

# NOBEL SYMPOSIA

TUBERCULOSIS AND ANTIBIOTIC RESISTANCE  
FROM BASIC DRUG DISCOVERY TO CLINIC  
STELLENBOSCH, STIAS, 23-27 OCTOBER 2023

**NOBEL**  
**IN AFRICA**

A STIAS INITIATIVE



# THE 178TH NOBEL SYMPOSIUM IN CHEMISTRY

## TUBERCULOSIS AND ANTIBIOTIC RESISTANCE: FROM BASIC DRUG DISCOVERY TO CLINIC

### INTRODUCTION NOTE

Tuberculosis is considered the world's deadliest infectious disease, and killed more than 1.6 million people in 2022. The World Health Organisation (WHO) launched an ambitious End TB strategy in 2015 to reduce TB incidence by 80% and TB deaths by 90% in 2030. With multidrug resistance of *Mycobacterium tuberculosis* on the rise, this strategy is critically dependent on the development of a better vaccine, improved diagnostics, and new drugs to fight TB. The October 2023 Nobel in Africa Nobel Symposium in Chemistry will bring together a multidisciplinary group of

world leading scientists, working in fields ranging from drug design and its organic chemical synthesis, to biochemical analyses and computational approaches, all the way to medical applications in TB diagnosis and treatment. The invitation-only symposium will gather around 40 scientists and selected observers for three days, with lectures, discussions, and time for informal conversations. Besides the three-day symposium at STIAS, outreach activities at TB research centres in SA are planned before and after the symposium.

*The Nobel in Africa – NOBEL SYMPOSIA series is a STIAS Initiative in partnership with Stellenbosch University, under the auspices of the Nobel Foundation and the Royal Swedish Academy of Sciences with funding from the Knut & Alice Wallenberg Foundation. The NOBEL SYMPOSIA mark is owned by the Nobel Foundation.*

## PROGRAMME

<b>MONDAY, 23 OCTOBER</b>		
<b>OUTREACH SESSION (All participants invited), Stellenbosch University, Tygerberg Campus</b>		
<b>09:00</b>	Depart by bus from STIAS to Tygerberg	
<b>10:30-12:30</b>	Tour of the Biomedical Research Institute (BMRI), Faculty of Medicine & Health Sciences, Stellenbosch University, hosted by Gerhard Walzl, Stellenbosch University	
<b>12:30-13:30</b>	LUNCH	
<b>14:00-15:00</b>	Site visit to the Desmond Tutu TB Centre Paediatric Pharmacokinetic Trial Unit, Brooklyn Chest Tuberculosis Hospital, Ysterplaat, hosted by Anneke Hesseling, Stellenbosch University	
<b>18:30</b>	SYMPOSIUM WELCOME RECEPTION, STIAS Wallenberg Research Centre with Remarks by His Excellency Håkan Juholt, Swedish Ambassador to South Africa	
<b>TUESDAY, 24 OCTOBER</b>		
<b>OPENING SESSION (open to media and invited guests)</b>		<b>MC: Noloyiso Mtumbu, STIAS, South Africa</b>
<b>08:00</b>	Registration	
<b>08:30-08:45</b>	<b>Opening remarks:</b> <ul style="list-style-type: none"> <li>• STIAS Director, Edward K. Kirumira</li> <li>• Stellenbosch University Deputy Vice-Chancellor (Research, Innovation and Postgraduate Studies), Sibusiso Moyo</li> <li>• Embassy of Sweden, First Secretary for Trade &amp; Economic Affairs, Martin Jörnruud</li> <li>• Symposium Convenor, Fredrik Almqvist, Umeå University, Sweden</li> </ul>	
<b>08:50-09:30</b>	<b>The incentives and barriers to the development of drugs for global health: a case study in Leprosy and Tuberculosis</b>	Keynote address: Gilla Kaplan, Former Director of the Global Health Program on Tuberculosis, Bill and Melinda Gates Foundation
<b>09:30-09:50</b>	<b>Community and Public Engagement as Essential Science</b>	Anastasia Koch, Eh!woza, University of Cape Town, South Africa
<b>09:50-10:15</b>	<b>Establishment of a regional model to strengthen programmatic and research capacities on TB in West and Central Africa</b>	Dissou Affolabi, West and Central African Regional Networks for Tuberculosis Control, Benin
<b>10:15-10:45</b>	COFFEE & TEA BREAK	
<b>CLINICAL PERSPECTIVES ON TUBERCULOSIS TREATMENT REGIMENS</b>		<b>Chair: Maria Lerm, Linköping University, Sweden</b>
<b>10:45-11:15</b>	<b>Chemometrics in tuberculosis disease prognostication</b>	Johan Normark, Department of Clinical Microbiology, Umeå University, Sweden
<b>11:15-11:45</b>	<b>Individualized TB treatment and shorter regimens</b>	Katarina Niward, Department of Biomedical and Clinical Sciences, Linköping University, Sweden
<b>11:45-12:15</b>	<b>Novel therapeutics for tuberculosis: from innovations to access</b>	Anneke Hesseling, Stellenbosch University, South Africa
<b>12:15-12:45</b>	<b>MDR TB treatment: Developments &amp; the unmet needs</b>	Adamu Bayissa Kiltu, Clinical trial Directorate, Armauer Hansen Research Institute, Ethiopia
<b>12:45-14:00</b>	LUNCH	

