Fundusze Europejskie
Wiedza Edukacja Rozwój

Unia Europejska
Europejski Fundusz Społeczny

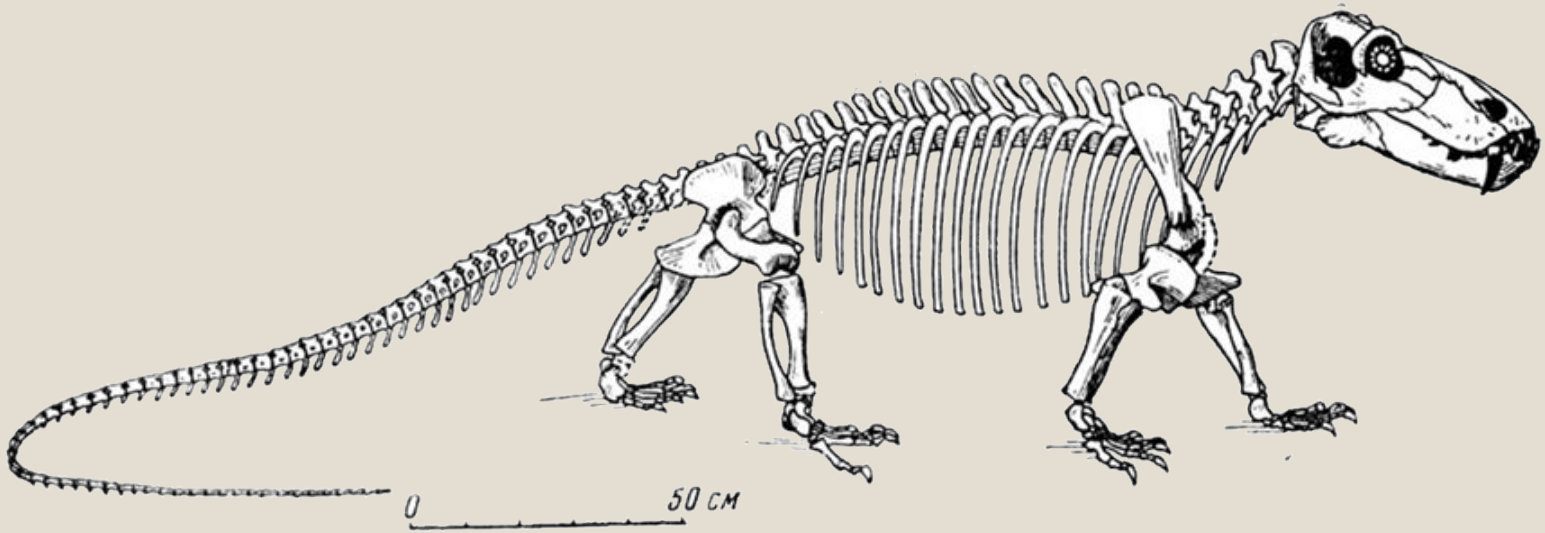
Projekt pt. „Paleobiologia. Umiędzynarodowienie specjalności magisterskiej na kierunku studiów Biologia w Samodzielnej Katedrze Biosystematyki Wydziału Przyrodniczo - Technicznego Uniwersytetu Opolskiego" współfinansowany ze środków Unii Europejskiej w ramach Europejskiego Funduszu Społecznego POWR.03.03.00-00-M108/16 - okres realizacji od 01.05.2017 r. do 30.09.2019 r.

Modern reconstruction of *Titanophoneus potens*

Mariia Kolesnik
Promotor dr hab. Elena Yazykova, prof. UO

Object of research:

Titanophoneus potens Efremov, 1938
(=*Doliosaurus yanschinovi* Orlov, 1958)
species of Middle Permian synapsid from Isheevo, Russia



"In the world of ancient animals = Essays on the paleontology of vertebrates" Orlov, *1961*

Definition of object

Superclass Tetrapoda

Class Synapsida

Subclass † Therapsida

Infraclass † Eotherapsida

Order † Dinocephalia

Infraorder † Anteosauria

Superfamily † Anteosauroidea

Family † Anteosauridae

Genus † *Titanophoneus* Efremov, 1940

Species † *Titanophoneus potens* Efremov, 1940

Species † *Titanophoneus adamanteus* (Orlov, 1958)

Species † *Titanophoneus rugosus* (Trautschold, 1884)

Subject of research:

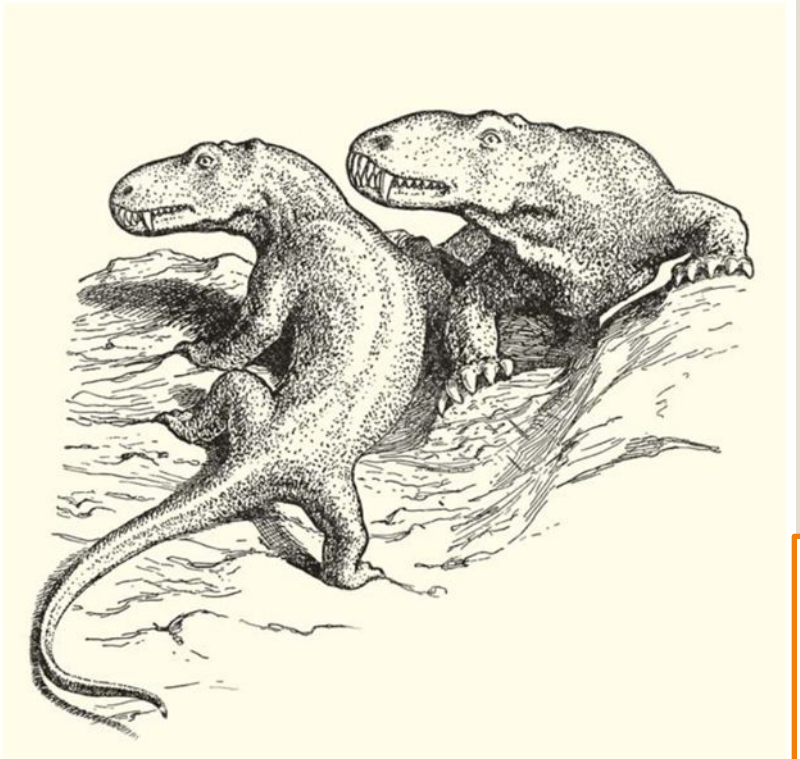
Museum of Permian antiquities

high-quality anatomical casting of skeleton of *Titanophoneus potens* Efremov, 1938, exhibited in the **Museum of Permian antiquities**.

