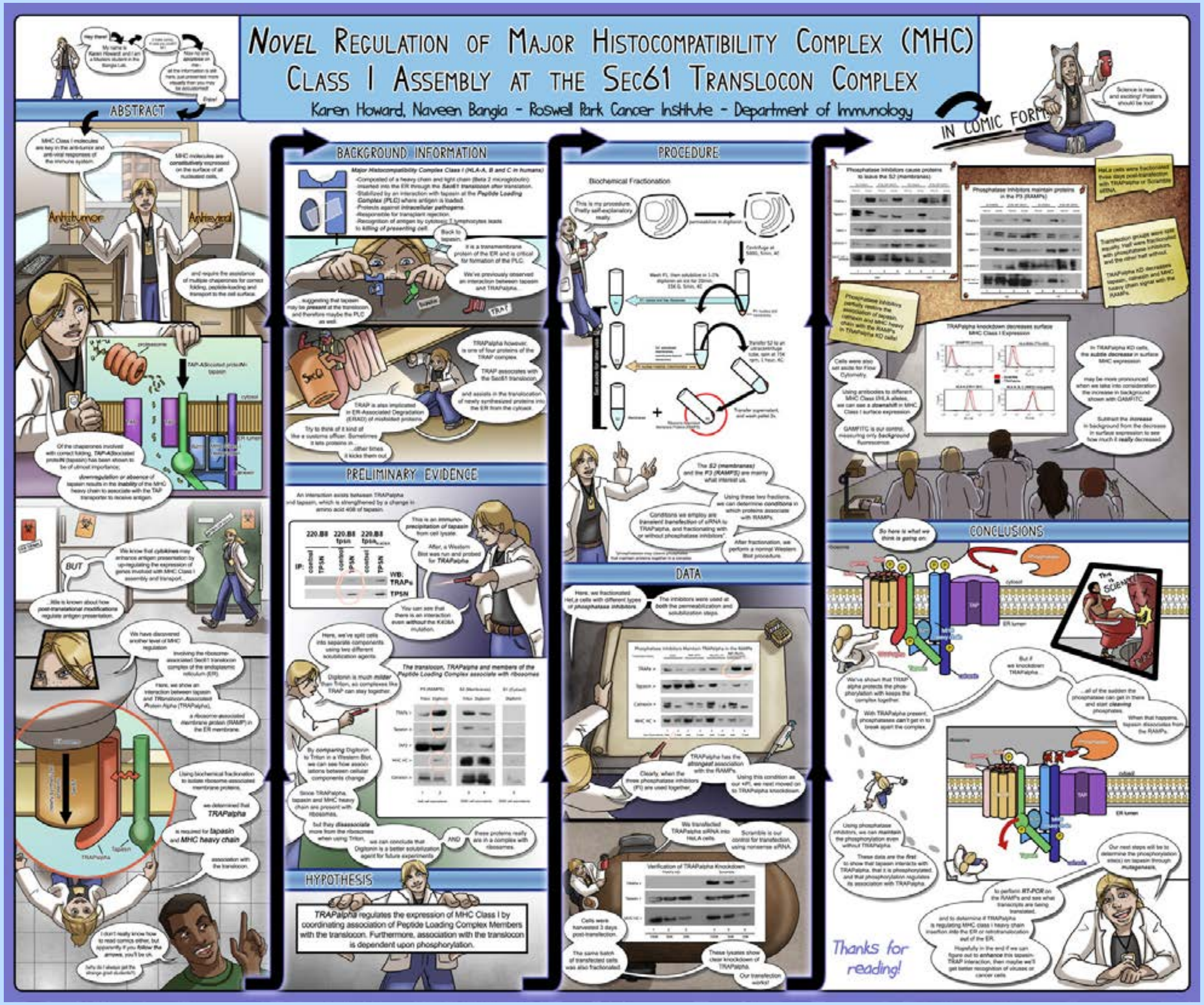
Title:	Making a Poster
Grade and Subject:	9th-12th grades; GK-12 Elective Course
Number of Days for Completion of the Project:	1
Overarching Project Goals/Outcomes:	Understanding how to create a scientific poster: Writing the components of the Science Day Poster. Students have been analyzing and finalizing their data for the past few weeks. This lesson plan is designed to promote collaboration and scientific writing. The class is broken up into groups, each with a "mission" to complete a designated section of the poster. Their writing is put into a poster template to serve as a rough draft. This will give them an overall understanding of the project from start to finish, in addition to them understanding the different components of a poster. The class will begin with a powerpoint explaining the components of a poster with some examples. The students will be broken up and each team will be given a mission to complete. They will write their answers on large paper and briefly present it to the class.
Materials:	• SmartBoard/Computer, powerpoint, markers, large paper, mission handouts
Introduction:	1. Introducing the components of a scientific poster 2. Examples of posters
Instruction/Direct Experience:	1. Students will collaborate in groups to complete poster missions and write answers on large paper.
Independent Activities:	Independent participation in groups.
Assessment:	Student's listening skills, interaction with fellow classmates, and overall participation. Clarity, organization, and accuracy of written components will be assessed.
Follow-up	Answers written by groups will be assessed by the whole class. Edits will be made, followed by the write-up of the abstract (Lesson 13).

