

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet:	Palinologija
Course title:	Palynology

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Primerjalni študij idej in kultur, doktorski študij 3. stopnje	Arheologija med Jadranom in Donavo	Brez letnika	/
Comparative Study of Ideas and Cultures, doctoral study 3 rd cycle	Archaeology between the Adriatic and the Danube	Not specified	/

Vrsta predmeta / Course type

splošno izbirni / general elective

Univerzitetna koda predmeta / University course code:

P089

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje work	Druge oblike študija	Samost. delo Individ. work	ECTS
20	10				150	6

Nosilec predmeta / Lecturer:

[doc. dr. Maja Andrič](#)

Jeziki /

Predavanja / Lectures: slovenščina, angleščina / Slovenian, English

Languages:

Vaje / Tutorial: /

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:

Za vključitev v delo ni posebnih pogojev. Priporočljivo je vsaj pasivno znanje nemškega, angleškega in italijanskega jezika

Prerequisites:

There are no specific prerequisites. At least a passive knowledge of German, English, and Italian is recommended

Vsebina:

S pomočjo peloda, ki se je v preteklosti odlagal na paleoekoloških (jezera, močvirja) in arheoloških najdiščih na vlažnih tleh lahko rekonstruiramo razvoj rastlinstva v različnih arheoloških obdobjih.

Študenti in študentke se bodo seznanili z:

1. Osnovnimi palinološkimi raziskovalnimi metodami:

- ohranjenost peloda in tafonomija,
- izbira najdišča in vzorčenje,
- shranjevanje in laboratorijska priprava vzorcev,
- identifikacija peloda in izdelava pelodnega diagrama,
- datiranje,

Content (Syllabus outline):

Pollen, which has been deposited in palaeoecological (lakes, swamps) and archaeological sites on wet soils, can be used to reconstruct the development of vegetation in different archaeological time periods.

Students will get acquainted with:

1. Basic palynological research methods:

- the preservation of pollen and taphonomy,
- selection of study sites and sampling,
- storage and laboratory preparation of samples,
- identification of pollen grains and plotting pollen diagram,
- dating,

- multidisciplinarne raziskave in sodelovanje z drugimi vedami.

2. Razvojem kvartarne vegetacije v Sloveniji / Evropi s poudarkom na poznem glacialu in holocenu ter človekovem vplivu na okolje.

Specifične teme bodo izbrane za vsakega študenta oz. študentko posebej, po potrebi v sodelovanju z ostalimi predavatelji in predavateljicami ali mentorji oz. mentoricami in prilagojene njegovim/njenim raziskovalnim željam in temi doktorske disertacije. Nabor raziskovalnih tem lahko vključuje:

- Paleoekologija: dolgoročne spremembe okolja in okoljski procesi, vpliv klime, ekoloških dejavnikov in človeka na sestavo vegetacije
- Kvartarna vegetacija: razvoj in sestava nekdanjega gozda, požarni režimi in vpliv človeka na vegetacijo in odprtost pokrajine v različnih arheoloških in geoloških obdobjih, migracije kvartarnih drevesnih vrst
- Paleoekonomija: prehranske navade in gospodarstvo v arheoloških obdobjih
- Paleoklimatologija: kvartarna klima, primerjava ledenih, globokomorskih in kopenskih paleokoljskih arhivov, vpliv podnebnih nihanj na vegetacijo
- Paleolimnologija: sedimentacijski procesi, nekdanje hidrološke razmere
- Varstvo narave: uporaba znanja o dolgoročnih spremembah okolja pri načrtovanju naravovarstvenih ukrepov in renaturacije

- multidisciplinary research and cooperation with other disciplines.

2. Quaternary vegetation in Slovenia/Europe, with an emphasis on Lateglacial/Holocene and human impact on the environment.