Original skeleton is placed in the museum of **Paleontological Institute, Russian Academy of Sciences**

Goal of the research:

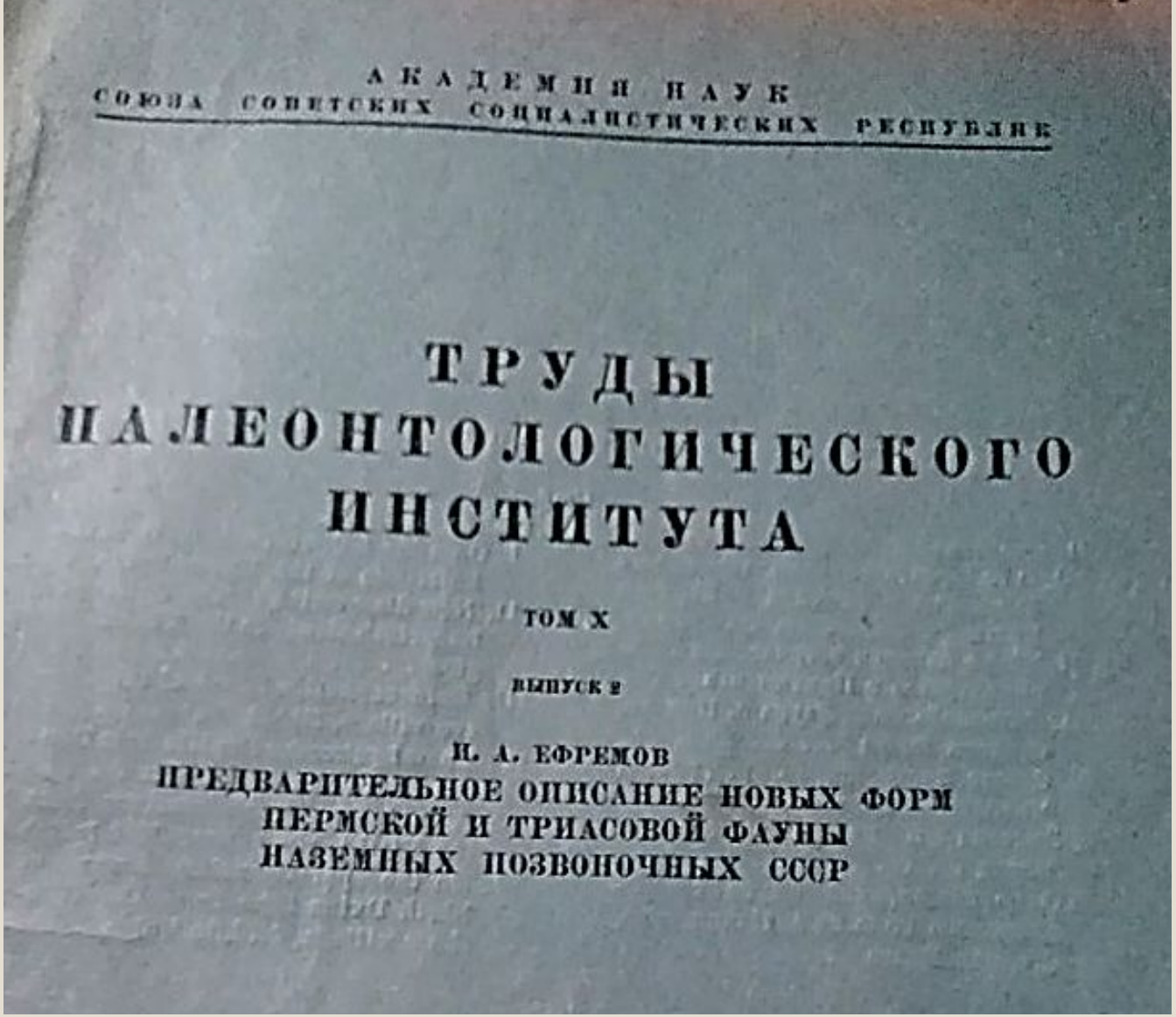
Creating a museum object, which is scientifically accurate reconstruction of *Titanophoneus potens* based state-of-the-art research.



Artistic reconstruction of T. potens PIN No. 157/1 and PIN No. 157/3 by Bystrov (in Efremov, 1940)

