

Faculty Development Plan

██████████, Assistant Professor,
Department of Physics and Astronomy

Timeframe: 2021-2024

In this document, I present my faculty development plan for 2021-2024 which outlines my goals as preparation for my Continuing Faculty Status review. I joined BYU in the summer of 2021 after working as a senior researcher at Ghent University in Belgium (2015-2017) and Pulkovo Observatory in Russia (2011-2015, 2017-2021).

This faculty plan outlines my path to become a successful scholar, instructor, mentor, and steward for my department, college, and the University.

1. SELF-ASSESSMENT

Scholarship Strengths

- I am active and successful in writing scientific publications (which is reflected in my CV).
- I work on various research projects in a very fruitful, tight collaboration with external institutions.
- I develop my own software which can (and is) helpful for the astronomical community.
- In Russia, I was successful in bringing in external funding (two grants).
- I daily read new astronomical publications and apply the new knowledge in my research projects.
- I am successful in organizing research collaborations and groups under my supervision.

Scholarship Areas to Improve

- My skills in writing grant proposals are still weak and I realize that I want to improve them to receive external funding.
- My research collaboration is still limited in the US. I need to expand my circle of potential collaborators for joint grant proposals and for productive research as a whole.
- Regular writing (articles, grant proposals) is not my habit. Persistence in effective writing is what I want to improve.

Teaching and Mentorship Strengths

- I have a wealthy experience of teaching on my mission, in the MTC, and in Church in general.
- I provide effective mentoring of students. Under my supervision they are able to write their own scientific publications and participate in astronomy conferences at the beginning of their research projects.
- As a teacher, I prepare intuitively understandable presentations which highlight the main take-aways of my lectures.
- I can offer various projects to my students. I engage them in real research by providing interesting topics with a benefit of scientific publication in a good journal.
- I encourage my students to be (proa)active right at the beginning of their study at BYU.

Teaching and Mentorship Areas to Improve

- Prior to BYU I had no significant experience in teaching. Moreover, the educational system in Russia (and in Europe in general) differs from the US system, especially in BYU. I will need to learn and apply new teaching practices to become an efficient teacher.
- I need to plan my group meetings more thoroughly and on a regular basis.
- Sometimes I feel that my students need more care, so I should plan on spending more time working with them.

Citizenship Strengths

- I have served as a reviewer of many research papers, master and PhD theses, grant proposals etc. This service helps me grow as a scholar and improve my style of writing, research skills, and critical assessment of myself.
- I interact with my colleagues and am willing to serve them in any aspects: collaboration, interdisciplinary study, reviewing paper and grant proposal drafts, serving on a committee etc.

Citizenship Areas to Improve

- I need to learn more on how my skills and talents can be used at BYU: serving on committees, contributing to the mission of the department and the University.
- Sometimes I feel shy to take a more active role. I understand that I am committed to being an active member of my department and play an active role in building and strengthening the department, the college and the University. For that, I should improve my communication skills and develop collegiality.

My professional skills and competencies

- Programming
- Data analysis
- Observing at telescopes
- Brainstorming
- Collaborating
- Diligence
- Research
- Tolerance for disagreement
- Work ethic
- Teamwork
- Responsibility
- Decision making
- Leadership
- Problem solving
- Organizational skills
- Results orientation
- Project and task management
- Continuous learning

My professional interests

- Extragalactic astronomy
- Milky Way
- Interstellar medium
- Paleoastronomy and Archeoastronomy
- Data science
- Statistical analysis

My professional opportunities at BYU

- Observational time on the ARC 3.5m telescope (bought for BYU)
- Access to powerful computational resources (supercomputer)
- BYU West Mountain Observatory for my regular observations (including deep photometry)
- BYU Planetarium for interactive presentations

2. LONG-TERM PLAN AND GOALS FOR 2021-2024

My main goal is to obtain Continuing Faculty Status at BYU.

Scholarship Goals

The organizing framework of my program of scholarship is built on the general theme of Galaxy Formation and Evolution. It is based on both the observational (spectroscopic and photometric analysis of observations from small, modest and large telescopes, including HST and JWST) and theoretical (simulations) blocks.

