

1. Raziskovalna organizacija (*Research organisation*):

Univerza v Ljubljani, *Fakulteta za matematiko in fiziko*

2. Ime in priimek mentorja (*Name and surname of a mentor*):

prof. dr. Tomaž Zwitter

3. Področje znanosti iz šifranta ARRS (*Primary research field*):

1.02.03 - Naravoslovno-matematične vede / Fizika / Astronomija

4. Kontaktni e-naslov mentorja (*Contact of a mentor*):

tomaz.zwitter@fmf.uni-lj.si

5. Kratek opis programa usposabljanja (*Short description of the program*):

SLO

Kandidat/ka bo raziskoval na področju astrofizike, cilj je izboljšati razumevanje strukture in razvoja naše Galaksije kot ene tipičnih galaksij v vesolju z združevanjem rezultatov izjemno obsežnih in raznovrstnih pregledov neba, pri katerih sodelujemo. Septembra letos bo satelit Gaia Evropske vesoljske agencije javno objavil oddaljenosti in lastno gibanje prvega dobrega milijona zvezd. Nato bodo v enoletnih razmakih sledile objave popolnih prostorskih in kinematičnih informacij za več kot milijardo zvezd naše Galaksije. Tako bo enkrat za vselej rešeno vprašanje razdalj v vesolju. Vendar Gaia ne zmore vsega: tekoča spektroskopska projekta Galah v Avstraliji in Gaia-ESO v Čilu sta na dobri poti določanja podrobne kemične sestave zvezd: prvi meri zastopanost kar 28 različnih elementov in je doslej opazoval že 300.000 zvezd, drugi s teleskopom VLT opazuje preko 100.000 zvezd, ki so pretemne za spektroskop na krovu satelita Gaia. To odpira povsem nova obzorja: (1) iskanje in preučevanje prvih zvezd v vesolju (od lani vemo, da so nekatere zvezde, ki pripadajo drugi vesoljski generaciji zvezd, še vedno tu), (2) iskanje sester našega Sonca (zvezd, ki so se rodile v isti kopici), (3) iskanje in preučevanje zvezd v kratkotrajnih obdobjih zvezdnega razvoja, (4) mnogodimenzionalno dinamično preučevanje medzvezdne snovi in nastajanja novih zvezd, (5) preučevanje fizikalnih lastnosti zvezdnih parov in trojk, tudi takih s planeti, (6) raziskovanje, ali se obstoj Zemlji podobnih planetov zrcali v kemični sestavi zvezde, pa še in še.

V Ljubljani aktivno sodelujemo pri misiji Gaia, v projektih Galah ([galah-survey.org](http://galah-survey.org)), Gaia-ESO ([gaia-eso.eu](http://gaia-eso.eu)) in RAVE ([rave-survey.org](http://rave-survey.org)) pa vodimo obdelavo podatkov in skrbimo za odkrivanje, klasifikacijo in fizikalno raziskovanje neobičajnih tipov zvezd. Zato dostopa do tako številnih in kvalitetnih podatkov še v fazi testiranja in torej pred javno objavo nimajo študentje nikjer drugod, kam točno se bo na valu teh vznemirljivih možnosti usmeril doktorat pa je seveda stvar pogovora.

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The research is in the field of astrophysics. The goal is to make advances in our understanding of the structure and evolution of our Galaxy as one of the typical galaxies in the Universe by joining results from extensive and diverse sky surveys which we are contributing to. This September Gaia mission of the European Space Agency is expected to publish distances and proper motions for over a million stars. This first public data release will be followed by new releases in one year intervals which will contain complete spatial and kinematic information for over a billion stars in our Galaxy. So the question of distances in the Universe will be solved once and for all. But Gaia cannot do everything: the ongoing spectroscopic projects Galah in Australia and Gaia-ESO in Chile are on their way to provide a detailed picture of stellar chemistry: the former measures abundances for 28 chemical elements and already obtained spectra of 300,000 stars; the latter uses the VLT telescope to observe over 100,000 stars which are too faint for the on-board spectrograph of Gaia. This opens entirely new horizons: (1) identification and study of the first stars in the Universe (from last year we know that some of the stars belonging to the second generation of stars in the Universe are still around), (2) search for Solar siblings (stars which were born in the same cluster as our Sun), (3) identification and study of properties of stars which are in short-lived phases of stellar evolution, (4) building of a multi-dimensional dynamical picture of interstellar matter and of stellar nurseries, (5) physical studies of binary and triple stars, including the ones with planets, (6) study of a correspondence of chemical properties of a star with existence of Earth-like planets around it, and much more.

In Ljubljana we are actively participating to the Gaia mission. In projects Galah ([galah-survey.org](http://galah-survey.org)), Gaia-ESO ([gaia-eso.eu](http://gaia-eso.eu)) and RAVE ([rave-survey.org](http://rave-survey.org)) we are responsible for data reduction and for identification, classification and physical characterisation of unusual types of stars. So we have a unique access to these prestigious data sets already in the testing phase, i.e. before their public release. Given the many exciting possibilities it is of course a matter of discussion what exactly will be the topic of the PhD.