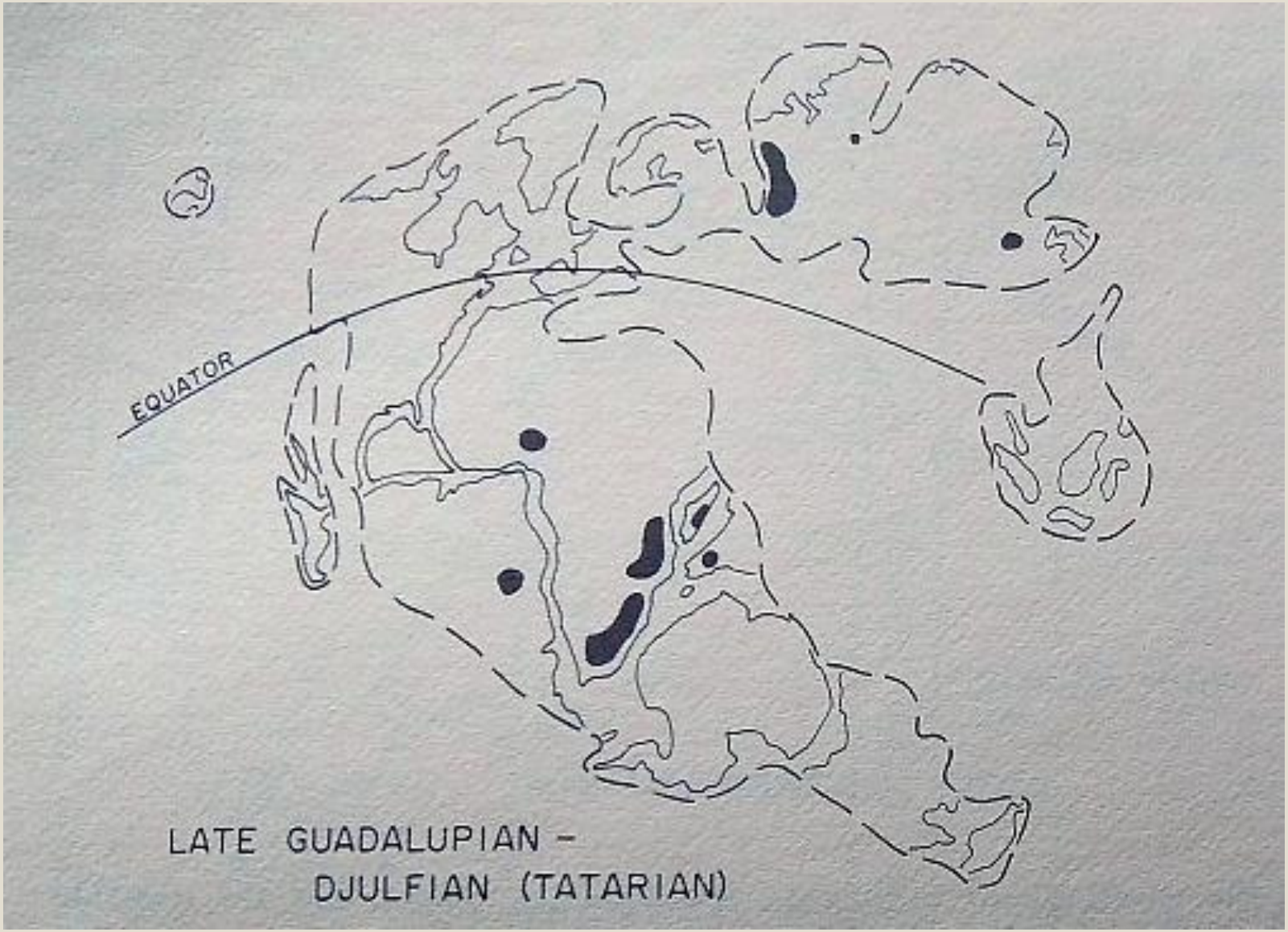
Objectives

- Analyze the literature data
- Compare the data from various sources and check if the exhibit from the Museum of Permian Antiquities matches these data
- Compose an integral view of *Titanophoneus* sp.
- Create the 3D model
- Create the interactive exhibit of titanophone adopting the concept of Smart Museum



Analyze the literature data

Description of the species by Ivan Efremov in the library of the PIN RAS



Analyze the literature data

Biological and Physical factors in the dispersal of permo-carboniferous terrestrial vertebrates by Olson E.C. 1979

ISHEEVIAN DEINOCEPHALIAN COMPLEX, ZONE II (FIG. 2)

NORTHERN VOLGA REGION AND SOUTHERN PRE-URALS

Бутлеровка, Tatar, A.S.S.R. (N. 54°40′ E. 50°00′). Red and yellow sandstone. *Titanophoneus* sp.

Ишеево, Tatar, A.S.S.R. (N. 55°25′ E. 48°30′ approx., near Isheevo, 354 meters northwest of Tetyushi). This is one of the important localities of this faunal complex. Sections are as follows:

Section	Meters
1. Soil with fragments of limestone	1.0
2. White, calcareous clay with fragments of limestone	0.3
3. Red-brown compact clay	0.26
4. Red calcareous shale and interbedded white clay and white, friable sandstone, compact limestone and marl	1.26
5. Light, compact cavernous limestone	1.20
6. Red and gray, platy, calcareous clay, compact and hard	0.7
7. Gray sandy clay	0.35
8. Compact, bedded, red, bone-bearing sandstone with thin beds of bone breccia and separate pebbles of red clay	3.0

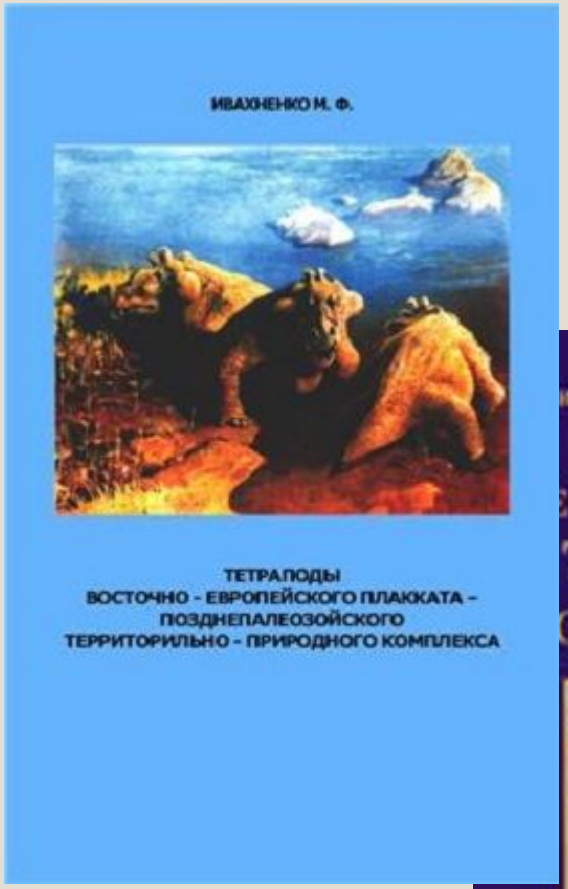
Conditions of bedding and preservation.—Remains of terrestrial vertebrates occur with sharks, ganoid fishes, and plant remains, mainly in the upper part of the sandstone (bed No. 8). Much of the preservation is good, but there is some decomposition and deformation. There are a great many separate, indeterminate fragments. Great quantities of coprolites are present. More complete remains occur as skeletons, separate bones, and skulls, exceptionally well preserved. Cartilaginous chondrocrania of sharks also are preserved. The locality was formed on the littoral part of a great delta, in the vicinity of a river bottom during comparatively rapid flow of the water. This flow carried in fragments from the upper reaches of the region. With them were carried floating corpses and partial skeletons. These were preserved along the upper part of the bank when the stream reached a maximum. Remains of sharks and ganoids were preserved almost exactly in the place of death of the animals. *Tryphosuchus paucidens* Konzh., *Enosuchus breviceps* Efr., *Lanthanosuchus qualeni*

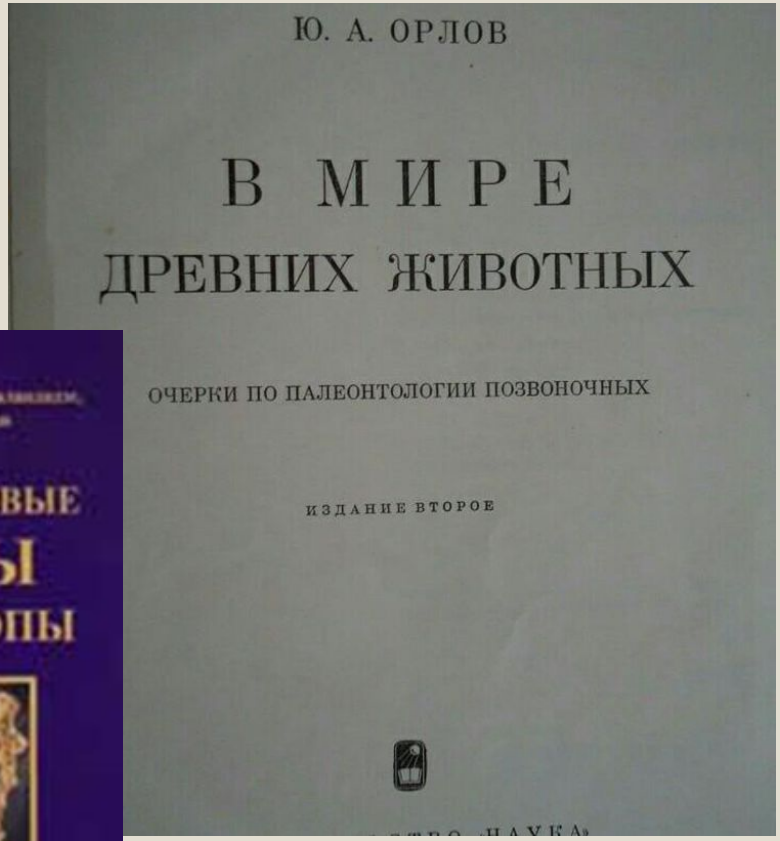
Analyze the literature data

Catalogue of Localities of Permian and Triassic Terrestrial Vertebrates of the Territories of the U.S.S.R.