Specific topics will be selected for each student (in collaboration with other lecturers/mentors, where appropriate) and adapted to his/her research interests and the theme of doctoral thesis. They may include:

- Palaeoecology: long-term changes of the environment and ecological processes, the impact of climate, ecological factors and people on the vegetation
- Quaternary vegetation: the composition and development of forests, fire regimes and human impact on the vegetation and landscape openness in various archaeological and geological time periods, migrations of Quaternary tree taxa
- Palaeoeconomy: food and economy in archaeological time periods
- Palaeoclimatology: Quaternary climate, comparison of ice, marine and terrestrial palaeoenvironmental archives, the influence of climatic fluctuations on the vegetation
- Palaeolimnology: sedimentological processes, palaeohydrological conditions
- Nature protection: knowledge about long-term environmental changes can help us to better plan nature protection/restoration measures

Temeljni literatura in viri / Readings:

Osnovna literatura:

- Andrič M., Tolar T., Toškan B. 2016. Okoljska arheologija in paleoekologija: palinologija, arheobotanika in arheozoologija. Založba ZRC in Inštitut za arheologijo ZRC SAZU, Ljubljana.
- Moore P. D., Webb J. A. & Collinson M. E. 1991. Pollen Analysis. Blackwell Science, Oxford.
- Faegri K., Iversen J. 1989. Textbook of Pollen Analysis. The Blackburn Press, Caldwell.
- Pearsall D. M. 2000. Paleoethnobotany (A Handbook of Procedures). Academic Press, London.
- Smol J. P., Birks H. J., Last W. M. (eds.) 2012. Tracking Environmental Changes Using Lake Sediments. Kluwer Academic Publishers, Dordrecht.

Identifikacijski ključ / ID keys:

- Moore et al. 1991. (glej zgoraj /see above)

- Reille M. 1992. Pollen et spores d'Europe et d'Afrique du Nord, Laboratoire du Botanique Historique et palynologie, Marseille
- Beug H. J. 2004. Leitfaden der Pollenbestimmung, Verlag Dr. Friedrich Pfeil, München.

Multidisciplinarnе paleookolske raziskave v Sloveniji (izbor):

- Caf N., Sabatier P., Šmuc A., Ogrinc N., Dolenc M., Rapuc W., Potočnik D., von Grafenstein U., Andrič M. 2023. Multi-proxy reconstruction of the Holocene vegetation and land use dynamics in the Julian Alps, north-west Slovenia. *Journal of Quaternary Science* 38(1), 107-122, <https://doi.org/10.1002/jqs.3461>.
- Andrič M. 2020. Maharski prekop, Stare gmajne and Blatna Brezovica settlements and the vegetation of Ljubljansko barje (Slovenia) in the 4th millennium cal. BC, *Documenta Praehistorica* 47, 420-445.
- Feurdean A., Vannièrè B., Finsinger W., Warren D., Connor S. C., Forrest M., Liakka J., Panait A., Werner C., Andrič M., et al. 2020. Fire hazard modulation by long-term dynamics in land cover and dominant forest type in eastern and central Europe, *Biogeosciences* 17, 1213–1230, <https://doi.org/10.5194/bg-17-1213-2020>
- Andrič M., Sabatier P., Rapuc W., Ogrinc N., Dolenc M., Arnaud F., von Grafenstein U., Šmuc A. 2020. 6600 years of human and climate impacts on lake-catchment and vegetation in the Julian Alps (Lake Bohinj, Slovenia), *Quaternary Science Reviews* 227, <https://doi.org/10.1016/j.quascirev.2019.106043>.
- Rapuc W., Sabatier P., Andrič M., Crouzet C., Arnaud F., Chapron E., Šmuc A., Develle A-L., Wilhelm B., Demory F., Reyss J-L., Régnier E., Daut G., von Grafenstein U. 2018. 6600 years of earthquake record in the Julian Alps (Lake Bohinj, Slovenia), *Sedimentology* 65, 1777–1799, doi: 10.1111/sed.12446.
- Feurdean A., Perşoiu A., Tanţău I., Stevens T., Magyari E.K., Onac B.P., Marković S., Andrič M., et al. 2014. Climate variability and associated vegetation response throughout Central and Eastern Europe (CEE) between 60 and 8 ka, *Quaternary Science Reviews* 106, 206–224. <http://dx.doi.org/10.1016/j.quascirev.2014.06.003>
- Lane C., Andrič M., Cullen V. L. in Blockley S. P. E. 2011. The occurrence of distal Icelandic and Italian tephra in the Lateglacial of Lake Bled, Slovenia. *Quaternary Science Reviews* 30, 1013–1018. doi:10.1016/j.quascirev.2011.02.014
- Andrič M., Martinčič A., Štular B., Petek F. in Goslar T. 2010. Land-use changes in the Alps (Slovenia) in the fifteenth, nineteenth and twentieth centuries AD: A comparative study of the pollen record and historical data. *The Holocene* 20(7), 1023–1037. DOI: 10.1177/0959683610369506
- Andrič M., Massafèrro J., Eicher U., Ammann B., Leuenberger M. C., Martinčič A., Marinova E. in Brancelj A. 2009. A multi-proxy Late-glacial palaeoenvironmental record from Lake Bled, Slovenia, *Hydrobiologia* 631, 121–141. DOI 10.1007/s10750-009-9806-9
- Andrič M., Kroflič B., Toman M. J., Ogrinc N., Dolenc T., Dobnikar M., Čermelj B. 2008. Late Quaternary vegetation and hydrological change at Ljubljansko barje (Slovenia), *Palaeogeography, Palaeoclimatology, Palaeoecology* 270, 150–165. doi:10.1016/j.palaeo.2008.09.008
- Andrič M. 2007. The Holocene vegetation development in Bela krajina (Slovenia) and the impact of first farmers on the landscape. *The Holocene* 17 (6), 763–776.
- Andrič M. in Willis K. J. 2003. The phytogeographical regions of Slovenia: a consequence of natural environmental variation or prehistoric human activity? *Journal of Ecology* 91, 807–821.

