

OPINION

by Prof. Mashenka Borissova Dimitrova – IEMPAM-BAS

Regarding: Competition for the academic position of associate professor in the specialty "Anthropology" (01.06.01), Professional direction 4.3 "Biological sciences", announced in State Gazette - SG no. 60/29.07.2022 r. for the needs of the "Anthropology and Anatomy" department of IEMPAM-BAS.

The only candidate in the competition is Silvia Yanakieva Nikolova, assistant professor, from the "Anthropology and Anatomy" department of IEMPAM-BAS. The candidate has presented excellently arranged and complete documentation that fully meets the requirements of the Law for the Development of the Academic Staff and its Regulations.

Silvia Nikolova entered IEMPAM-BAS in 2009 as a biologist with a master's degree in general anthropology, speciality in Biology at the University of St. Kl. Ohridski". In 2011, she obtained an PhD degree in "Anthropology" after defending a thesis on the topic "Anatomical variations of the skull - anthropological characterization and assessment of intersex and bilateral differences". Dr. Nikolova has 72 scientific publications in national and international journals in the field of anthropology and anatomy, 74 participations in scientific forums, 172 noticed citations, most of them in renowned international journals and h-factor 5 according to Scopus. This scientific production, impressive in terms of volume and quality, is the result of thirteen years of research work in cooperation with scientists from IEMPAM, other institutes of BAS and Medical Universities in the country.

The candidate's active project activity makes an excellent impression. She is a participant in 4 projects at the Science Fund of the Ministry of Education and Culture, 2 of which she is the leader of. She is also the head of a project under the Program for the Support of Young Scientists from the BAS. She is a participant in the target group of a project under OP "DHR". Dr Nikolova is a member of the Bulgarian Anatomical Society, the European Anthropological Association and the Federated International Program on Anatomical Terminology (FIPAT) Working Group on Anthropology (TAnthr). She was awarded the reward of the Bulgarian Anatomical Society "prof. D. Kadanov" for high publication activity in the period 2019-2021. In 2016, she received the National Science Fund award for an excellent reported project under the Program for the Support of Young Scientists at the BAS. Her expert work is reflected in 13 submitted reviews for prominent international journals.

In fulfillment of the minimum requirements of the IEMPAM for acquiring the academic title "associate professor" according to Appendix 1 of the Regulations of IEMPAM for the acquisition of scientific degrees and holding academic positions, Dr. Nikolova has 504 points according to indicators A-E at the required minimum (RM) of 430 points distributed as follows:

A1 – PhD thesis – **50 p.** (RM – 50 p.)

C4 – 5 scientific publications equivalent to a habilitation thesis, of which 1 with Q1 and 4 with Q2. – **105 p.** (RM – 100 p.)

D7 – 15 scientific publications in referenced and indexed journals, of which 3 with Q1, 3 with Q2, 7 with Q3 and 2 with Q4. – 264 p.

D8 – Published book chapter in the international publishing house IntechOpen – **15 p.**

Total according to D – 279 p. (RM – 220 r.)

E11 – 35 citations – 70 p. (RM – 60 p.)

The works with which Dr. Nikolova participated in the competition are in prominent international journals such as Journal of Comparative Human Biology, Journal of Legal Medicine, Folia Morphologica, Anthropologischer Anzeiger, Anatomical Science International, Journal of Craniological Surgery, Forensic Imaging, etc. They have a large number of citations, from which 35 citations in journals, referenced and indexed in international databases have been selected for the current competition.

Dr. Nikolova's scientific contributions are related to the study of anatomical variations, taking morphological data from 2D- and 3D-images obtained with modern imaging methods (computed tomography, laser scanning), extracting information from databases using machine learning methods training, evaluating the applicability of digital morphology. These developments are interdisciplinary and aim at introducing computer and information technologies into anthropology.