E.C. Olson *The Journal of Geology* Vol. 65, No. 2 (Mar., 1957)

Analyze the literature data





Compare the data from various sources and check if the exhibit from the Museum of Permian Antiquities matches these data

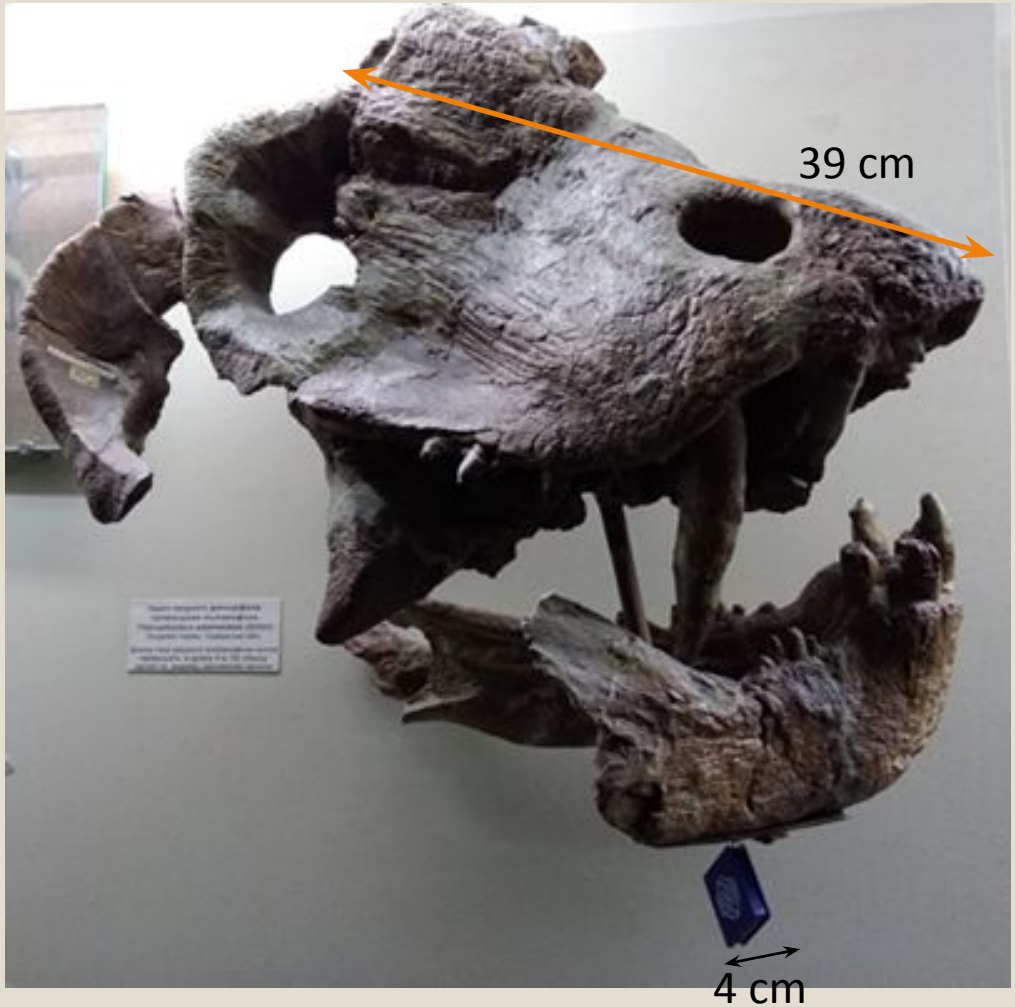
Photo by Michael Late

In PIN RAS three skeletons were measured:

1. Lectotype of *T. potens* PIN RAS No. 157/1 skull and postcranial skeleton. Collected by Efremov in 1934,

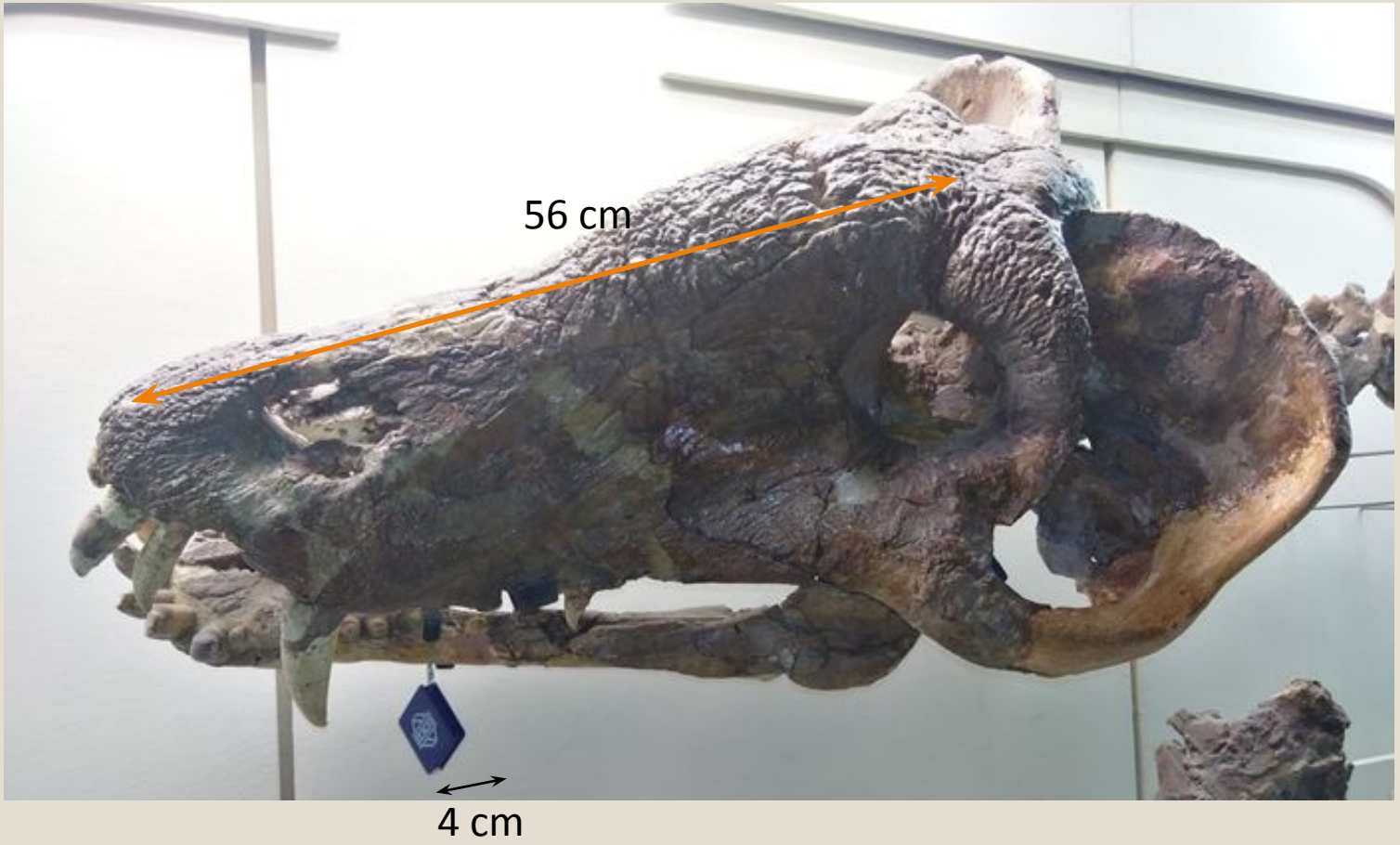
In PIN RAS three skeletons were measured:

