Training Underrepresented Students on Craniofacial Research at USC

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ABSTRACT

Background: Underrepresented students from local communities are provided research opportunities in STEM, social sciences, and humanities at the University of Southern California (USC). **Purpose**: Each year, several students from the USC Graduate Initiative for Diversity, Inclusion, and Access (DIA) JumpStart and USC's Science, Technology, and Research (STAR) programs have the opportunity to conduct craniofacial research at the Center for Craniofacial Molecular Biology (CCMB) under the mentorship of the faculty. **Methods**: As part of the training, students learned hands-on research skills, such as harvesting tissue samples from animals and processing samples for various biochemical assays. Using available datasets and tools on FaceBase, students performed morphometric analyses of craniofacial bones. They labeled anatomical landmarks and quantified the size and shape of the craniofacial bones. **Results**: Students learned to organize their findings into a presentation and presented their research posters at research symposia. **Conclusion**: This research opportunity trains and provides underrepresented students in the scientific research pipeline for the STEM workforce.
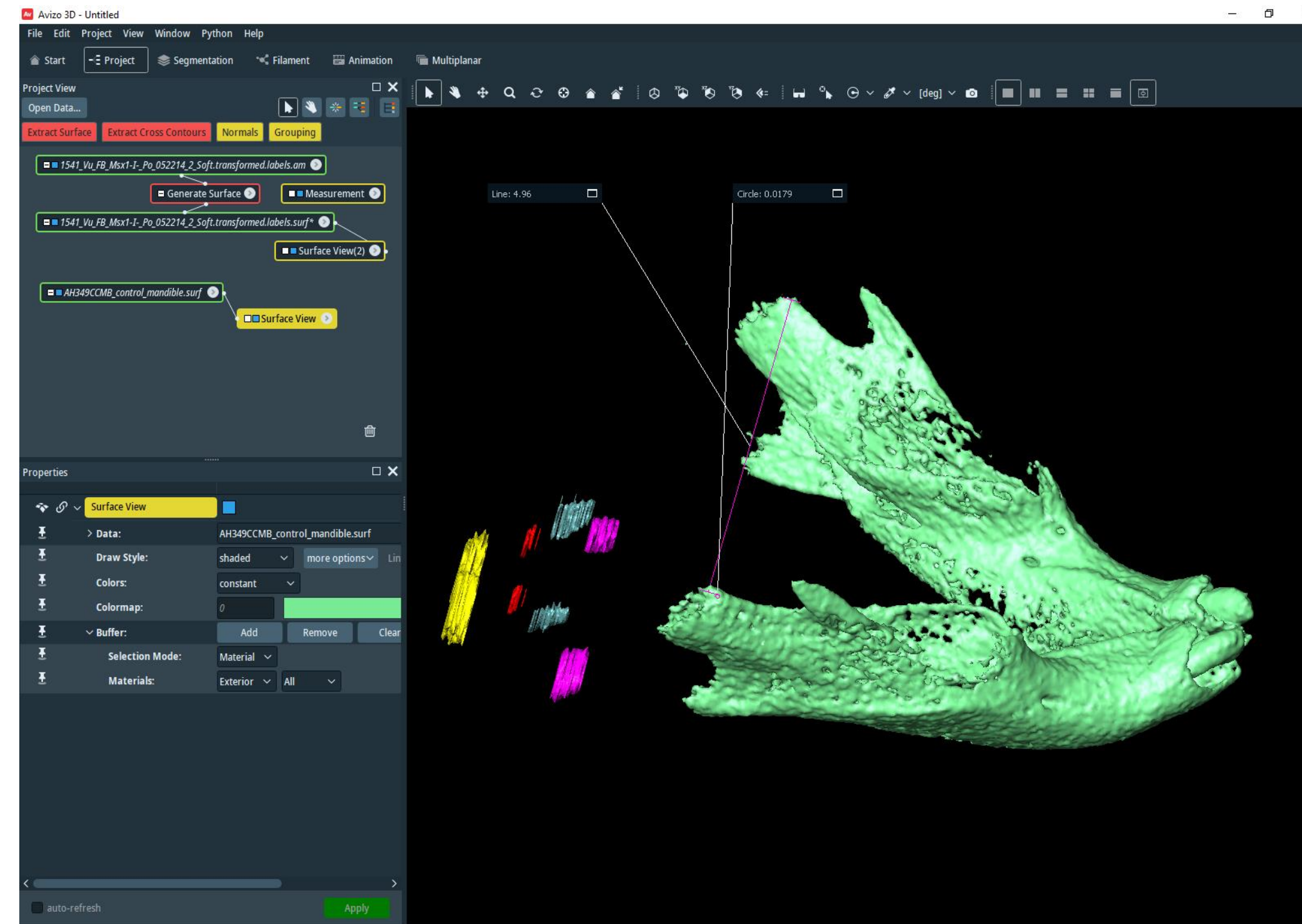
RESULTS

Figure 1 Mouse anatomical navigation tool on Facebase.
https://www.facebase.org/image-nav/mouse/

RESULTS

Figure 2 Students learning morphometric analysis using the Avizo software.

Figure 3 Students' poster presentations at the research symposia.
A&C- Posters from STAR students. D-Poster from Jumpstart students.