1. *Study of anatomical variations in the structure of the skull, mandible, postcranial skeleton and cranial sutures.*

Rare cases of absence of the *foramen spinosum* at the base of the skull, in which the middle meningeal artery is replaced by one derived from the ophthalmic artery, have been studied. Potential difficulties at surgery requiring ligation of this artery are discussed. Cases of the occurrence of abnormal intramembranous ossification nuclei, which lead to the appearance of additional bones and atypical division of the cranial vault, have been studied. Criteria have been proposed for the identification of these bones in adults. Single cases of supernumerary bones were also investigated, and the etiology and possible clinical complications were discussed. A number of them have been shown to be the result of a congenital disease affecting intramembranous ossification. A rare combination of bregma and metopism has also been found and hypothesized to be related to the control of bone growth. A critical review of the literature on premature or incomplete closure of the metopic suture from the perspective of frontal pneumatization was performed. A conclusion was made about the influence of early development on these features.

The frequency and laterality of two variations of the mandibular bone - a bipartite condyle and a bone bridge over the mylohyoid sulcus - were investigated. The former has been found to occur in 1% of modern men and occurs during embryonic development or as a result of trauma. For the second, the absence of laterality and gender differences in frequency in modern and medieval osteological series has been shown.

Variations of the suprascapular notch, which provides passage for the suprascapular nerve, have been studied in the postcranial skeleton. No gender differences were found in the medieval population, but interesting rare cases of single and double suprascapular foramen were found to be at risk for suprascapular nerve neuropathies.

A number of interdependencies in cranial suture closure have been identified, including differences in complementary cranial halves that affect the parietal and occipital cranial vaults and lead to erosion of the sella turcica and increased intracranial pressure.

The above contributions are noted by the candidate as "theoretical", but I believe that some of them also have potential applied value, especially in relation to surgical practice, as well as refining the boundary between normal and abnormal.

2. *Contributions related to the use of modern ICT in anthropology for the digitization of morphometric studies and their application for various purposes.*

Validation of digital morphometry methods. Using radiographic images and virtual casts, the influence of skull tilt on the precision of frontal sinus dimensions was evaluated. Caldwell view images have been shown to give the highest measurement accuracy. The reliability of measurements of the skull on 3D-models obtained by laser scanning, as well as the influence of the resolution and texture of the image on the accuracy of the measurement, were investigated. For this purpose, a laborious measurement of the distances and deviations between a number of points at different scanning parameters was carried out. High resolution and texture have been shown to be of great importance in improving accuracy.

These studies verify measurements on digital images obtained with different imaging methods and allow to define approaches to improve their accuracy and reliability.

Development of methods for determining sex, age and facial approximation.

With the use of symbolic and subsymbolic algorithms from machine learning, mathematical models and methods have been developed to determine the biological sex by the linear dimensions and area of the large occipital foramen, the mastoid triangle and the entire skull. The highest accuracy achieved was 96% with a full skull model.

Again, using symbolic and subsymbolic algorithms from machine learning, the extent to which the degree of sagittal suture closure is indicative of age was investigated. It has been proven that the most accurate results are obtained by closing the outer plate along the length of the sagittal suture.

The relationship between soft tissue thickness at different facial points and its dependence on gender, height and body mass index was investigated. A novel approach for the acquisition of a large amount of soft tissue thickness data based on polygonal models with a preset mesh density is proposed, which enables extremely detailed measurements over the entire facial area.

It has been shown that the application of micro-computed tomography in bioarchaeology allows obtaining data on traumas related to the way of life and risks in the early population of our lands.

The above studies (under point 2) are of essential importance for forensic medicine and paleoanthropology.

Conclusion: The materials presented by Dr. Nikolova at the competition show impressive scientometric indicators that outline a brilliant scientific career, both so far and in terms of her future development. Dr. Nikolova's works are at a high professional level with their interdisciplinary focus and the application of modern methods such as imaging, laser scanning, machine learning methods, etc. in anthropological studies. The obtained results are of theoretical importance, but also have a direct applied value in forensic medicine, the clinic and to validate the application of digital analyzes in anthropology. Active research and project activity, as well

as collaboration with scientists from other fields, are a guarantee for future development and growth in science.

On the basis of the above, I strongly recommend to the Honorable Scientific Jury to submit a proposal to the IEMPAM Scientific Cancel to award Silvia Yanakieva Nikolova the academic title of Associate Professor in "Anthropology" (06.01.01), Professional Direction 4.3. Biological Sciences.

09.12.2022

Signature:



/Prof. M. Dimitrova/