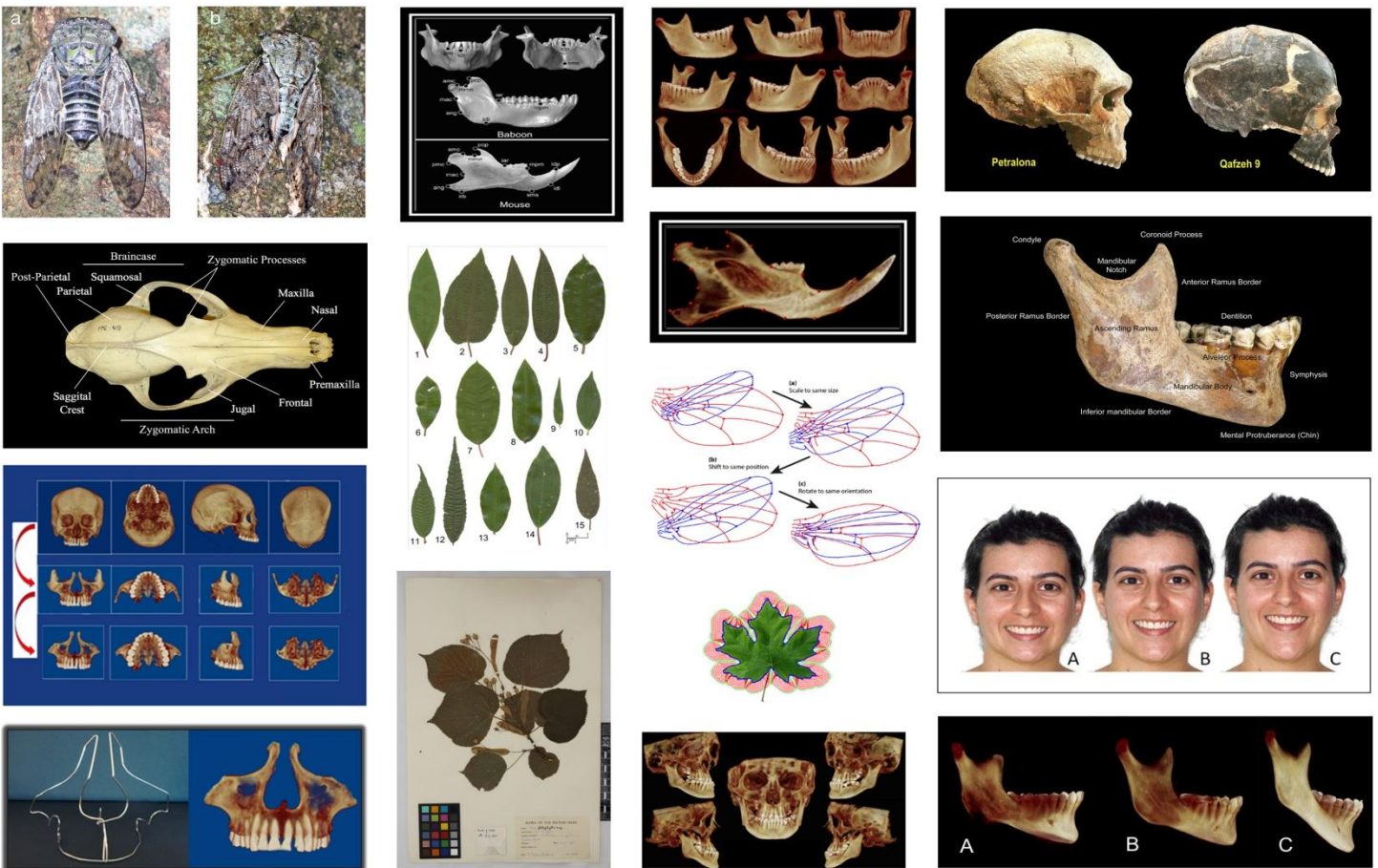# Biological Shape Analysis

Agenda of the 6th International Symposium on Biological Shape Analysis

June 25-27, 2019

Nausicaa Aquarium, Boulevard Sainte-Beuve,

Boulogne sur mer, Hauts de France, France

Organizers:

