

THE ANNUAL REPORT

Name and surname	Hanno Stinshoff
Project title	Expanding the BoOST massive star models to explain the formation of globular clusters
Scientific disciplines	Astronomy
Scientific Supervisor	Prof. dr. hab. Michał Hanaś
Assistant Supervisor	Dr. Dorottya Szécsi
Foreign scientific supervisor	

Year of study: (the academic year 2022/ 2023)

1. Description of the progress in the preparation of the doctoral dissertation and the progress in conducting scientific research

Massive stars have essential roles in stellar populations, being short-lived with strong winds, and providing products of nuclear fusion for their surroundings. One specific effect, that may be facilitated by massive stars, is the formation of globular clusters with multiple populations.

Because of that it is essential to create new evolutionary models with a broad range of initial masses, metallicities and rotational velocities, which then can be used in cluster evolution to investigate the validity of that aforementioned scenario.

Scientific Goals:

1.) The beginning of the project is focused on the creation of the models of massive stars in a broad parameter space. The Bonn Code is employed with a set of 336 different initial parameter configurations to ensure a good resolution for the grids to be created. This will later-on be expanded slightly, upon inspecting the models and deciding which sections of the parameter space need better resolution.

2.) The BoOST format is about to be applied to the models. In this format certain points in evolution are determined in a systematic way, which then are used to get a unified data table with a set number of lines/time points between each of them. They also facilitate interpolation between models of differing initial parameters, therefore enabling the creation of dense grids of models.

The grids of models are then published in a tabulated, user-friendly way to make further processing of the data easier.

The student became familiar with the operation while testing it on older models, and will apply it to the new models as soon as they are ready.

Preparing the models for the process also includes checking each model for inconsistencies or computational errors. It can happen that the code goes on a tangent to find the solution before eventually getting there, so identifying those moments and deleting and redoing those parts as much as possible is essential for a proper model. This is something the student is currently in the middle of doing and soon expected to finish, it is the last step before applying the BoOST format.

3.) The student familiarized himself with the WINDCALC code that will be used to investigate the models under the scope of cluster wind research. He applied it to existing models to test out the results and consequences of different inputs and got a better understanding of how those inputs affected the way the resulting populations behaved. He also in general got a better understanding of the parameters of a synthetic population.

2. Participation in classes

[Title of courses, amount of hours, ECTS credits].

1. Name of the course: Artificial Intelligence and the future of scientific thinking

Course code on USOS: 7405-AC-AI-2
Form of classes: Lecture
Final grade: 4
Number of hours: 10 hours
Number of ECTS points: 1 ECTS credits

2. Name of the course: Ethics and intellectual property
Course code on USOS: 7405-AC-EIP-2
Form of classes: Lecture
Final grade: - (still to be graded by the professor)
Number of hours: 10 hours
Number of ECTS points: 1 ECTS credits
3. Name of the course: Scientific data presentation and copyright II
Course code on USOS: 7405-AC-SDPC2-2
Form of classes: Lecture
Final grade: 4.5
Number of hours: 10 hours
Number of ECTS points: 1 ECTS credits
4. Name of the course: History of scientific thinking and inquiry
Course code on USOS: 7405-AC-HST-2
Form of classes: Lecture
Final grade: 5
Number of hours: 10 hours
Number of ECTS points: 1 ECTS credits
5. Name of the course: Evolutionary Biology
Course code on USOS: 7405-AC-EB-2
Form of classes: Lecture
Final grade: - (still to be graded, exam is on 18th of september)
Number of hours: 10 hours
Number of ECTS points: 1 ECTS credits
6. Name of the course: Supervisory mentoring
Course code on USOS: 7405-AC-SMEN-1
Form of classes: Supervisor mentoring
Final grade: 5
Number of hours: not applicable
Number of ECTS points: 4 ECTS credits
7. Name of the course: Occupational Safety, Health and Ergonomics (Basic Training)
Course code on USOS: 9000-eBHP
Form of classes: Training
Final grade: ZAL

3. Participation in scientific conferences.

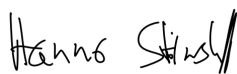
[name of conference, organizer, dates]

1. Conference name: VFTS meeting
Date: 27 - 29 March 2023
Type of participation: Poster presentation (Title: A new model grid expanding on the BoOST project)
Venue: Max Planck Institute for Astrophysics, MPI, Postfach 1317, D-85741 Garching, Germany.
2. Conference name: EAS meeting (certification handed in at UMK, but not accounted for in USOS yet)

<p>Date: 10 - 14 July 2023 Type of participation: Poster presentation (Title: New stellar evolutionary models of massive stars with rotation: Expanding the BoOST project) Venue: ICE Kraków Congress Centre, ICE, Marii Konopnickiej, 17, 30-302 Kraków, Poland.</p> <p>3. Workshop title: Public speaking and investor pitching Date: 16 - 17 November 2022 Venue: Nicolaus Copernicus University, Toruń, Poland.</p>
<p>4. Internship.</p> <p>[Name of the institution, place, dates, description of the internship].</p> <p>Not applicable</p>
<p>5. Initiating a doctoral assessment process – yes/no [delete as appropriate].</p> <p>Not applicable</p>
<p>6. Submission of the doctoral dissertation – yes/no [delete as appropriate].</p> <p>Not applicable</p>
<p>7. Teaching practice</p> <p>[Title of courses, amount of hours].</p> <p>Not applicable</p>
<p>8. Applying for a research grant.</p> <p>The research of the student in question is covered by the National Science Center (NCN), Poland under grant No. OPUS 2021/41/B/ST9/00757. There is no need for the application for a research grant anymore.</p>

07 - 09 - 2023

Date



PhD student's signature

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Scientific Supervisor's signature



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Assistant Supervisor's signature

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Signature of the Head of ISD AC