- My main research topic for these three years is Low Surface Brightness Universe which includes the following projects:
 - Galaxies with polar structures in deep imaging (2022-2023)
 - Low surface brightness features around edge-on galaxies (2023)
 - Study of the spiral structure of galaxies using deep optical observations (2023-2024)
- Create my research group (10 undergrads and 2 grads) by the end of 2022.
- Publish two papers as the main author and two papers where the first authors are my students (every year).
- Regular participation in AAS meetings and astronomical conferences (at least 2/yr).
- Establish a network with scholars and professionals at other institutions all around the US to build new effective collaborations.
- Apply for external funding (NSF, NASA) every year.

Teaching and Mentorship Goals

- Prepare interesting and effective projects for students to learn the material and feel like real scholars in all courses I teach (Physics 127, 529, 727). The outcome should be publishable.
- Find my style of teaching by practicing different methodologies and approaches learned from BYU and AAPT workshops and books on improving college teaching.
- Improve my teaching ratings to meet the expectations of the department, college, and the University by the next annual stewardship interview in 2023.
- Become a thoughtful and inspiring mentor for my students through efficient group meeting and personal visits. Learn how to create warm atmosphere for fruitful studying in both class and my research group.

Citizenship Goals

- Regularly attend department, college and university meetings and actively engage with my colleagues through informal discussions, “brown bags” and lunches. Visit with my colleagues to help me know more about them, the courses they teach, and ask for a piece of advice to improve different aspects of my teaching, citizenship, and scholarship.

- Be actively engaged in service on committees, panels, boards, etc. Be open to share my ideas, suggestions, and constructive criticism.
- Active participation in the intellectual life of the department, college, and university. Learn how to use my skills and talents to support the unique mission of BYU.
- Help with outreach and Planetarium shows. Help with strengthening the reputation of BYU through my service.
- Continue reviewing scientific publications (3/yr), theses, grant proposals etc.

3. SHORT-TERM GOALS FOR FALL 2022

Scholarship Plans

- Publish three papers (as the first author):
 - August: The distribution of dust in edge-on galaxies: I. The global structure (+ my BYU students),
 - September: UGC 4599: HERON reveals a 40 kpc spiral structure in a Hoag's Object Analog,
 - October: The number of polar-ring galaxies is significantly underestimated? (+ my BYU students).
- Using ARC 3.5m, WMO and [REDACTED] (California) telescopes, obtain observations for a sample of Galactic cirrus and galaxies which demonstrate low surface brightness features around them (Q3 and Q4). Publish most interesting cases on BYU physics & astronomy website.
- Create my research group: 10 undergraduate and 2 graduate students. Each research project must be published in the end. Each student should present at an astronomical conference. [REDACTED] and [REDACTED] should present at AAS #241.
- Scheduled publications of my students:
 - [REDACTED] (first author) and [REDACTED] "The comparison of the general structural properties of the Milky Way with other galaxies"
 - [REDACTED] "Galaxy polar structures in deep optical images"
- Apply for a NSF grant (November).
- Read "Publish & Flourish" by Tara Gray and spend 30 min/day on writing.

- Present at an AAS meeting and another big astronomy conference.
- 30 min/day to read new pre-prints on ArXiv.
- Establish new collaborations (University of Utah, New Mexico State University, etc.).
- Collaboration with [REDACTED] (BYU) on dust radiative transfer modelling using FitSKIRT.
- New habit of writing every day for 30 min (reflected in my daily schedule!).

Teaching Plans

- Re-organize my Physics 127 course: new Syllabus (implement ideas from the Effective Teaching workshop session), new textbook (*At Play in the Cosmos* instead of *OpenStax Astronomy*), new proactive homework assignments, new efficient Planetarium and physics demos.
- In this semester, I'll be working on improving my student ratings on "Explained concepts effectively", "Well organized", and "Opportunities for student involvement".
- Record pre-class videos and stimulate active discussion before, in and after class. Refocus my class on pushing critical thinking and problem solving, not just conveying the material.
- Read these two books: "Teaching Tips" by Wilbert McKeachie, "Tools for Teaching" by Barbara Davis and try *five* different teaching approaches this semester.
- Practice new teaching approaches which were discussed at the last AAPT New Faculty Workshop. e.g. Think-Pair-Share and Just-in-Time teaching.
- Perform self-evaluation of my teaching after every unit.