Creating a Scientific Poster



NOVEL REGULATION OF MAJOR HISTOCOMPATIBILITY COMPLEX (MHC) CLASS I ASSEMBLY AT THE SEC61 TRANSLOCON COMPLEX

Karen Howard, Naveen Bangia - Roswell Park Cancer Institute - Department of Immunology

IN COMIC FORM

ABSTRACT

BACKGROUND INFORMATION

PROCEDURE

PRELIMINARY EVIDENCE

DATA

CONCLUSIONS

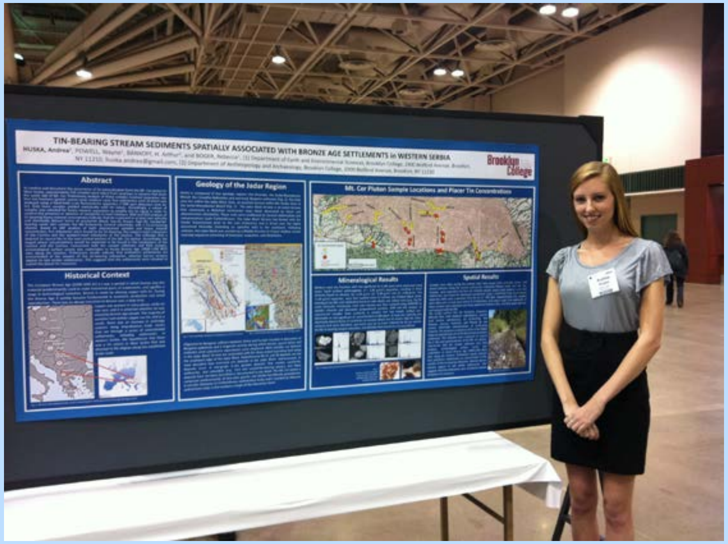
HYPOTHESIS

TRAPalpha regulates the expression of MHC Class I by coordinating association of Peptide Loading Complex Members with the translocon. Furthermore, association with the translocon is dependent upon phosphorylation.

Thanks for reading!

Why do we need to do this?

- Posters are the way in which scientists present their current research
- Mostly at conferences
- Allow for feedback, advice, and discussion about your research