<b>HOST-DEPENDENT AND HOST-DIRECTED THERAPIES</b>		<b>Chair: Nicole Sampson, University of Rochester, USA</b>
<b>14:00-14:30</b>	New concepts for immune-enhancing therapy of tuberculosis (TB)	Susanna Brighenti, Center for Infectious Medicine (CIM), Karolinska Institute, Sweden
<b>14:30-15:00</b>	Host lipid metabolism in <i>Mycobacterium tuberculosis</i> infection	Norbert Reiling, Research Center Borstel – Leibniz Lung Center, Germany
<b>15:00-15:30</b>	COFFEE & TEA BREAK	
<b>COMPUTATIONAL SYSTEMS ANALYSIS OF DISEASE STATES AND PHARMACOLOGY</b>		<b>Chair: Paolo Denti, University of Cape Town, South Africa</b>
<b>15:30-16:00</b>	Metabolic network analysis for drug target identification in <i>Mycobacterium tuberculosis</i> : genome scale structural models and mechanistic dynamic models	Jacky Snoep, Department of Biochemistry, Stellenbosch University, South Africa
<b>16:00-16:30</b>	Within-granuloma bacterial and antibiotic dynamics and their impact on resistance	Elsje Pienaar, Weldon School of Biomedical Engineering, Purdue University, USA
<b>NOBEL IN AFRICA YOUNG SCIENTISTS' SESSION, STIAS Manor Library</b>		
<b>16:45-18:30</b>	Young Scientists' discussion session with Wilbert Bitter, VU Amsterdam, Netherlands, & Erick Strauss, Stellenbosch University, South Africa	
<b>18:30</b>	DINNER AT STIAS (Barbecue buffet): STIAS <i>Aliquid Novi</i> wine tasting Refreshments will be available from 16:30	

<b>WEDNESDAY, 25 OCTOBER</b>		
<b>METHOD DEVELOPMENT WITH IMPACT ON DRUG DISCOVERY AND TARGET IDENTIFICATION</b>		<b>Chair: Fredrik Almqvist, Umeå University, Sweden</b>
<b>08:30-09:00</b>	Spatiotemporal studies of host responses to mycobacteria in macrophages	Trude Helen Flo, CEMIR, Department of Clinical and Molecular Medicine, Norwegian University of Science and Technology, Norway
<b>09:00-09:30</b>	Exposure to tuberculosis induces epigenetic changes – implications for disease biology, diagnosis and treatment	Maria Lerm, Department of Inflammation and Infection, Linköping University, Sweden
<b>09:30-10:00</b>	Better chemical synthesis of drugs with light!	Burkhard König, Faculty of Chemistry and Pharmacy, University of Regensburg, Germany
<b>10:00-10:30</b>	Exploiting host-pathogen interactions for innovative TB drug development	Priscille Brodin, Institut Pasteur de Lille, University of Lille, France
<b>10:30-10:35</b>	GROUP PHOTO	
<b>10:35-11:00</b>	COFFEE & TEA BREAK	
<b>Session continues</b>		<b>Chair: Norbert Reiling, Research Center Borstel – Leibniz Lung Center, Germany</b>
<b>11:00-11:30</b>	Organosulfur bioactives: The two sides	Carsten Bolm, Institute of Organic Chemistry, RWTH Aachen University, Germany
<b>11:30-12:00</b>	Recent examples of new antibiotics from microbial sources and how chemical synthesis can initiate MedChem programs	Andreas Kirschning, Leibniz University, Hannover, Germany
<b>12:00-12:30</b>	Chemical probes of the mycobacterial cell envelope	Laura Kiessling, Massachusetts Institute of Technology, USA
<b>12:30-13:30</b>	LUNCH	

