

Research Funding

Angelo Frei

Ph.D.

Date of Birth: 15.09.1990

Nationality: Swiss

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Career Summary

Secured >1.1m CHF in independent research funding

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24 publications (16 first &

10 corresponding author)

3 patents, >800 citations

h-index = 14

-

Expert in synthetic medicinal inorganic and organic chemistry, analytical methodology, radiochemistry and antibiotic development

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Spearheaded interdisciplinary collaborations with groups in the UK, France, Germany, Switzerland, Italy, Poland, South Africa, USA, Canada, Uruguay, Australia and Singapore

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Strong competency in mentoring, supervising and motivating students

Soft Skills Training

Leadership in Action (2021, Resilient Leaders Elements)

Communication Skills for Leaders (2017, Rohner AG, Switzerland)

Leadership Skills for Leaders (2016, Mettler Toledo, Switzerland)

Research Partnership Grant – ASEAN 2022

Leading House Asia, ETHZ (**15,000 CHF**)

Combinatorial Bioorganometallic Compounds against Malaria

FCT – Scientific Employment Stimulus 2021

Foundation for Science and Technology, Portugal (**175,000 CHF**)

Metal Complexes as New Antimicrobial Strategies

SNSF Ambizione Grant 2021

Swiss National Science Foundation (**889,000 CHF**)

Outsmarting the Bugs – Metal Complexes as New Antimicrobial Strategies

Early Postdoc.Mobility Fellowship 2018

Swiss National Science Foundation (**71,000 CHF**)

Key Research Experience

SNSF Ambizione Fellow 2022 -

University of Bern, Switzerland

- Exploration of Novel Metal-based Antimicrobial Strategies
- Supervision & mentoring of PhD and Master students

Research Associate 2020 - 2022

Imperial & King's College, United Kingdom

- Development of new chelators for novel radiometals towards clinical radiotheranostics
- Investigation of radioimaging probes for the accurate diagnosis of bacterial infections

Postdoc 2018 - 2020

The University of Queensland, Australia

- Preparation of antibacterial metal-based compounds
- Synthesis of antibiotics, peptides and antifungals
- Experience in microbiological assays, protein-docking, click-chemistry and solid-phase peptide synthesis

Ph.D. Thesis 2014 – 2018

University of Zurich, Switzerland

- Development of synthetic platform for multifunctional cyclopentadiene ligands and complexes
- Proficiency in the handling of radioactive substances
- Three research visits in the group of Prof. Andreas Roodt in South Africa for In-depth kinetic investigation

Master Thesis 2012 – 2013

University of Zurich, Switzerland

- Development of new ruthenium-complexes for photodynamic therapy against cancer and bacteria

Awards

CASB Symposium Poster Award
(2019, Brisbane, AUS)

ICBIC-19 Travel Award
(2019, Interlaken, CH)

SNF Early Postdoc.Mobility Fellowship (2017, Zurich, CH)

Honorable Mention, Albert Hofmann PhD Award
(2017, Zurich, CH)

CMSZH/PerkinElmer Travel Award
(2017, Zurich, CH)

NZ Institute of Chemistry ECR Award (2016, Auckland, NZ)

AsBIC8 Travel Award
(2016, Auckland, NZ)

Swiss Chemical Society Travel Award (2016, Zurich, CH)

J. Med. Chem. Highly Cited Article Award (2014, Zurich, CH)

A. Werner Legat for a remarkable GPA, Master Studies
(2014, Zurich, CH)

A. Werner Legat for a remarkable GPA, Bachelor Studies
(2013, Zurich, CH)

Languages

German: native speaker

Rumantsch: native speaker

English: fluent

Italian: fluent

French: conv. Proficiency

Organisational Skills

Head City Organiser
Pint of Science Festival
(2023, Bern, Switzerland & 2019,
Brisbane, Australia)

Organization Committee
QLD Annual Chemistry Symposium
(2019, Brisbane, Australia)

Screening & Hit Validation Advisor for
the Community for Open
Antimicrobial Drug Discovery

Technical Skills

NMR, HPLC, radio-HPLC, ESI-MS, LC-MS,
ICP-MS, UV/Vis, IR, ligand-docking
(Schroedinger), kinetic simulation (Kintek),
Data analysis (Origin, Prism), Machine
Learning Applications (Knime, Python)
MIC-assays, Bacterial cell uptake assays,

Education

Ph.D. in Chemistry

2014 – 2018

University of Zurich, Switzerland

Thesis: "Multi-functional Cyclopentadienyl Complexes for Theranostic Applications"