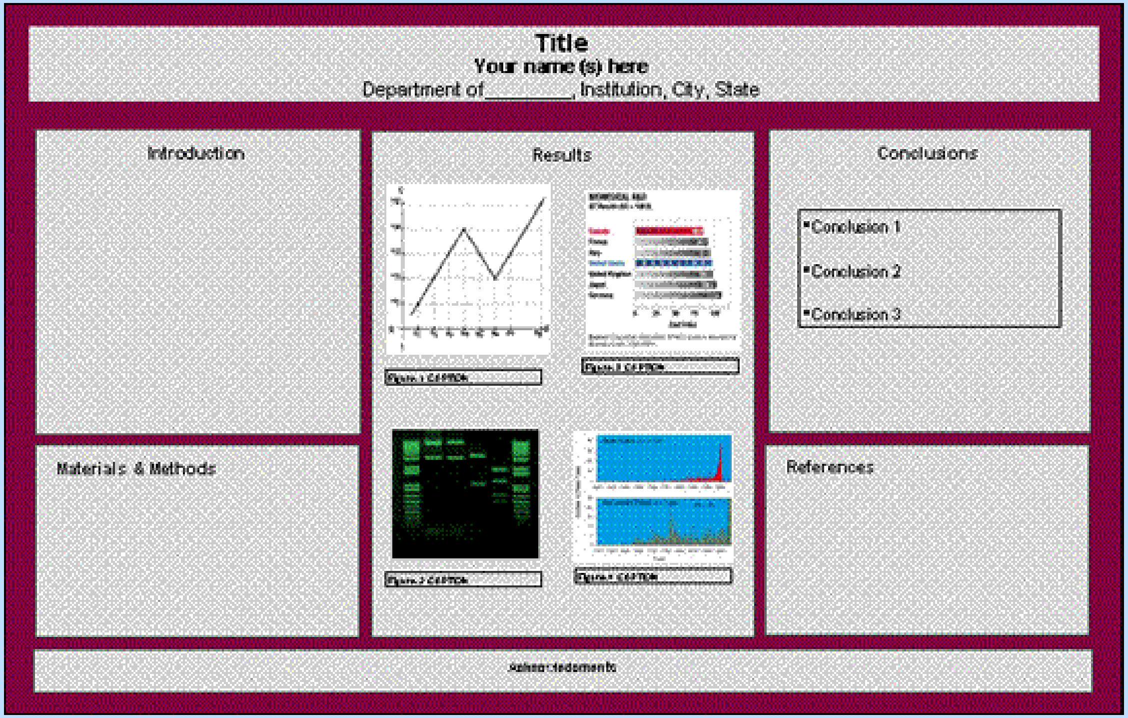


How does this benefit YOU?

- Important for networking
- Represents **you** in a professional environment, your class, and your school
- Students from **this** class will be selected as the representatives for this project, and will present our poster at Brooklyn College’s Science Day

Why our poster should look AWESOME

- Should promote your work and engage people that are otherwise not familiar
- **The reverse is also true.**