- Ask for mid-term feedback from the students and use help from CTL (SCOT).
- Observe a colleague's teaching and invite a colleague to observe mine. Discuss with each other what we are learning and make necessary adjustments.
- Reflect a love of God, a commitment to keeping His commandments, and loyalty to the Church through sharing my personal spiritual experience and testimony. Memorize the names of my students and reflect vivid interest, care, and support.
- Provide free help sessions (Zoom and in person), write encouraging e-mails (especially to those students who are falling behind and meet with them to discuss how they can improve).
- Collect ideas, observations, and new assignments for a pilot (new) GE Physics 127 in fall 2023. Develop ways to evaluate the effectiveness of my teaching and the achievement of student learning.

Citizenship Plans

- Active service on Computational Lab committee: suggestions, questions, comments. Author for Physics 230: learn Mathematica and implement several ideas on how to improve the course.
- Serve on the Undergraduate Committee: advise new courses, plan new GE courses, mentor assigned students.
- Implement several astronomy assignments in computational labs: Physics 230, 330 and 430.
- Serve as a coordinator and representative in the ARC consortium: learn how select proposals, coordinate BYU observations on the ARC 3.5 telescope, and induce publications based on ARC data.
- Serve as a reviewer of astronomy publications (at least three) and bachelor and master theses.
- Review grant proposals of my colleagues.
- Assist in organizing an online conference on edge-on galaxies in 2023 (planned).

- Collaborate on interdisciplinary scholarship with my new research project in archeo/paleoastronomy (several students will be engaged).
- Collaborate on several scholarship projects with Dr. [REDACTED] (and his graduate student [REDACTED]): dust attenuation in galactic AGN tori, using WMO to monitor AGNs and low surface brightness features around early-type galaxies in the context of the formation of their supermassive black holes during the major merger events.
- Serve as a chair of sub-committee on new GE Physics 127 for the next year. Develop our strategy on how to change the course according to the new GE requirements and expectations.

4. THE RELATIONSHIP BETWEEN INDIVIDUAL GOALS AND DEPARTMENT AND UNIVERSITY ASPIRATIONS AND NEEDS

Department aspirations and needs

The mission of the Department of Physics and Astronomy is to assist individuals in developing their potential as scientific leaders innovators and disciples of Jesus Christ. That assistance should help students become independent learners as they master physical laws discover scientific and other knowledge of real consequence and more deeply appreciate our Creator's universe.

- Focus my students on the development of critical thinking and problem solving.
- Teach by the Spirit to help them grow both intellectually and spiritually.
- Encourage students to interact with the broader community through publications and conference presentations.
- My students should be involved in research projects which are new and impact and attract the attention of communities of scholars. For that, I expect them to publish in highly-regarded journals and give presentations at astronomy meetings and conferences.
- My research should have external fund support. My goal is to write highly-ranked professional proposals to receive external funding and engage more undergraduate and graduate students in my research.
- Be collaborative - with my students, other faculty and external researchers.
- Seek for opportunities to serve my students and unite with colleagues to solve problems of common concern. Serving in the CoLa committee. Serving as a reviewer for journals. Promoting the understanding of science in the broader community by sharing the wonders of our Universe.

University aspirations and needs

Support and be part of the unique mission of Brigham Young University

- Participation in university meetings, forums and devotionals.
- Live according to the highest standards of conduct, honor code, dress and grooming standards and have a valid temple recommend.
- Provide Gospel oriented teaching - share versus from the Scriptures, my personal spiritual experience and bear my testimony. Show them how to see the connection between the Gospel and science.
- Provide education that is spiritually strengthening, intellectually enlarging, character building, and leading to lifelong learning and service.

Engage in high quality citizenship

- See *Citizenship*

Engage in high quality teaching

- See *Teaching and Mentorship*

Engage in high quality scholarship

- See *Scholarship*

5. RESOURCES NEEDED TO ACCOMPLISH THE PROFESSIONAL GOALS

Budgetary support: As described in my startup plan.

Equipment: Observational time on the APO ARC 3.5m telescope and the 0.8m WMO telescope

The resources are sufficient to accomplish my professional goals.