<b>Session continues</b>		<b>Chair: Susanna Brighenti, Center for Infectious Medicine (CIM), Karolinska Institutet, Sweden</b>
<b>13:30-14:00</b>	Chemical synthesis-driven studies of tuberculosis lipids and lipidomics	Adriaan Minnaard, Stratingh Institute for Chemistry, University of Groningen, The Netherlands
<b>14:00-14:30</b>	Host cell environments and antibiotic efficacy in tuberculosis	Maximiliano Gutierrez, The Francis Crick Institute, United Kingdom
<b>14:30-15:00</b>	Taking shape: morphological phenoprinting as tool in new TB drug discovery	Digby Warner, Department of Pathology, and Institute of Infectious Disease & Molecular Medicine (IDM), University of Cape Town, South Africa
<b>15:00-15:30</b>	COFFEE & TEA BREAK	
<b>MECHANISTIC INSIGHTS ON ANTIBIOTIC RESISTANCE AND TOLERANCE</b>		<b>Chair: Elsje Pienaar, Purdue University, USA</b>
<b>15:30-16:00</b>	Reversing antibiotic resistance	Pål Jarle Johnson, The Arctic University of Norway, Norway
<b>16:00-16:30</b>	New therapy for tuberculosis	Tone Tønjum, Unit for genome Dynamics, Department of Microbiology, University of Oslo, Norway
<b>16:30-17:00</b>	Population genomics identifies novel determinants of TB treatment outcomes	Sarah Fortune, Harvard TH Chan School of Public Health, Harvard University, USA
<b>STELLENBOSCH UNIVERSITY CHANCELLOR'S PUBLIC LECTURE, Jan Mouton Learning Centre</b>		<b>MC: Sibusiso Moyo, Deputy Vice-Chancellor, Stellenbosch University</b>
<b>17:30</b>	Transfer from STIAS to SU campus Jan Mouton Learning Centre	
<b>18:00-18:15</b>	Opening remarks and introducing the speaker	Wim de Villiers, Rector & Vice-Chancellor, Stellenbosch University Edwin Cameron, Chancellor, Stellenbosch University
<b>18:15-19:15</b>	A chemist's eye on the future of tuberculosis chemotherapy	Clifton Barry, NIAID, USA
<b>19:15</b>	COCKTAIL RECEPTION, foyer of the Jan Mouton Learning Centre	

<b>THURSDAY, 26 OCTOBER</b>		
<b>NEW ANTIBIOTICS, ALTERNATIVE STRATEGIES AND POTENTIAL TARGETS</b>		<b>Chair: Tone Tønjum, University of Oslo, Norway</b>
<b>08:30-09:00</b>	Revisiting clinically validated targets for TB drug discovery	Kelly Chibale, Holistic Drug Discovery & Development (H3D) Centre, University of Cape Town, South Africa
<b>09:00-09:30</b>	Teaching an old drug new tricks thanks to SMART compounds	Nicolas Willand, Molecular and Drugs for Living Systems research unit, Institut Pasteur de Lille, University of Lille, France
<b>09:30-10:00</b>	TBA	David Barros-Aguirre, GSK, Spain
<b>10:00-10:30</b>	COFFEE & TEA BREAK	