RESEARCH TRAINING

Training outline:
- Complete laboratory safety training courses
- Study craniofacial development
- Complete animal training course: mouse genetics/lab animal care and use
- Learn aseptic techniques and cell culture techniques
- Perform mouse tissue collection and processing
- Perform microscopy imaging
- Perform immunofluorescence and histology assays
- Perform microCT morphometric analysis
- Conduct literature review and presentations
- Attend weekly seminars

FUTURE DIRECTIONS

- High school students who completed the STAR program have successfully applied to top-tier Universities.
- DIA JumpStart students who successfully complete the program will have their application fees waived if they apply to USC PhD programs.
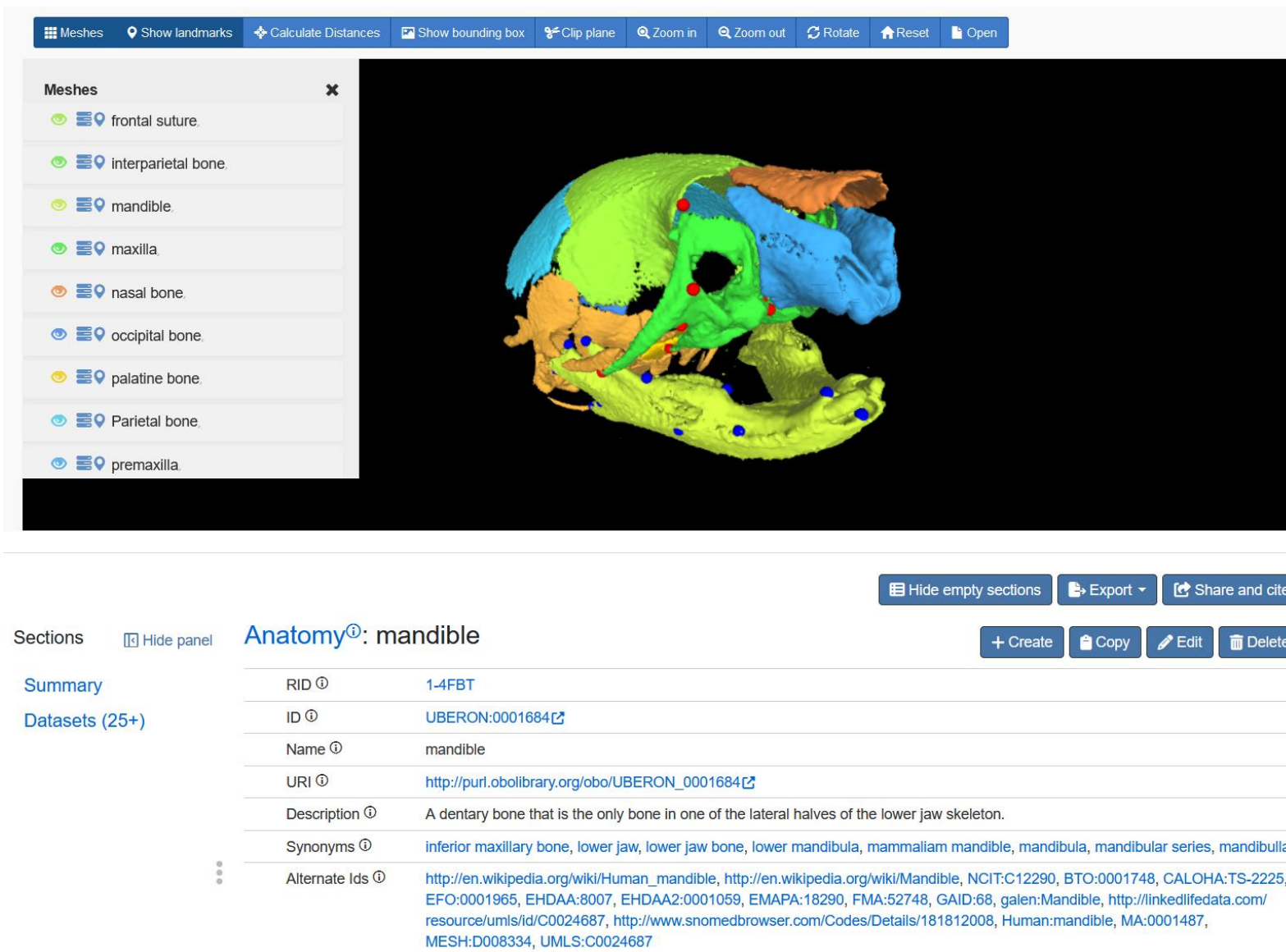
REFERENCES

-Iwata J, Suzuki A, Yokota T, Ho TV, Pelikan R, Urata M, Sanchez-Lara PA, Chai Y. (2014) TGFβ regulates epithelial-mesenchymal interactions through WNT signaling activity to control muscle development in the soft palate. *Development.* 2014 Feb;141(4):909-17. doi: 10.1242/dev.103093. PubMed PMID: 24496627; PubMed Central PMCID: PMC3912833.
-Ho TV, Iwata J, Ho HA, Grimes WC, Park S, Sanchez-Lara PA, Chai Y. (2015) Integration of comprehensive 3D microCT and signaling analysis reveals differential regulatory mechanisms of craniofacial bone development. *Dev Biol.* 2015 Apr 15;400(2):180-90. doi: 10.1016/j.ydbio.2015.02.010. Epub 2015 Feb 23. PubMed PMID: 25722190; PubMed Central PMCID: PMC4385433.
-Samuels BD, Aho R, Brinkley JF, Bugacov A, Feingold E, Fisher S, Gonzalez-Reiche AS, Hacia JG, Hallgrimsson B, Hansen K, Harris MP, Ho TV, Holmes G, Hooper JE, Jabs EW, Jones KL, Kesselman C, Klein OD, Leslie EJ, Li H, Liao EC, Long H, Lu N, etc… Yuan Y, Chai Y. (2020) FaceBase 3: Analytical Tools and FAIR Resources for Craniofacial and Dental Research. *Development.* 2020 Sep 21;147(18):dev191213. doi: 10.1242/dev.191213. PMID: 32958507; PMCID: PMC7522026.