Članki v revijah:

- The Holocene, Quaternary Science Reviews, Quaternary Research, Journal of Quaternary Science, Palaeogeography, Palaeoclimatology, Palaeoecology, Vegetation History and Archaeobotany, Journal of Archaeological Science

Načrtovanje raziskave in pisanje:

- Booth W. C., Colomb G. G. & Williams J. M. 1995. The Craft of Research. The University of Chicago Press, Chicago.

Cilji in kompetence:

Študenti in študentke se bodo seznanili z osnovnimi palinološkimi raziskovalnimi metodami in pridobili znanja o kvartarnem okolju/vegetaciji v Evropi/Sloveniji ter o gospodarstvu in človekovem vplivu na okolje v različnih arheoloških obdobjih. Usposobili se bodo za sodelovanje med arheologi in palinologi pri multidisciplinarnih raziskavah arheoloških najdišč na mokrih tleh.

Poudarek bo na individualnem raziskovalnem delu študentk in študentov. Obravnavane teme bodo izbrane za vsakega študenta oz. študentko posebej in prilagojene njegovim/njenim raziskovalnim željam in potrebam. Študenti in študentke, katerih glavna raziskovalna tema doktorske disertacije bodo palinološke raziskave, se bodo usposobili za samostojno raziskovalno delo na omenjenem področju.

Objectives and competences:

Students will acquire basic knowledge about palynological research methods, the Quaternary environment/vegetation in Europe/Slovenia, economy and human impact on the environment in various archaeological time periods. They will be qualified to collaborate with palynologists and archaeologists studying archaeological sites on wet ground.

This course will be largely based on specialised and supervised research. The selection of topics will be adapted individually according to student's research interests and needs. Students with palynology as the main topic of their research will be qualified to independently carry out palynological research.

Predvideni študijski rezultati:

Znanje in razumevanje:

Glavni cilj predmeta je usposobiti študentke in študente za razumevanje okoljskih procesov in vzrokov za spremembe nekdanjega in današnjega okolja. Pridobljena znanja jim bodo omogočila kritično branje, analizo in interpretacijo znanstvene literature, zavedanje možnosti in omejitev različnih paleoekoloških raziskovalnih metod in interpretativnih teorij, komuniciranje s strokovnjaki drugih ved ter sodelovanje pri interdisciplinarnih temeljnih in aplikativnih raziskovalnih projektih.

Poleg zgoraj navedenega bodo študenti in študentke, katerih glavna raziskovalna tema bo palinološka raziskava, znali v celoti samostojno izvesti palinološko raziskavo, vključno z izbiro najdišča in vzorčenjem na terenu, laboratorijsko pripravo vzorcev, identifikacijo peloda, analizo in interpretacijo ter objavo rezultatov raziskave.

Intended learning outcomes:

Knowledge and understanding:

After completing the course students will be able to understand the main environmental processes and causes for changes of past and current environment. This knowledge will enable them to critically read, analyse and interpret the literature and be aware of possibilities and limitations of selected research methods and theories. They will be qualified to communicate with experts from other fields of research, and take part in interdisciplinary basic and applied research projects.

In addition to the knowledge/understanding stated above, students specialising in palynological research will be able to independently carry out palynological research (including selection of study site, fieldwork, laboratory treatment of samples, identification of

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pollen grains, analysis and interpretation of the data) and publication of the results.