2. *Titanophoneus adamanteus* Ivakhnenko et al., 1997 from the location of Maly Uran

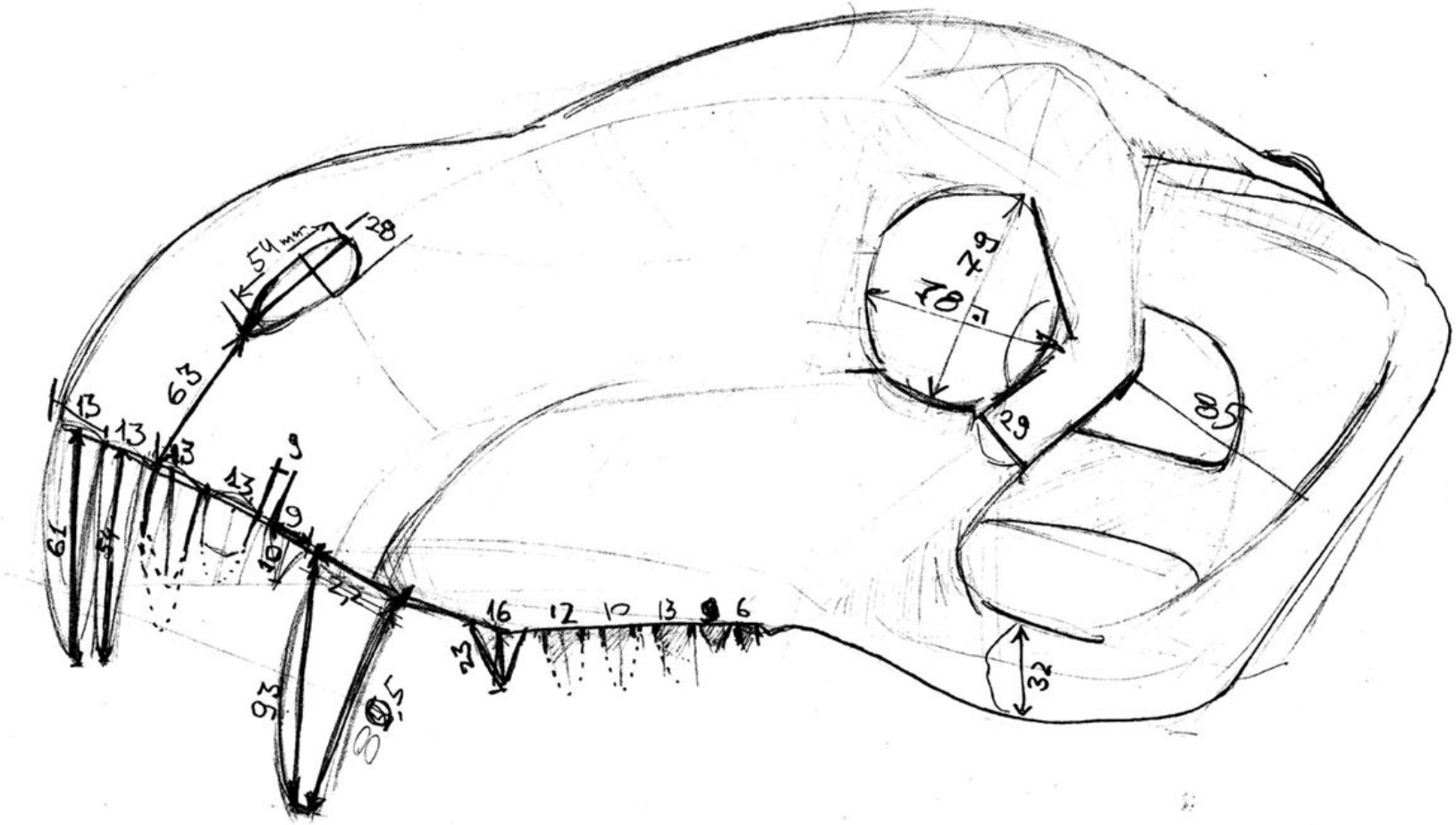


In PIN RAS three skeletons were measured:

3. *Titanophoneus potens* holotype PIN RAS No. 157/3

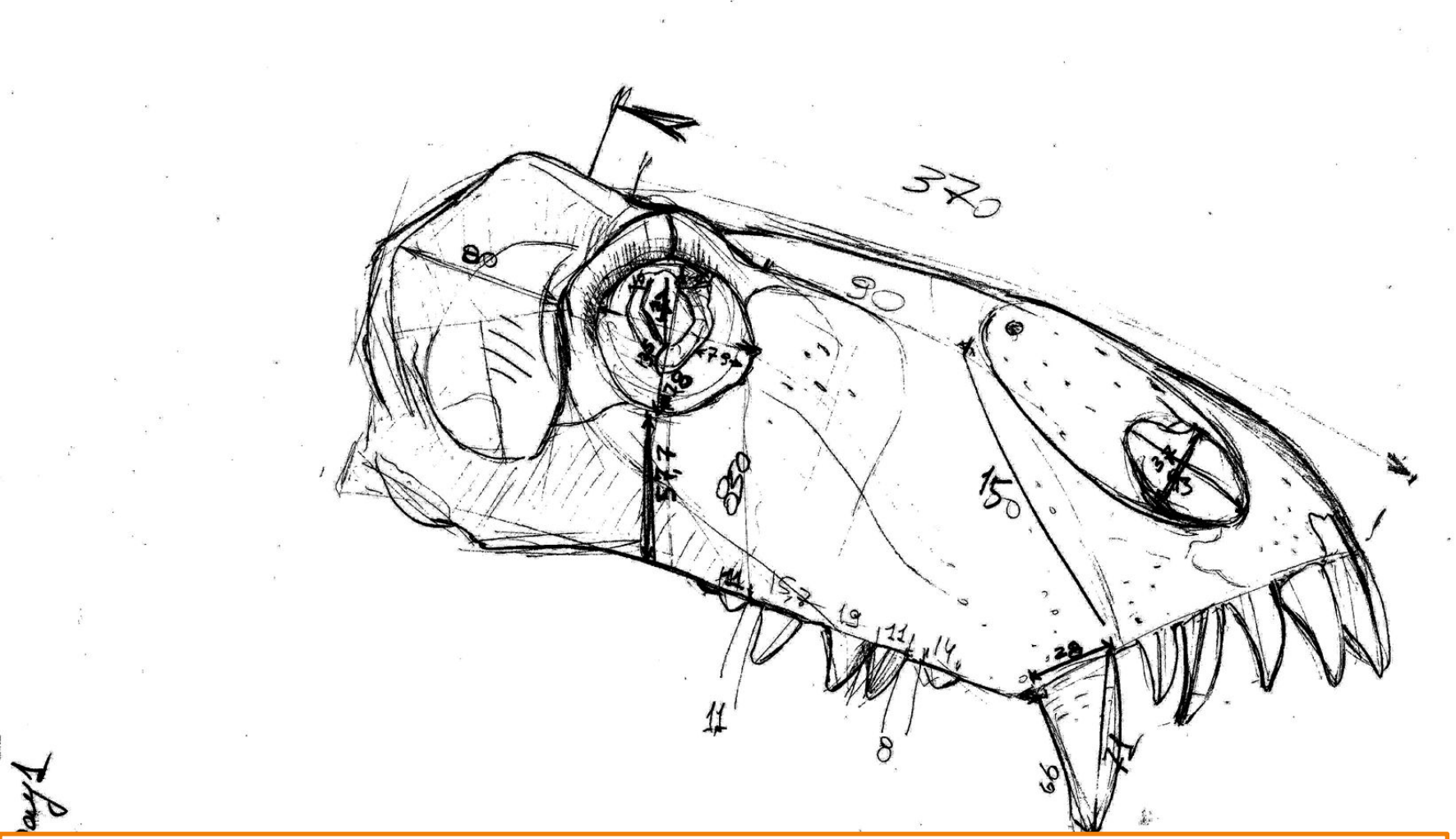


Measurements scheme of the recast of integral reconstruction *T. potens* skull located in the MPA.



sp.

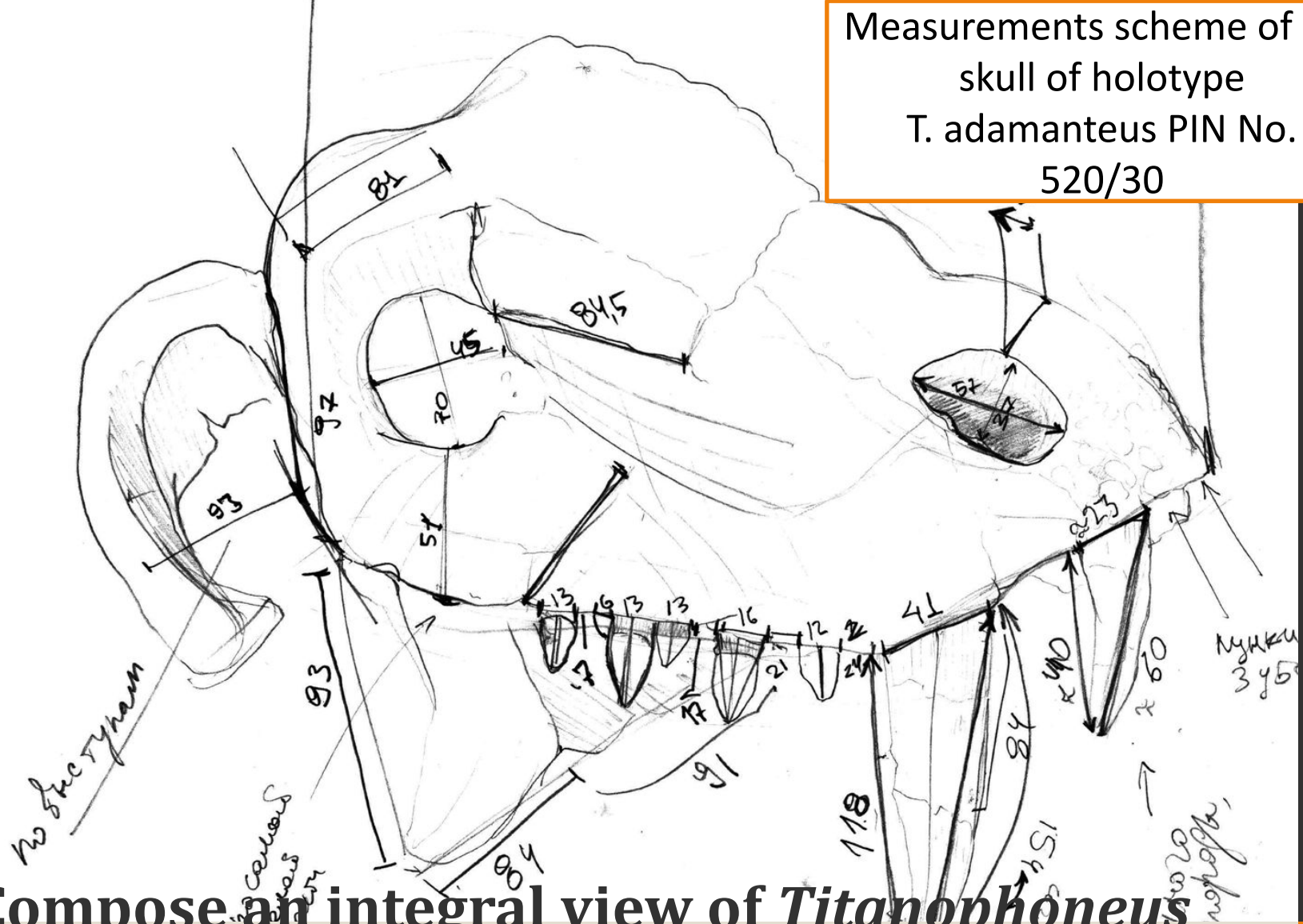
It was possible to measure 4 skulls (including the recast from MPA), representing three different age stages, and make a series of photographs and sketches.



Measurements scheme of the skull of lectotype of T. potens PIN No. 157/1.

Compose an integral view of *Ptanophoneus* sp.