H. Iwata, H. Tatsuta, S. Ninomiya, P. E. Lestrel, Wei Guo,

Koji Noshita, W. Moon, J. Paliwal and Kelig Mahe

The 6th International Symposium on Biological Shape Analysis

Nausicaa Aquarium, Boulevard Sainte-Beuve,
Boulogne sur mer, Normandy, France

Program

Tuesday Afternoon, June 25

11:00 AM	Registration
1:15 PM	Opening remarks: PETE E. LESTREL

Tuesday Afternoon, June 25
Session A: Keynote address, wavelets, fractals, quantitative analyses, etc.
Session Chair: Haruki Tatsuta

1:30 PM	1	O1	**Keynote Address: NORMAN MacLEOD** **Beyond Geometric Morphometrics: A Case Continuing the Development of Quantitative Morphological Analysis**
2:30 PM	2	A1	**NELE NAUWELAERS, MARK D. SHRIVER, and PETER CLAES** **Multiresolution Wavelet Decomposition of 3D Meshes for Facial DNA-based classification**
3:00 PM			**Break**
3:30 PM	3	A2	**BINGJUE LI, ANDREW P. MURRAY, DAVID H. MYSZKA, and GERARD SUBSOL** **2D Shape Analysis of Mandible Outlines in Fossil Hominins Utilizing synthesis Techniques from Planar Mechanism Design**
4:00 PM	4	A3	**HIROYOSHI IWATA, GOSHI SASAKI, YUSUKE TODA, YOSHIHIRO OMORI, YUJI YAMASAKI, HIROKAZU TAKAHASHI, HIDEKI TAKANASHI, MAI TSUDA, HIROMI KAJIYA-KANEGAE, HISASHI TSUJIMOTO, AKITO KAGA, MIKIO NAKAZONO, TORU FUJIWARA** **Remote and proximal sensing of drought stress in soybeans**
4:30 PM	5	A4	**JOHN RUSS** **The Quest to Describe Object Shape: Form, Angularity and Roughness**
From 5 to 6:30 pm			**Social Mixer**

Wednesday Morning, June 26
Session B: Flower imaging processing, fungal infections.
Session Chair: Norm MacLeod

10:00 AM	6	B1	**JIRI NEUSTUPA and KATERINA WOODARD** **Morphometric decomposition of matching symmetry in outline shapes of petals within flowers lacking the adaxial-abaxial differentiation**
10:30 AM	7	B2	**S. KIRIE, C. PRADAL, K. NOSHITA, P. NEVEU, and H. IWATA** **Constructing a Semantic System for Flower Form Description**
11:00 AM			**Break**
11:30 AM	8	B3	**SANDEEP THAKUR, CHYNGYZ EERKINBAEV, AND JITENDRA PALIWAL** **Monitoring fungal infection in wheat spikes using visible-to-near infrared imaging**
12:00 PM			**Lunch**

Wednesday Afternoon, June 26
Session C: General Insect studies
Session Jitendra Paliwal

2:00 PM	9	C1	**YU KAZIWARA and HARUKI TATSUTA** **Evolutionary considerations for the divergence patterns of reproductive traits and speciation in *Entoria* spp.**
2:30 PM	10	C2	**DAISUKE SATOMI, WATARU OGASA, HIROSHI TAKASHIMA, SYOTA FUJIMOTO, CHIHARU KOSHIO, SHIN-ICHI KUDO, YASUOKI TAKAMI and HARUKI TATSUTA** **Morphological variation and scaling relationships in the sexually dimorphic traits in the false blister beetle *Oedemera sexualis* (Coleoptera: Oedemeridae)**
3:00 PM			**Break**
3:30 PM	11	C3	**NORMAN MacLEOD, BEN PRICE, ZACKARY STEVENS, MARTIN HALL, APRIL WARDHANA, RUNGTP WONGLERSAK, and DIANA PERCY** **Behavioral, Ecological and Biogeographic Inferences from Morphometric Data: Analyses of Insect Wings**