Metode poučevanja in učenja:

Oblike dela:

- Frontalna oblika poučevanja
- Delo v manjših skupinah oz. v dvojicah
- Samostojno delo študentov
- e-izobraževanje

Metode (načini) dela:

- Razlaga
- Razgovor/ diskusija/debata
- Delo z besedilom
- Proučevanje primera
- "Terenske vaje" (npr. obiski podjetij)

Learning and teaching methods:

Types of learning/teaching:

- Frontal teaching
- Work in smaller groups or pair work
- Independent students work
- e-learning

Teaching methods:

- Explanation
- Conversation/discussion/debate
- Work with texts
- Case studies
- Field work (e.g. company visits)

Načini ocenjevanja:

Krajši pisni izdelki
Končno ocenjevanje (pisni/ustni izpit)

Delež (v %) /
Weight (in %)

50
50

Assessment:

Short written assignments
Final examination (written/oral)

Reference nosilca / Lecturer's references:

- Caf N., Sabatier P., Šmuc A., Ogrinc N., Dolenc M., Rapuc W., Potočnik D., von Grafenstein U., **Andrič M.** 2023. Multi-proxy reconstruction of the Holocene vegetation and land use dynamics in the Julian Alps, north-west Slovenia. *Journal of Quaternary Science* 38(1), 107-122, <https://doi.org/10.1002/jqs.3461>.
- **Andrič M.**, Sabatier P., Rapuc W., Ogrinc N., Dolenc M., Arnaud F., von Grafenstein U., Šmuc A. 2020. 6600 years of human and climate impacts on lake-catchment and vegetation in the Julian Alps (Lake Bohinj, Slovenia), *Quaternary Science Reviews* 227, <https://doi.org/10.1016/j.quascirev.2019.106043>.
- **Andrič M.** 2020. Maharski prekop, Stare gmajne and Blatna Brezovica settlements and the vegetation of Ljubljansko barje (Slovenia) in the 4th millennium cal. BC, *Documenta Praehistorica* 47, 420-445, <https://doi.org.10.4312/dp.47.24>
- Feurdean A., Vannièrè B., Finsinger W., Warren D., Connor S. C., Forrest M., Liakka J., Panait A., Werner C., **Andrič M.**, Bobek P., Carter V. A., Davis B., Diaconu A-C., Dietze E., Feeser I., Florescu G., Gałka M., Giesecke T., Jahns S., Jamrichová E., Kajukało K., Kaplan J., Karpinska-Kořaczek M., Kořaczek P., Kuneš P., Kupriyanov D., Lamentowicz M., Lemmen C., Magyari E. K., Marcisz K., Marinova E., Niamir A., Novenko E., Obremaska M., Pedziszewska A., Pfeiffer M., Poska A., Rösch M., Słowinski M., Stancikaite M., Szal M., Swieta-Musznicka J., Tantau I., Theuerkauf M., Tonkov S., Valkó O., Vassiljev J., Veski S., Vincze I., Wacnik A., Wiethold J., Hickler T. 2020. Fire hazard modulation by long-term dynamics in land cover and dominant forest type in eastern and central Europe, *Biogeosciences* 17, 1213–1230, <https://doi.org/10.5194/bg-17-1213-2020>
- Rapuc W., Sabatier P., **Andrič M.**, Crouzet C., Arnaud F., Chapron E., Šmuc A., Develle A-L., Wilhelm B., Demory F., Reyss J-L., Régnier E., Daut G., von Grafenstein U. 2018. 6600 years of earthquake record in the Julian Alps (Lake Bohinj, Slovenia), *Sedimentology* 65, 1777–1799, <https://doi.org/10.1111/sed.12446>.

- **Andrič M.**, Verbič T., Lomax J., Tolar T. 2017. Človekov vpliv na okolje v prazgodovini : primer z obrežja Ljubljanice pri Špici (Ljubljana) / Embankment of the Ljubljanica River at Špica (Ljubljana) and human impact on the environment in late prehistory. *Arheološki vestnik* 68, 479-498.
- Filipović D., Challinor D., **Andrič M.** 2017. Vinča tell in southeast Europe : multi-proxy palaeobotanical evidence from Late Neolithic levels and the implications for the environment and economy. *Quaternary International* 429, 13-23, <https://doi.org/10.1016/j.quaint.2014.09.059>