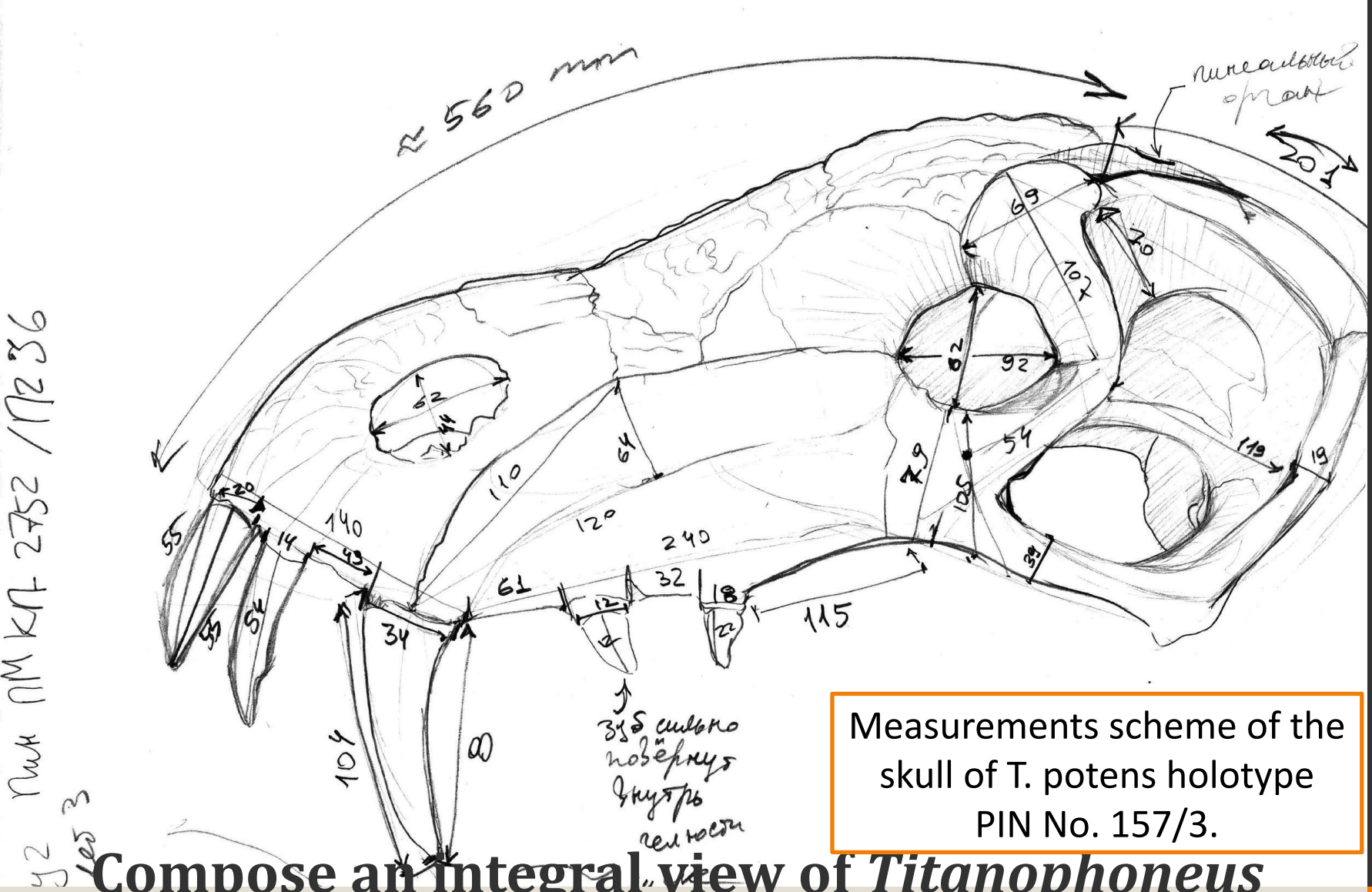
It was possible to measure 4 skulls (including the recast from MPA), representing three different age stages, and make a series of photographs and sketches.



Measurements scheme of the skull of holotype T. adamanteus PIN No. 520/30

Compose an integral view of *Titanophoneus* sp.

It was possible to measure 4 skulls (including the recast from MPA), representing three different age stages, and make a series of photographs and sketches.



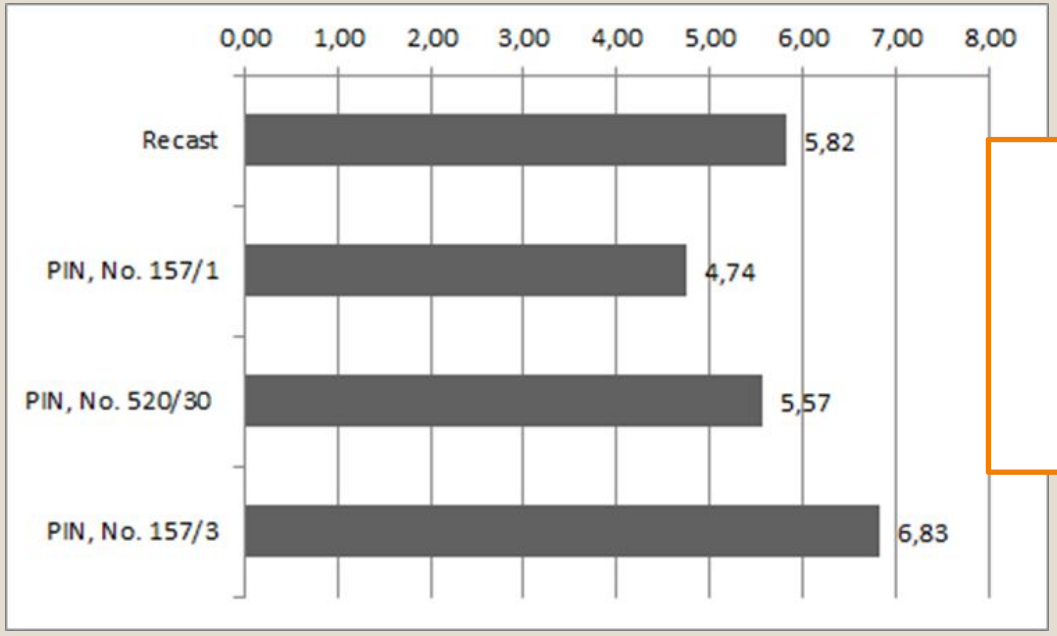
Measurements scheme of the skull of T. potens holotype PIN No. 157/3.

Compose an integral view of *Titanophoneus* sp.

It was possible to measure 4 skulls (including the recast from MPA), representing three different age stages, and make a series of photographs and sketches.