<b>Session continues</b>		<b>Chair: Christina Stallings, Washington University School of Medicine, USA</b>
<b>10:30-11:00</b>	<b>ERA4TB – the European Regimen Accelerator for Tuberculosis</b>	Stewart Cole, Institute Pasteur, Paris, France
<b>11:00-11:30</b>	<b>Metabolic vulnerabilities in tuberculosis drug resistance</b>	Christina Stallings, Department of Molecular Microbiology, Washington University School of Medicine, USA
<b>11:30-12:00</b>	<b>Novel treatment for pulmonary tuberculosis</b>	Gabriela Godaly, Lund University, Sweden
<b>12:00-13:00</b>	LUNCH	
<b>Session continues</b>		<b>Chair: Gerhard Walzl, Stellenbosch University, South Africa</b>
<b>13:00-13:30</b>	<b>Targeting the core-clamp in <i>M. tuberculosis</i></b>	Valerie Mizrahi, Institute of Infectious Disease and Molecular Medicine, University of Cape Town, South Africa
<b>13:30-14:00</b>	<b>Chemical and Protein Modulators of Amyloid Formation</b>	Matthew Chapman, MCDB, University of Michigan, Ann Arbor, USA
<b>14:00-14:30</b>	<b>Tuberculosis Target Discovery in Secondary Metabolic Pathways</b>	Nicole Sampson, Department of Chemistry, University of Rochester, USA
<b>14:30-15:00</b>	COFFEE & TEA BREAK	
<b>Session continues</b>		<b>Chair: Erick Strauss, Stellenbosch University, South Africa</b>
<b>15:00-15:30</b>	<b>Host-Pathogen Interactions Reveal Antibiotic-Sparing Strategies to Treat Infectious Diseases</b>	Scott Hultgren, Department of Molecular Microbiology/Center for Women's Infectious Disease Research, Washington University, St. Louis, USA
<b>15:30-16:00</b>	<b>Chemical Synthesis of Antibiotics</b>	Andrew G. Myers, Department of Chemistry & Chemical Biology, Harvard University, Cambridge, USA
<b>16:00-16:30</b>	<b>Concluding Discussion</b>	Co-convenors and all participants
<b>18:30</b>	SYMPOSIUM CLOSING DINNER, Longridge Wine Estate, Stellenbosch	

<b>FRIDAY, 27 OCTOBER</b>		
<b>OUTREACH SESSION (All participants invited), Cape Town</b>		
<b>08:45</b>	Depart by bus from STIAS to Cape Town	
<b>10:00-13:00</b>	<b>Mini-symposium hosted by the Institute of Infectious Disease and Molecular Medicine (IDM), University of Cape Town (see announcement)</b>	
<b>13:00</b>	LUNCH AT IDM	
<b>EXCURSION, Cape Town</b>		
<b>14:30</b>	Transport provided to V&A Waterfront or Stellenbosch; free afternoon & evening	
<b>19:00 &amp; 21:00</b>	Return transport from V&A Waterfront to Stellenbosch	