Title
Your name (s) here
Department of________, Institution, City, State

Introduction

Results

Conclusions

- Conclusion 1
- Conclusion 2
- Conclusion 3

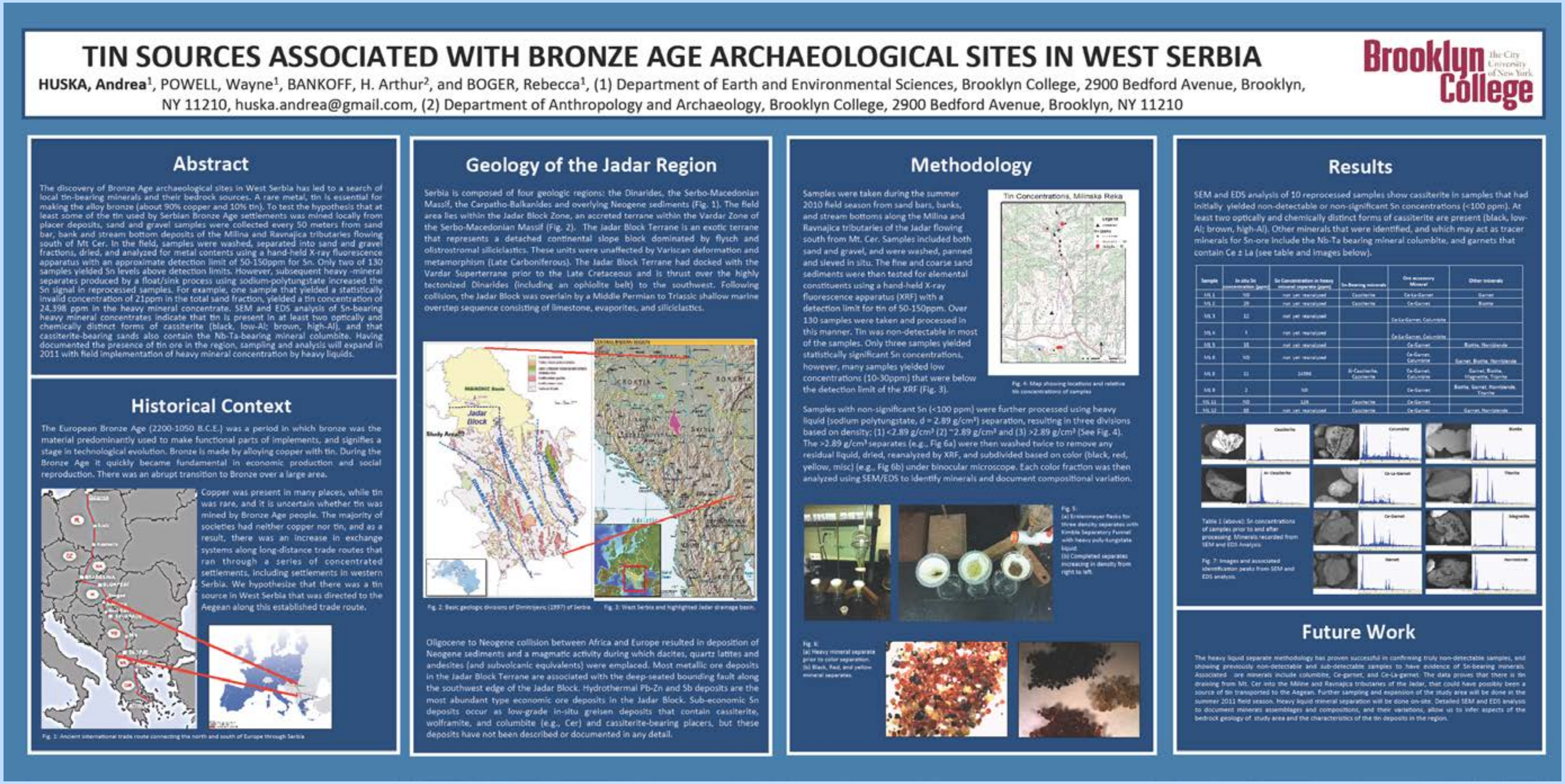
Materials & Methods

References

Acknowledgements

•Posters that do not attract attention and do not yield productive discussions obviously do not adequately promote you or your work.

Breaking Down the Sections



TIN SOURCES ASSOCIATED WITH BRONZE AGE ARCHAEOLOGICAL SITES IN WEST SERBIA

HUSKA, Andrea[1], POWELL, Wayne[1], BANKOFF, H. Arthur[2], and BOGER, Rebecca[1], (1) Department of Earth and Environmental Sciences, Brooklyn College, 2900 Bedford Avenue, Brooklyn, NY 11210, huska.andrea@gmail.com, (2) Department of Anthropology and Archaeology, Brooklyn College, 2900 Bedford Avenue, Brooklyn, NY 11210