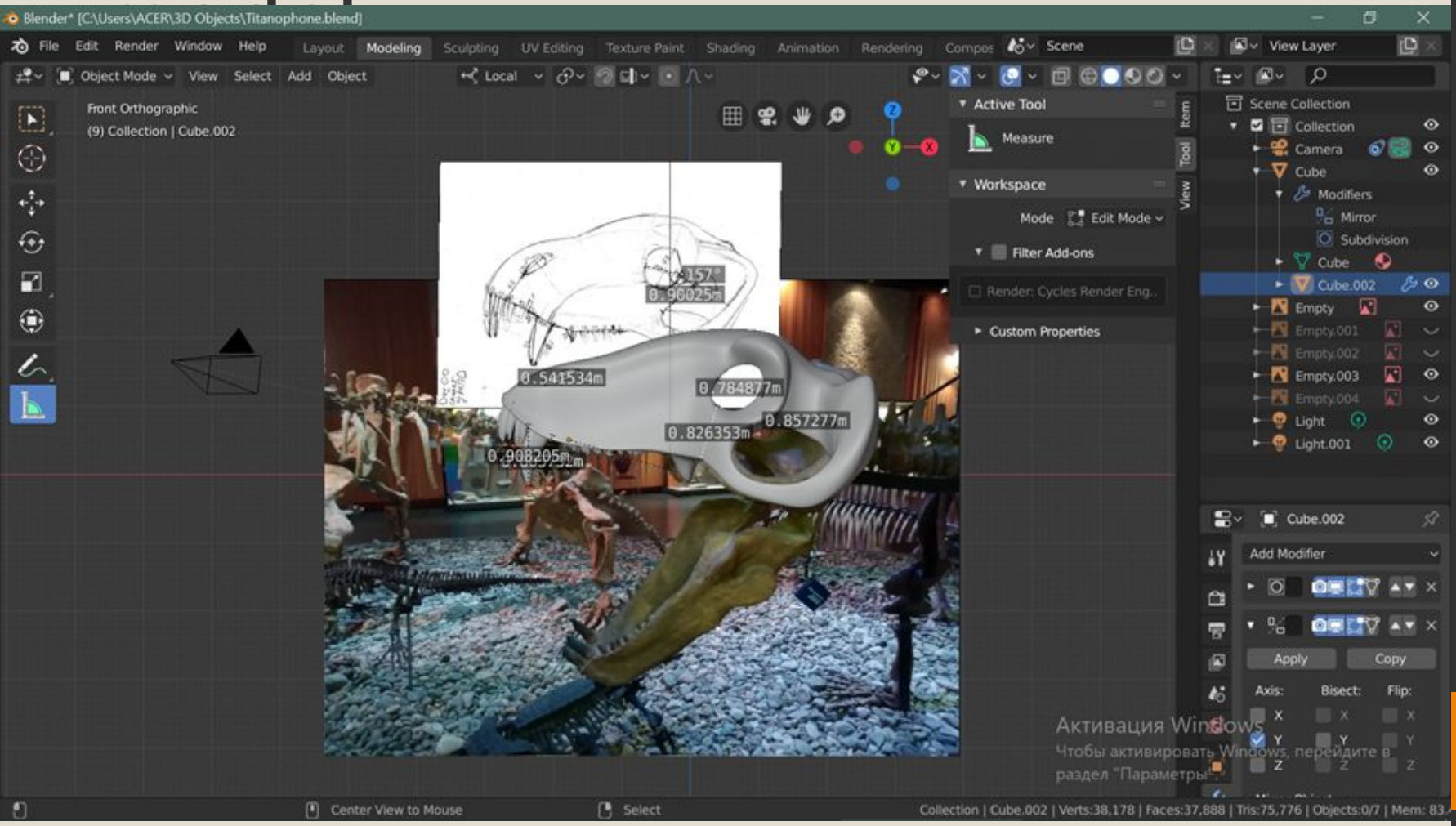
The most informative measurements:

- Condylobasal length of the skull
- Ratio of condylobasal length to eye orbit
- Change the lengths of canines
- Changing the shape of the nose and eye openings
- Changing the shape of the temporal window

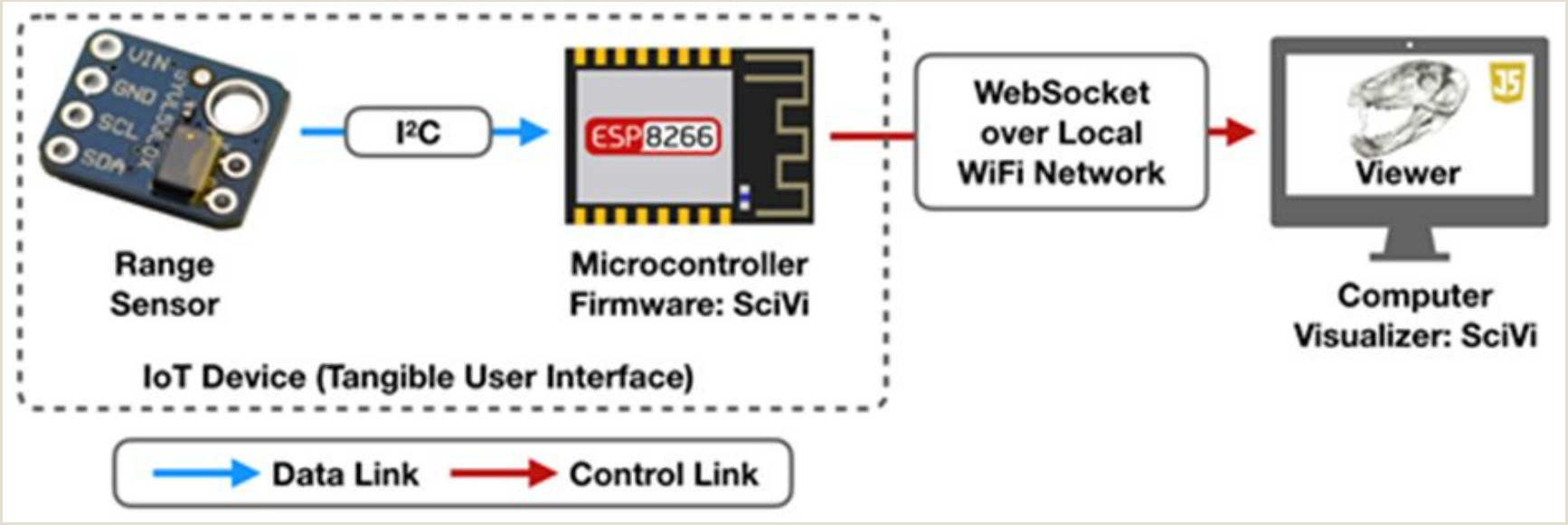


Comparison of muzzle proportions (ratio of condylobasal length to eye orbit)

Using Blender v2.8 tools for making correct-sized 3d



The architecture of titanophone cyber-physical exhibit



Thank you for attention!