Supervisor: Prof. Dr. Roger Alberto

M.Sc. in Chemistry

2012 – 2013

University of Zurich, Switzerland

GPA: 5.50 / 6.00

Thesis: "Towards Red-Light Activated Ruthenium Photosensitizers for Photodynamic Therapy"

Supervisor: Dr. Gilles Gasser

B.Sc in Chemistry

2009 – 2012

University of Zurich, Switzerland

Major: Chemistry **GPA:** 4.90 / 6.00

Minor: Biochemistry **GPA:** 5.20 / 6.00

Teaching Experience

Supervision and Mentoring of undergraduate and graduate students in my research group (2 PhD, 1 Master, 1 Bachelor Student)

Creation and Teaching of new Master Level Course: Medicinal Inorganic Chemistry

Teaching of chemistry exercise classes (20-25 students)

Management of lab-demonstrations for children

Selected Invited Scientific Talks

AsBIC10

2022

Kobe, Japan

"Crowd-Sourced Metal Complexes as the Starting Point for the Next Generation of Antimicrobials"

Invited Talk – ISBOMC21

2021

Virtual Symposium

"Outsmarting the Bugs – Metal Complexes as New Antimicrobial Strategies"

Invited Seminar

2020

Macquarie University, Sydney, Australia

"Metalloantibiotics, A New Weapon in the Fight against Antimicrobial Resistance?"

ICBIC19

2019

Interlaken, Switzerland

"Light-activated Rhenium Complexes against Gram(+) and Gram(-) bacteria"

Publications (I)

