



Leibniz-Institut für
Astrophysik Potsdam

How to build a career in academia

Kalaga Madhav

Head of Astrophotonics - innoFSPEC

27 Juni 2022



Leibniz-Institut für
Astrophysik Potsdam

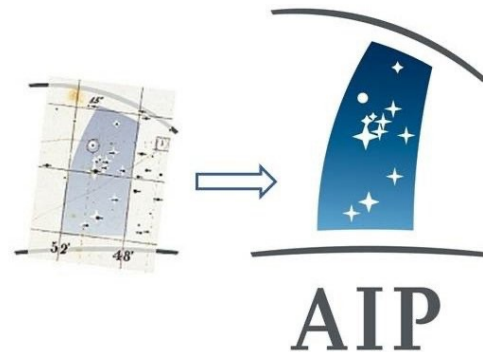
GESCHICHTE DES AIP

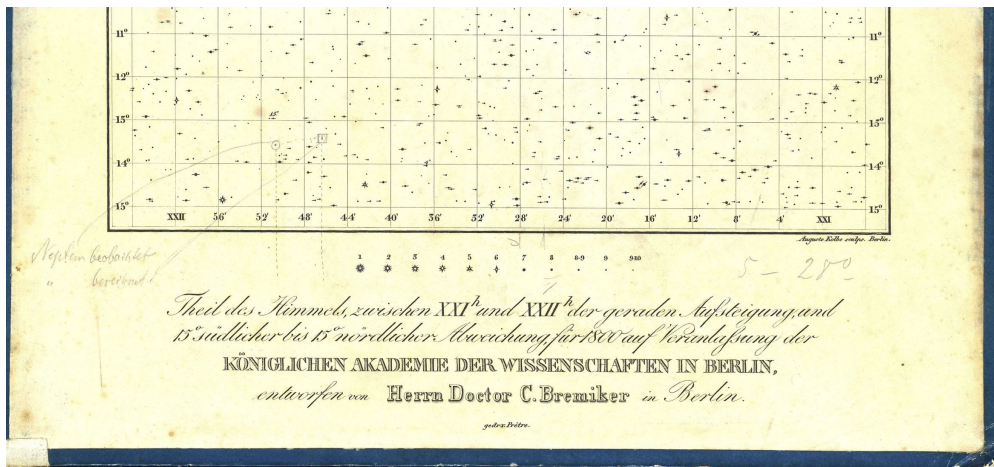
History of AIP

1846 Entdeckung des Planeten Neptun
durch Johann Gottfried Galle
Discovery of the planet Neptune
by Johann Gottfried Galle

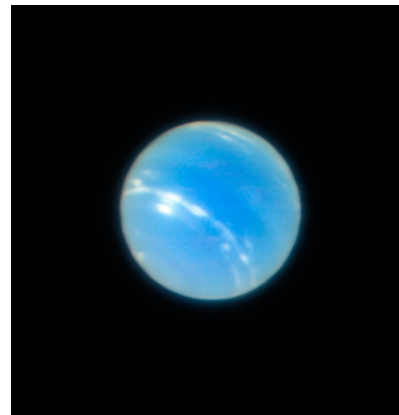


1700 Einführung des sogenannten
„Verbesserten Kalenders“ in den
protestantischen Staaten Deutschlands
Introduction of the so-called
“Improved Calendar” in the Protestant
states of Germany





Excerpt from the Hora XXI sky chart of the Berlin Science Academy completed by Carl Bremker. The work on the chart started in 1826, but was completed only in 1844 and printed in **1845**. It laid untouched until 23 September 1846 when Johann Gottfried Galle and Heinrich Louis d'Arrest used it to discover Neptune, based on the theoretical prediction by Jean Joseph Urbain Le Verrier. The predicted location (square) and the observed location (circle) were noted in pencil, allegedly by Galle, but at some time after the discovery.
 Credit: AIP archive



June 2018:

The outermost planet of our solar system, Neptune, observed using adaptive optics with the MUSE instrument at the Very Large Telescope in Chile.
 Credit: AIP/P. Weilbacher



Leibniz-Institut für
Astrophysik Potsdam

GESCHICHTE DES AIP

History of AIP

1881 Erster Michelson-Versuch
in Potsdam

First Michelson experiment in Potsdam

1904 Entdeckung der interstellaren
Materie durch Johannes Hartmann

Discovery of the interstellar matter by
Johannes Hartmann



1876 – 1879 Bau des Hauptgebäudes
des Astrophysikalischen Observatoriums
auf dem Potsdamer Telegrafenberg
Construction of the main building of the
AOP on the Telegrafenberg at Potsdam



1909 Berufung von Karl Schwarzschild
zum Direktor des AOP

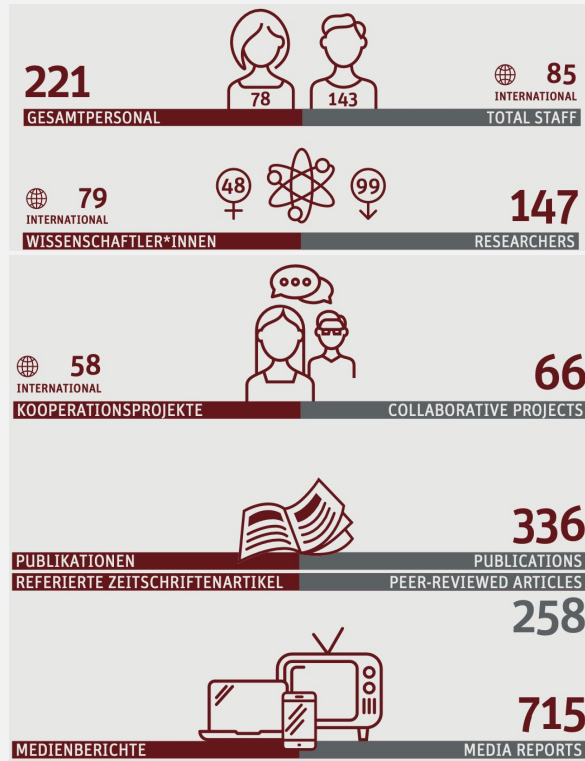
Appointment of Karl Schwarzschild as
director of the AOP