6. THE FACULTY MEMBER'S ACTIVITIES AND ACCOMPLISHMENTS SO FAR IN ACHIEVING THE GOALS

Teaching

- My first Fall 2021's Physics 127 class went relatively well. My main goal for the past semester was to find my own style of teaching by practicing many different teaching

techniques I had studied during two last AAPT New Faculty Workshops. Although professors who teach/taught this class provided all materials for me, I decided to prepare my own slides and assignments (quizzes, homework, exams) to make my teaching more effective and free.

At the beginning I experienced some technical difficulties with the iClicker Cloud for my in-class quiz sessions. I decided not to use it any more. My class was divided into 4 units, and after the first one I asked my students to give their feedback via a Google form survey. This helped me a lot to refocus my attention to the students needs. In addition, I asked two faculty () to observe my teaching and give their feedback. As a result, it helped me make my class discussion more effective and engage as many students as possible. Also, I realized that I would like to use the Planetarium and physics demos in a better way. Planetarium demos must illustrate the material I teach and make my class more interesting and interactive. Also, there were some problems with grading my home assignments which was a responsibility of one of my TAs, but due to a significant delay, I had to grade three weeks myself. The free textbook I used for this semester was too detailed for a GE class, so I decided to use a different textbook for my next Fall semester. Overall, since this was my first teaching experience at BYU and most of the things were completely new for me, I evaluate my progress as good. My student rating 3.9/5 is slightly lower than the average 4.4 but it will definitely improve next semester.

- To improve my teaching, I attended two AAPT New Faculty Workshops in the past Summer and Fall.

- Also, I observed teaching of my colleagues: ().

- I attended all BYU New Faculty Series and pre-CFS meetings.

Scholarship

- In terms of papers, all of my goals were met. My Milky Way paper (<https://ui.adsabs.harvard.edu/abs/2021MNRAS.507.5246M/abstract>) became my first BYU paper. In total, I authored and co-authored 10 publications in peer-reviewed highly ranked astronomical journals, 6 of which were written under my direct supervision. We have published three papers in the framework of my Russian grant, one paper is submitted and 5 papers are in preparation (with the participation of my (co-mentored) BYU undergraduate student ()) and should be published this year.

- My new research group at BYU consists of 6 (two of them joined recently and are not mentioned in this report) undergraduate students and two potential future graduate (they have applied to BYU) students from BYU Idaho. Also, one student (I

am his co-advisor) is involved in a Russian research grant and is included in a submitted publication to MNRAS.

- My Physics 127 students participated in research projected aimed at selecting edge-on galaxies from an automatically pre-selected sample of 150,000 galaxies. They went through 130,000 galaxies and helped us remove non-edge-on galaxies from the sample. We will thank them in Acknowledgement of our future paper.

- At the moment, two of my students (one of them is my RA) work on a comparative analysis of our Galaxy with external galaxies - we plan to submit a publication on this matter by the end of the year.

- Despite the pandemic, I co-authored 9 oral and 1 poster presentations at the VAK-2021 astronomy conference in Russia.

- Although I have not applied for a research grant, I've been actively working on a proposal.

- I attended Annual Scholarship Workshop "Applying the Ten Steps of Publish & Flourish" by Tara Gray.

- To advertise my research, I presented my research projects at Research Night for undergraduate (November 9) students and Graduate Program Virtual Open House (November 16).

Altogether, while a few papers are still in progress, I did make significant research progress in 2021.

Citizenship

- I serve on the Computational Lab Committee where I add machine learning assignments related to astronomy. Several assignments have been prepared. The total number of hours I spent serving in this committee is 5.

- I helped with the department booth during the Major's Fair on October 13.

- On November 19-20, I visited BYU Idaho where I gave a talk for the students and faculty. I advertised our department and my research projects and recruited potentially new graduate students.

- I regularly update my Python package IMAN with tons of useful routines for doing surface photometry of galaxies. This package is publicly available:
<https://bitbucket.org/mosenkov/iman> new.

- I voluntarily taught 6 lectures of Physics 529 in the Winter of 2021.

- I presented at Research Development's Faculty Research Networking Event on August 24 where I could discuss interdisciplinary research with my colleagues from other departments. The title of my talk was "Connecting the Sky and the Earth".

- Part of my interview on our ARC 3.5m telescope observations is published in Daily Universe: <https://universe.byu.edu/2021/10/29/byu-students-and-professors-captured-astronomical-images-in-new-mexico-observatory/>