- 24 A. Frei[#], A. D. Verderosa, A. G. Elliott, J. Zuegg, , M. A. T. Blaskovich[#] "Metals to combat antimicrobial resistance" **Nat. Rev. Chem.** **2023**, DOI: [10.1038/s41570-023-00463-4](https://doi.org/10.1038/s41570-023-00463-4).
- 23 A. Frei[#], A. G. Elliott, A. Kan, H. Dinh, S. Bräse, A. E. Bruce, M. R. Bruce, F. Chen, D. Humaidy, N. Jung, A. P. King, P. G. Lye, H. K. Maliszewska, A. M. Mansour, D. Matiadis, M. P. Muñoz, T.-Y. Pai, S. Pokhrel, P. J. Sadler, M. Sagnou, M. Taylor, J. J. Wilson, D. Woods, J. Zuegg, W. Meyer, A. K. Cain, M. A. Cooper, M. A. T. Blaskovich[#] "Metal Complexes as Antifungals? – From a Crowd-Sourced Compound Library to First In Vivo Experiments" **JACS Au**, **2022**, Inside Cover DOI: [10.1021/jacsau.2c00308](https://doi.org/10.1021/jacsau.2c00308)
- 22 M. Krenn, Q. Ai, S. Barthel, N. Carson, A. Frei, N. C. Frey, P. Friederich, T. Gaudin, A. A. Gayle, K. M. Jablonka, R. F. Lameiro, D. Lemm, A. Lo, S. M. Moosavi, J. M. Nápoles-Duarte, A. K. Nigam, R. Pollice, K. Rajan, U. Schatzschneider, P. Schwaller, M. Skreta, B. Smit, F. Strieth-Kalthoff, C. Sun, G. Tom, G. F. von Rudorff, A. Wang, A. White, A. Young, R. Yu, A. Aspuru-Guzik "SELFIES and the future of molecular string representations" **Patterns**, **2022**, DOI: [10.1016/j.patter.2022.100588](https://doi.org/10.1016/j.patter.2022.100588)
- 21 S. M. Cooper, C. Siakalli, A. J. P. White, A. Frei, P. W. Miller, N. J. Long "Synthesis and anti-microbial activity of a new series of bis(diphosphine) rhenium(V) dioxo complexes", **Dalton Trans.**, **2022**, DOI: [10.1039/D2DT02157A](https://doi.org/10.1039/D2DT02157A)
- 20 A. Frei[#], A. Rigby, Thomas T. C. Yue, G. Firth, M. T. Ma, N. J. Long "To chelate thallium(I) – synthesis and evaluation of Kryptofix-based chelators for ²⁰¹Tl", **Dalton Trans.**, **2022**, DOI: [10.1039/D2DT01074G](https://doi.org/10.1039/D2DT01074G)
- 19 J. L. Medina-Franco, E. López-López, E. Andrade, L. Ruiz-Azuara, A. Frei, D. Guan, J. Zuegg, M. A. T. Blaskovich "Bridging informatics and medicinal inorganic chemistry: Toward a database of metallodrugs and metallodrug candidates" **Drug Discovery Today**, **2022**, DOI: [10.1016/j.drudis.2022.02.021](https://doi.org/10.1016/j.drudis.2022.02.021)
- 18 D. V. Kama, A. Frei, M. Schuette-Smith, A. Brink, Chantel Swart, H. Braband, R. Alberto, A. Roodt "Exploring preliminary structural relationships and mitochondrial targeting of fac-[M₁(CO)₃]-bis(diarylphosphino)alkylamine complexes (M = ⁹⁹Tc, Re)" **New J. Chem.**, **2021**, DOI: [10.1039/D1NJ04273D](https://doi.org/10.1039/D1NJ04273D)
- 17 D. V. Kama, A. Frei, A. Brink, H. Braband, R. Alberto, A. Roodt "New approach for the synthesis of water soluble fac-[M₁(CO)₃]⁺ bis(diarylphosphino)alkylamine complexes (M=⁹⁹Tc, Re)" **Dalton Trans.**, **2021** Front Cover & Hot Paper DOI: [10.1039/D1DT03234H](https://doi.org/10.1039/D1DT03234H)
- 16 A. Frei[#], S. Ramu, G. J. Lowe, H. Dinh, L. Semenec, A. G. Elliott, J. Zuegg, A. Deckers, N. Jung, S. Braese, A. K. Cain, M. A. T. Blaskovich[#] "Platinum Cyclooctadiene Complexes with Activity against Gram-positive Bacteria" **ChemMedChem**, **2021** Front Cover DOI: [10.1002/cmdc.202100157](https://doi.org/10.1002/cmdc.202100157)
- 15 A. Frei[#], P. A. King, G. J. Lowe, A. K. Cain, F. L. Short, H. Dinh, A. G. Elliott, J. Zuegg, J. J. Wilson, M. A. T. Blaskovich[#] "Non-toxic Cobalt(III) Schiff Base Complexes with Broad Spectrum Antifungal Activity" **Chem. Eur. J.**, **2021** Inside Cover DOI: [10.1002/chem.202003545](https://doi.org/10.1002/chem.202003545);
- 14 A. Notaro*, A. Frei*, R. Rubbiani*, M. Jakubaszek, U. Basu, S. Koch, C. Mari, M. Dotou, O. Blacque, J. Gouyon, F. Bedioui, N. Rotthowe, R. F. Winter, B. Goud, S. Ferrari, M. Tharaud, M. Řezáčová, J. Humajová, P. Tomšík and G. Gasser, "A Ruthenium(II) Complex Containing a Redox-Active Semiquinonate Ligand as Potential Chemotherapeutic Agent: From Synthesis to In Vivo Studies". **J. Med. Chem.**, **2020**, DOI: [10.1021/acs.jmedchem.0c00431](https://doi.org/10.1021/acs.jmedchem.0c00431),
- 13 A. Frei[#], "Metal Complexes, an Untapped Source of Antibiotic Potential?", **Antibiotics**, **2020**, DOI: [10.3390/antibiotics9020090](https://doi.org/10.3390/antibiotics9020090); (**> 100 citations**)
- 12 A. Frei^{**}, J. Zuegg*, A. G. Elliott, M. Baker, S. Braese, C. Brown, F. Chen, C. Dowson, G. Dujardin, N. Jung, P. A. King, A. M. Mansour, M. Massi, J. Moat, H. A. Mohamed, A. K. Renfrew, P. J. Rutledge, P. J. Sadler, M. H. Todd, C. E. Willans, J. J. Wilson, M. A. Cooper, and M. A. T. Blaskovich[#], "Metal-complexes as a Promising Source for New Antibiotics". **Chem. Sci.**, **2020**, Inside Cover DOI: [10.1039/C9SC06460E](https://doi.org/10.1039/C9SC06460E); (**>230 citations**)

Publications (II)