1911 – 1913 Bau der Sternwarte
in Babelsberg

Construction of the observatory in
Babelsberg



Working environment



2020-2021

Jobs for physicists in the company/institute



Apprenticeship at AIP

For decades, the AIP has been successfully providing apprenticeships in the skilled trades, IT and commercial fields at state-of-the-art workplaces under the guidance of motivated and competent trainers.

1) Humboldt Fellowship

The Humboldt Fellowship provides a stipend for two years, as well as some research funds. The fellowship offers some additional benefits, in particular a paid, 2 to 4-months long, full-time German language course before the fellowship. Applications are possible at any time throughout the year.

2) Walther Benjamin Program

The Walther Benjamin programme by the DFG provides postdoctoral researchers with funding for their own research project for up to two years. During this time they will be employees of the hosting institute, and also get some additional research funds. It is aimed at young postdocs who have recently finished their PhD. There is no fixed application deadline, submissions are possible at any time (but only after the PhD thesis was submitted).

3) Marie Curie Fellowship

The European Marie Curie fellowship program provides up to two years of funding for postdoctoral researchers at a European research institute. It emphasizes training, acquiring new skills, and advancing the career of the funded researchers. There is a yearly call with an application deadline typically in September.

Typical jobs types at AIP

Optical engineer, instrumentation engineer, modelling (ZEMAX, ANSYS, IDL, Python, Solidworks), scientists positions in observational astrophysics, cosmology, ML, e-science, exoplanets, MHD etc.

About me

Senior Scientist- AstrOOptics

innoFSPEC, Leibniz Institute for Astrophysics Potsdam (AIP), Germany,

Head of Astrophotonics June 2018 - to date

innoFSPEC, Leibniz Institute for Astrophysics Potsdam (AIP), Germany,

Website :

<https://www.aip.de/en/research/innoFSPEC/astrophotonics/>

Team :



Projects

Completed Academic Funded Projects

1. Laser Doppler Velocity system
 - Fiber optic 3-component LDV, power spectrum estimation of low-SNR LDV systems
2. Flow visualization
 - Quantitative flow visualization of Mach 2 nozzle
3. Image processing
 - Tissue phantoms/turbid media imaging and image processing
 - Tomographic inversion of wavefronts through shadow casting for flow visualization
4. Fiber Optic Sensors
 - FBG Fabry-Perot Interferometer (FBG-FPI), Tapered FBGs, Temperature, Strain, Pressure, Magnetic field, Current, Chemical concentration, Vibration, SHM, Sensor arrays, Macro Bend
5. Optical Fiber sensors
 - Low cost disposable fiber optic sensor for high temperature measurement
 - Micro-displacement sensors
6. Angle Closure Glaucoma
 - Non-contact Imaging of Angle Closure Glaucoma for early medical diagnosis

Completed Industrial Projects

1. Structural Health Monitoring (SHM) using FBG array sensors
2. Detection of acoustic and non-acoustic sources in turbulent water through optical imaging
3. Automated system for qualitative optical analysis of window screen compliant to ASTM F2469, ASTM F801 and ASTM F1181 standards.
4. Palm-sized Four-wavelength PCR medical diagnostic product
5. Oxygen sensor for FTIS
6. H₂S sensor for biogas industries

Current Active Instrument Projects

1. PAWS : Potsdam Arrayed Waveguide Spectrograph\
2. POCO : Turn-key VIS and H-band Frequency Comb
3. GRAFPI : Fiber Fabry-Perot interferometer for ELT/MICADO
4. OH-SUPER : OH-emission suppression for ground-based telescopes
5. EUPRAXIA at VLT

Current Active Research Areas

1. Sky OH-emission suppression filters for ground-based telescopes
2. Arrayed Waveguide Grating Spectrographs for astronomical H-band
3. Fibre and photonic lanterns
4. Beam combiners for astronomical H- and K-band
5. VIS and H-band ultra-high stability frequency combs ($\Delta\nu < 50\text{cm/s}$)
6. Ultra-fast laser inscription (ULI) of 3D waveguides
7. Fiber Fabry-Perot interferometer

Current Research Group

5 Postdocs, 4 PhDs, 2 Engineers, 2 Masters, 1 Bachelors

Career Advice

1. Become an expert in one topic, area, research, or domain
2. Develop skills (LabView, ZEMAX, TracePro, IDL, Python, COMSOL, Code V, FDTD, ANSYS, etc.)
3. Find a mentor (s)
 - Someone who will advise you
4. Find a sponsor (s)
 - Someone who will talk on your behalf , advertise you, without you
5. Build brand value
 - What are you known for?
6. Network
 - Means you should help others & contribute to their projects
7. Stay current and relevant
 - Read, read, read (papers, reports, books), educate yourself
 - Have strong understanding of fundamentals
 - Increase your knowledge base, always learn new things
 - Knowledge in adjacent areas
 - Keep a list of groups, people, teams, project you should follow closely.
8. Calibrate every few months
 - Stay on top
9. Curate your resume