## PARTICIPANTS

Name	Last name	Unit	Institution	Country
Berhanu	Abegaz	Department of Chemistry	Addis Ababa University	Ethiopia
Dissou	Affolabi	West and Central African Regional Networks for Tuberculosis Control	Abomey-Calavi University	Benin
Jerrold	Agbankpe	Polytechnic School of Abomey-Calavi	University of Abomey-Calavi	Benin
Fredrik	Almqvist	Department of Chemistry	Umeå University	Sweden
David	Barros-Aguirre		GSK	Spain
Clifton	Barry		NIAID	USA
Ryan	Bitter	Department of Molecular Microbiology   Center for Women's Infectious Disease Research	Washington University	USA
Wilbert	Bitter	Department of Molecular Microbiology	Vrije Universiteit Amsterdam	The Netherlands
Carsten	Bolm	Institute of Organic Chemistry	RWTH Aachen University	Germany
Susanna	Brighenti	Center for Infectious Medicine (CIM)	Karolinska Institutet	Sweden
Priscille	Brodin		French Institute of Health and Medical Research	France
Matthew	Chapman	Department of Molecular, Cellular and Developmental Biology	University of Michigan	USA
Kelly	Chibale	Holistic Drug Discovery & Development (H3D) Centre	University of Cape Town	South Africa
Stewart	Cole		Institute Pasteur	France
Eric	De Cloedt	Department of Medicine: Division of Clinical Pharmacology	Stellenbosch University	South Africa
Paolo	Denti	Division of Clinical Pharmacology	University of Cape Town	South Africa
Andreas	Diacon		TASK Europe, Cape Town	South Africa
Trude Helen	Flo	CEMIR, Department of Clinical and Molecular Medicine	Norwegian University of Science and Technology	Norway
Sarah	Fortune	Harvard TH Chan School of Public Health	Harvard University	USA
Gabriela	Godaly	Division of Microbiology, Immunology and Glycobiology	Lund University	Sweden
Maximiliano	Gutierrez		Crick Institute	United Kingdom
Anneke	Hesseling	Desmond Tutu TB Centre	Stellenbosch University	South Africa
Scott	Hultgren	Department of Molecular Microbiology   Center for Women's Infectious Disease Research	Washington University	USA
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Gilla	Kaplan	Former Director of the Global Health Program on Tuberculosis	Bill and Melinda Gates Foundation	USA
Laura	Kiessling	Department of Chemistry	Massachusetts Institute of Technology	USA
Adamu Bayissa	Kiltu	Clinical trial Directorate	Armauer Hansen Research Institute	Ethiopia
Andreas	Kirschning	Institute of Organic Chemistry	Leibniz University, Hannover	Germany
Bert	Klumperman	Department of Chemistry & Polymer Science	Stellenbosch University	South Africa
Anastasia (Tasha)	Koch	Eh!woza	University of Cape Town	South Africa
Burkhard	König	Institute of Organic Chemistry	University of Regensburg	Germany
Maria	Lerm	Department of Inflammation and Infection	Linköping University	Sweden

Name	Last name	Unit	Institution	Country
Adriaan J.	Minnaard	Stratingh Institute of Chemistry	University of Groningen	The Netherlands
Valerie	Mizrahi	Institute of Infectious Disease and Molecular Medicine	University of Cape Town	South Africa
Andrew G.	Myers	Department of Chemistry and Chemical Biology	Harvard University	USA
Katarina	Niward	Department of Infectious Diseases & Department of Biomedical and Clinical Sciences	Linköping University Hospital & Linköping University	Sweden
Johan	Normark	Department of Clinical Microbiology	Umeå University	Sweden
Elsje	Pienaar	Weldon school of Biomedical Engineering	Purdue University	USA
Norbert	Reiling	RG Microbial Interface Biology	Research Center Borstel - Leibniz Lung Center	Germany
Nicole	Sampson	Department of Chemistry	University of Rochester	USA
Stephanie	Smelyansky	Department of Chemistry	Massachusetts Institute of Technology	USA
Jacky	Snoep	Department of Biochemistry	Stellenbosch University	South Africa
Christina	Stallings	Department of Molecular Microbiology	Washington University School of Medicine	USA
Adrie	Steyn		Africa Health Research Institute	South Africa
Erick	Strauss	Department of Biochemistry	Stellenbosch University	South Africa
Tone	Tønjum	Unit for genome Dynamics, Department of Microbiology	University of Oslo	Norway
Willem	van Otterlo	Department of Chemistry & Polymer Science; South Africa Chemical Institute	Stellenbosch University	South Africa
Gerhard	Walzl	Department of Biomedical Sciences	Stellenbosch University	South Africa
Digby	Warner	Department of Pathology, and Institute of Infectious Disease & Molecular Medicine (IDM)	University of Cape Town	South Africa
Nicolas	Willand	Molecular and Drugs for Living Systems research unit   Institut Pasteur de Lille	University of Lille	France

#### **SCIENTIFIC ORGANISING COMMITTEE:**

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 Birgitta Henriques-Normark, Karolinska Institutet  
 Maria Lerm, Linköping University (Co-convenor)  
 Valerie Mizrahi, University of Cape Town  
 Nicole Sampson, Stony Brook University  
 Jacky Snoep, Stellenbosch University (Co-convenor)  
 Christina L. Stallings, Washington University

#### **LOCAL ORGANISING COMMITTEE:**

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 Sibusiso Moyo, Vice-Rector: Research, Innovation and Postgraduate Studies, Stellenbosch University  
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