- 11 A. Frei[†], M. Amado, M. C. Cooper, and M. A. T. Blaskovich[‡], "Light-activated Rhenium Complexes with Dual Mode of Action against Bacteria". **Chem. Eur. J.**, **2020** Inside Cover DOI: [10.1002/chem.201904689](https://doi.org/10.1002/chem.201904689);
- 10 A. Frei[†], E. Fischer, B. C. Childs, J. P. Holland and R. Alberto, "Two is Better than One: Difunctional High-affinity PSMA Probes Based on a [CpM(CO)₃] (M = Re/^{99m}Tc) Scaffold", **Dalton Trans.** **2019**, 48, 14600 – 14605. DOI: [10.1039/C9DT02506E](https://doi.org/10.1039/C9DT02506E);
- 9 R. Bolliger, A. Frei, H. Braband, G. Meola, B. Spingler and R. Alberto, "Chemistry at High Dilution: Dinuclear ^{99m}Tc Complexes". **Chem. Eur. J.** **2019**, 25, 7101-7104. Hot Paper DOI: [10.1002/chem.201901161](https://doi.org/10.1002/chem.201901161);
- 8 A. Frei[†], "Synthetic routes towards multifunctional cyclopentadienes". **Chem. Eur. J.** **2019**, 25, 7074-7090. Selected as outstanding Review-type article & Recognized as top downloaded paper 2018-2019 DOI: [10.1002/chem.201900276](https://doi.org/10.1002/chem.201900276);
- 7 A. Frei[†], B. Spingler, R. Alberto, "Multifunctional Cyclopentadienes as a Scaffold for Combinatorial Bioorganometallics in $[(\eta^5-C_5H_2R_1R_2R_3)M(CO)_3]$ (M=Re, ^{99m}Tc) Piano-Stool Complexes". **Chem. Eur. J.** **2018**, 24, 10156-10164. VIP Article DOI: [10.1002/chem.201801271](https://doi.org/10.1002/chem.201801271);
- 6 A. Frei, P. P. Mokolokolo, R. Bolliger, H. Braband, M. S. Tsosane, A. Brink, A. Roodt, R. Alberto, "Self-Assembled Multinuclear Complexes Incorporating ^{99m}Tc". **Chem. Eur. J.** **2018**, 24, 10397-10402. Hot Paper DOI: [10.1002/chem.201800600](https://doi.org/10.1002/chem.201800600);
- 5 P. P. Mokolokolo, A. Frei, M. S. Tsosane, D. V. Kama, M. Schuette-Smith, A. Brink, H. G. Visser, G. Meola, R. Alberto, and A. Roodt, "Nuclearity manipulation in Schiff-base fac-tricarbonyl complexes of Mn(I) and Re(I)". **Inorg. Chim. Acta** **2017**, 471, 249-256. DOI: [10.1016/j.ica.2017.10.036](https://doi.org/10.1016/j.ica.2017.10.036);
- 4 J. P. Kraack, A. Frei, R. Alberto, and P. Hamm, „Ultrafast Vibrational Energy Transfer in Catalytic Monolayers at Solid-Liquid Interfaces”. **J. Phys. Chem. Lett.** **2017**, 8, 2489-2495. DOI: [10.1021/acs.jpcllett.7b01034](https://doi.org/10.1021/acs.jpcllett.7b01034);
- 3 A. Frei, D. Sidler, P. Mokolokolo, H. Braband, T. Fox, B. Spingler, A. Roodt, and R. Alberto, "Kinetics and Mechanism of CO Exchange in fac-[MBr₂(solvent)(CO)₃]⁻ (M = Re, ⁹⁹Tc)". **Inorg. Chem.** **2016**, 55, 9352-9360. DOI: [10.1021/acs.inorgchem.6b01503](https://doi.org/10.1021/acs.inorgchem.6b01503);
- 2 A. Frei^{*}, R. Rubbiani^{*}, S. Tubafard, O. Blacque, P. Anstaett, A. Felgenträger, T. Maisch, L. Spiccia, and G. Gasser, "Synthesis, Characterization, and Biological Evaluation of New Ru(II) Polypyridyl Photosensitizers for Photodynamic Therapy". **J. Med. Chem.** **2014**, 57, 7280-7292. Highly Cited Article of 2014 DOI: [10.1021/jm500566f](https://doi.org/10.1021/jm500566f); (>150 citations)
- 1 A. Leonidova*, T. Joshi*, D. Nipkow*, A. Frei*, J.-E. Penner, S. Konatschnig, M. Patra, and G. Gasser, "An Environmentally Benign and Cost-Effective Synthesis of Aminoferrocene and Aminoruthenocene". **Organometallics** **2013**, 32, 2037-2040. DOI: [10.1021/om400009g](https://doi.org/10.1021/om400009g);

*corresponding author

[†]authors have contributed equally

Patents

- G. Gasser, A. Frei, R. Rubbiani, A. Notaro, "Ruthenium Complexes bearing a Dioxolane Ligand as Anticancer Agents" Eur. Pat. Appl. (2019), EP19305668.6 prelim.
- A. Roodt, R. Alberto, A. Frei, P. Mokolokolo, R. Bolliger, A. Brink, "Multinuclear Complexes and their Preparation" WO/2019/123409.
- G. Gasser, A. Leonidova, T. Joshi, D. Nipkow, A. Frei, J.-E. Penner, S. Konatschnig and M. Patra, "Synthesis of Amino-substituted Metallocene Compounds" Eur. Pat. Appl. (2013), EP13157319.8 prelim.