Session E: Otolith analysis, Ichthyology, etc.
Session Chair: Pete Lestrel

4:00PM	12	E1	**GIZEM AKKUS, SHARIF JEMAA, ALI CEMAL GUCU, PAUL MARCHAL, PIERLUIGI CARBONARA, MAHMOUD BACHA, RACHID AMARA, BRUNO ERNANDE, CLAIRE SARAUX, AND KÉLIG MAHÉ** ***Differentiation of the Anchovy (Engraulis encrasicolus) Stocks from Atlantic Ocean to the Black Sea by using Otolith Shape Analysis***
7:00 PM			**Symposium Dinner**

Thursday Morning, June 27

Visit of Nausicaa
  ➢ **9:45 am and 11:15 am (backstage visit)**

Thursday Afternoon, June 27
Session D: Seahorses, human studies, etc.
Session Chair: Hiro Iwata

3:00 PM	13	D1	**SHARON ROSE TABUGO** **A Tale of Seahorses in Mindanao, Philippines: Fractal Analysis**
3:30 PM	14	D2	**Md. ABDUL WADOOD, M REZAUL KARIM, PETE E. LESTREL, and Md. GOLAM HOSSAIN** **Prevalence and associated factors of anemia among mothers in reproductive age and their under-five children in Bangladesh: a household study**
4:00 PM			**Break**
4:30 PM	15	D3	**PETE E. LESTREL and CHARLES A. WOLFE** **A Shape Difference Index for the Numerical Description of the biological form**
5:00 PM	16	D4	**MASAMI ISHIHARA[1], TAKAHIRO SUGI[1], SOHEI SATO[1], and PETE E. LESTREL[2]** **The evaluation of the Bouba/Kiki figures: An approach to analyze these shapes using a method of semantic differential (SD) and Fourier descriptors**
5:30 PM			**General Discussion and Closing Remarks**

2D SHAPE ANALYSIS OF MANDIBLE OUTLINES IN FOSSIL HOMININS UTILIZING SYNTHESIS TECHNIQUES FROM PLANAR MECHANISM DESIGN

BINGJUE LI[1], ANDREW P. MURRAY[2], DAVID H. MYSZKA[2], GERARD SUBSOL[3]

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Abstract. 2D shape analysis of anatomical structures in fossil hominins using morphometric methods is one tool for studying human evolution. Commonly used morphometric methods require analyzing many variables, thus increasing the difficulty in analyzing the data associated with problems involving a large number of specimens and complex shapes. Moreover, results are sometimes difficult to visualize, understand or assess. The presented research implements a kinematic synthesis methodology for designing a planar chain of bodies to match a desired set of curves. This methodology approximates the set of 2D curves that represent the outlines of a series of anatomical structures with the designed chain. The general approach uses bodies to form the chain that can be categorized into three types: a rigid segment, a segment with constant curvature but varying arc length, and a growth segment that maintains its shape but varies its scale. To accurately characterize the growth of the mandible, the presented work only employs rigid segments and growth segments. Variations and invariants among shapes can then be characterized by the kinematic parameters of the chain, such as the scale of growth segments and the rotation between two neighboring segments [1]. This approach offers two advantages. First, it requires a modest number of meaningful physical parameters to describe the shape and size change between a set of curves. Second, the body types in the model are established according to some anatomical assumptions on the skeletal growth of mandibles.This methodology is applied to the shape analysis of the mandible based on curves associated with the outlines of a large number of fossil hominins specimens. Preliminary results based on the data from the work of Lestrel *et al*. [2] validates the accuracy and efficiency of the proposed method. The presented work establishes an alternative approach for morphometric analysis of outlines of anatomical structures and could help to provide reference information for the study of human evolution.

[1] B. Li, A.P. Murray, D.H. Myszka, G. Subsol. "Synthesizing Planar Rigid-Body Chains for Morphometric Applications". ASME International Design Engineering Technical Conferences & Computers and Information in Engineering Conference, Charlotte (U.S.A.), August 2016.

[2] P. E. Lestrel, C. A. Wolfe, A. Bodt, "Mandibular shape analysis in fossil hominins: Fourier descriptors in norma lateralis," HOMO - Journal of Comparative Human Biology, 64(4), pp. 247-27, 2013.

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