

# Hannes V. Jakob

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## Education

### Gymnasium Nepomucenum Rietberg

ABITUR

Rietberg, Germany

July 2008 - June 2016

### Albert-Ludwigs-Universität Freiburg

B.SC. IN MATHEMATICS

Bachelor's thesis in set theory titled "Cichoń's Maximum"

Freiburg, Germany

Oct. 2017 - Sept. 2020

### Albert-Ludwigs-Universität Freiburg

M.SC. IN MATHEMATICS

Master's thesis in set theory titled "Generalised Tree Properties"

Freiburg, Germany

Oct. 2020 - Sept. 2022

### Albert-Ludwigs-Universität Freiburg

DR. RER. NAT. IN MATHEMATICS

- Graduated *summa cum laude*
- Thesis titled "Variants of Mitchell Forcing"
- Advisor: Prof. Heike Mildenberger

Freiburg, Germany

Oct. 2022 - Jan. 2025

## Positions

### Albert-Ludwigs-Universität Freiburg

WISSENSCHAFTLICHER MITARBEITER

Advisor: Prof. Heike Mildenberger

Freiburg, Germany

Oct. 2023 - August 2025

### University of North Texas

VISITING ASSISTANT PROFESSOR

Mentor: Prof. John Krueger

Denton, TX, USA

Sept. 2025 - May 2028

## Teaching

### Lecture: Combinatorics

TEACHING ASSISTANT

Winter 2023/2024

Freiburg, Germany

### Seminar: Prikry-Forcing

TEACHING ASSISTANT

Summer 2024

Freiburg, Germany

### Lecture: Mathematical Logic

TEACHING ASSISTANT

Summer 2024

Freiburg, Germany

### Lecture: Set Theory

TEACHING ASSISTANT

Winter 2024/2025

Freiburg, Germany

### Lecture: Topology

TEACHING ASSISTANT

Summer 2025

Freiburg, Germany

### Lecture: Calculus I (Honors)

LECTURER

Fall 2025

Denton, TX

### Lecture: Intro to Topology

LECTURER

Spring 2026

Denton, TX

## Publications and Preprints

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### Disjoint Stationary Sequences on an Interval of Cardinals

2023

J.

Submitted

We answer a question of Krueger by, from countably many Mahlo cardinals, constructing a model in which there is a disjoint stationary sequence on every  $\aleph_n$ ,  $n \geq 2$ . In this model, for any  $n \geq 1$  and any  $\Theta > \aleph_n$  there are stationarily many  $N \in [H(\Theta)]^{\aleph_n}$  which are internally unbounded but not internally club.

### Slender Trees and the Approximation Property

2023

J.

Submitted

We prove several compatibility results regarding the ineffable slender property introduced by Christoph Weiss.

### Distinguishing Internally Club and Approachable on an Infinite Interval

2024

J., MAXWELL LEVINE

Bull. of the London Math. Soc.

We answer a question of Krueger by, from countably many Mahlo cardinals, constructing a model in which for any  $n \geq 1$  and  $\Theta > \aleph_n$  there are stationarily many  $N \in [H(\Theta)]^{\aleph_n}$  which are internally club but not internally approachable.

### Cascading Variants of Internal Approachability

2024

J.

Submitted

We show that it is consistent that there exist stationarily many models which are internally approachable of different variants at different levels. We also show that, in general, the approachability property at  $\mu$  can hold together with the existence of stationarily many  $N \in [H(\mu^+)]^\mu$  which are internally stationary but not internally club.

### On Friedman's Property

2024

J.

Submitted

We introduce posets which gently add witnesses to the failure of variants of Friedman's property in order to separate many of these principles both at one cardinal and between different cardinals. Along the way we obtain that many known results which hold for  $\kappa$ -strategically closed forcings can fail for  $< \kappa$ -strategically closed ones.

### Failure of Approachability at the Successor of the first Singular for any Cofinality

2025

J., MAXWELL LEVINE

Submitted

We answer two long-standing open question regarding the successor of the first singular cardinal  $\aleph_{\omega+1}$ . Answering a question of Shelah we show that for any  $n \in \omega$  there can consistently be stationarily many non-approachable points of cofinality  $\aleph_{n+1}$ . As a corollary, we answer a question of Cummings, Foreman and Magidor by showing that there can consistently be stationarily many good points which are non-approachable.

### Total Failure of Approachability at Singulars of Countable Cofinality

2025

J.

Submitted

Relative to large cardinals, we construct a model of ZFC in which for every singular cardinal  $\delta$  of countable cofinality and every uncountable regular  $\mu < \delta$  the set  $E_\mu^{\delta+}$  is not in the approachability ideal. This answers a question of Mitchell and provides a definitive answer to a question of Foreman and Shelah.

### On Shelah's Approachability Ideal

2025

J., ALEJANDRO POVEDA

Submitted

We answer a longstanding open problem by Shelah by constructing a model where the approachability property fails at the successor of an arbitrary singular cardinal, for any cofinality. We also construct a model of ZFC where  $\text{AP}_\delta$  fails for every singular cardinal  $\delta$ .

## Invited Talks

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### On Friedman's Property

13.11.2024

SET THEORY SEMINAR AT THE CZECH ACADEMY OF SCIENCES

Prague, Czech Republic

### Strong Distributivity and the Indestructibility of ISP

15.11.2024

WORKSHOP: COMPACTNESS AND CARDINAL INVARIANTS II

Prague, Czech Republic

### On Friedman's Property

07.01.2025

OBERWOLFACH WORKSHOP IN SET THEORY

Oberwolfach, Germany

### On Shelah's Approachability Ideal

03.11.2025

LUMINY WORKSHOP IN SET THEORY

Luminy, France

**TBA**

BLAST CONFERENCE 2026

18.05.2026 - 21.05.2026

Waco, TX, United States

**TBA**

YOUNG SET THEORY WORKSHOP 2026

31.08.2026-04.09.2026

Barcelona, Spain

## Seminar Talks

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### Strong Distributivity and Games on Posets

OBERSEMINAR: MATHEMATISCHE LOGIK

25.04.2023

Freiburg, Germany

### Forcings with the Approximation Property

OBERSEMINAR: MATHEMATISCHE LOGIK

12.12.2023

Freiburg, Germany

### Friedman's and other Reflection Properties

OBERSEMINAR: MATHEMATISCHE LOGIK

06.04.2024

Freiburg, Germany

### On Shelah's Approachability Ideal

UNT SET THEORY SEMINAR

17.09.2025, 24.09.2025

Denton, TX

## Contributed Talks

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### Cascading Variants of Internal Approachability

EUROPEAN SET THEORY CONFERENCE

17.09.2024

Münster, Germany