundgren, Chalmers University, Sweden
- Prof. Ingo Burgert, ETH Zurich, Switzerland
- Dr. Michaela Eder, Max Planck Institute of Colloids and Interfaces, Potsdam, Germany
- Prof. Anna de Juan, Chemometrics group, University of Barcelona, Diagonal 645, 08028 Barcelona, Spain
- Yaseen Mottiar, Prof. Shawn D Mansfield, University of British Columbia, Forest Sciences Centre, Vancouver, Canada
- Prof. Gilbert Neuner, University of Innsbruck, Institute of Botany, Unit Functional Plant Biology, Innsbruck, Austria
- A.o. Univ. Prof. Ursula Lütz-Meindl, University of Salzburg, Cell Biology and Physiology Department, Salzburg, Austria
- Prof. Wolfgang Gindl, Institute for Wood technology and Renewable materials, University of Natural Resources and Life Sciences, Vienna, Austria