Brooklyn College
The City University of New York

Abstract

The discovery of Bronze Age archaeological sites in West Serbia has led to a search of local tin-bearing minerals and their bedrock sources. A rare metal, tin is essential for making the alloy bronze (about 90% copper and 10% tin). To test the hypothesis that at least some of the tin used by Serbian Bronze Age settlements was mined locally from placer deposits, sand and gravel samples were collected every 50 meters from sand bar, bank and stream bottom deposits of the Milina and Ravnajica tributaries flowing south of Mt Cer. In the field, samples were washed, separated into sand and gravel fractions, dried, and analyzed for metal contents using a hand-held X-ray fluorescence apparatus with an approximate detection limit of 50-150ppm for Sn. Only two of 130 samples yielded Sn levels above detection limits. However, subsequent heavy -mineral separates produced by a float/sink process using sodium-polytungstate increased the Sn signal in reprocessed samples. For example, one sample that yielded a statistically invalid concentration of 21ppm in the total sand fraction, yielded a tin concentration of 24,398 ppm in the heavy mineral concentrate. SEM and EDS analysis of Sn-bearing heavy mineral concentrates indicate that tin is present in at least two optically and chemically distinct forms of cassiterite (black, low-Al; brown, high-Al), and that cassiterite-bearing sands also contain the Nb-Ta-bearing mineral columbite. Having documented the presence of tin ore in the region, sampling and analysis will expand in 2011 with field implementation of heavy mineral concentration by heavy liquids.

Historical Context

The European Bronze Age (2200-1050 B.C.E.) was a period in which bronze was the material predominantly used to make functional parts of implements, and signifies a stage in technological evolution. Bronze is made by alloying copper with tin. During the Bronze Age it quickly became fundamental in economic production and social reproduction. There was an abrupt transition to Bronze over a large area.

Copper was present in many places, while tin was rare, and it is uncertain whether tin was mined by Bronze Age people. The majority of societies had neither copper nor tin, and as a result, there was an increase in exchange systems along long-distance trade routes that ran through a series of concentrated settlements, including settlements in western Serbia. We hypothesize that there was a tin source in West Serbia that was directed to the Aegean along this established trade route.

Fig. 1: Ancient international trade route connecting the north and south of Europe through Serbia

Geology of the Jadar Region

Serbia is composed of four geologic regions: the Dinarides, the Serbo-Macedonian Massif, the Carpatho-Balkanides and overlying Neogene sediments (Fig. 1). The field area lies within the Jadar Block Zone, an accreted terrane within the Vardar Zone of the Serbo-Macedonian Massif (Fig. 2). The Jadar Block Terrane is an exotic terrane that represents a detached continental slope block dominated by flysch and olistrostromal siliciclastics. These units were unaffected by Variscan deformation and metamorphism (Late Carboniferous). The Jadar Block Terrane had docked with the Vardar Superterrane prior to the Late Cretaceous and is thrust over the highly tectonized Dinarides (including an ophiolite belt) to the southwest. Following collision, the Jadar Block was overlain by a Middle Permian to Triassic shallow marine overstep sequence consisting of limestone, evaporites, and siliciclastics.

Fig. 2: Basic geologic divisions of Dimitrijevic (1997) of Serbia.

Fig. 3: West Serbia and highlighted Jadar drainage basin.

Oligocene to Neogene collision between Africa and Europe resulted in deposition of Neogene sediments and a magmatic activity during which dacites, quartz latites and andesites (and subvolcanic equivalents) were emplaced. Most metallic ore deposits in the Jadar Block Terrane are associated with the deep-seated bounding fault along the southwest edge of the Jadar Block. Hydrothermal Pb-Zn and Sb deposits are the most abundant type economic ore deposits in the Jadar Block. Sub-economic Sn deposits occur as low-grade in-situ greisen deposits that contain cassiterite, wolframite, and columbite (e.g., Cer) and cassiterite-bearing placers, but these deposits have not been described or documented in any detail.

Methodology

Samples were taken during the summer 2010 field season from sand bars, banks, and stream bottoms along the Milina and Ravnajica tributaries of the Jadar flowing south from Mt. Cer. Samples included both sand and gravel, and were washed, panned and sieved in situ. The fine and coarse sand sediments were then tested for elemental constituents using a hand-held X-ray fluorescence apparatus (XRF) with a detection limit for tin of 50-150ppm. Over 130 samples were taken and processed in this manner. Tin was non-detectable in most of the samples. Only three samples yielded statistically significant Sn concentrations, however, many samples yielded low concentrations (10-30ppm) that were below the detection limit of the XRF (Fig. 3).

Tin Concentrations, Milinska Reka

Fig. 4: Map showing locations and relative tin concentrations of samples

Samples with non-significant Sn (<100 ppm) were further processed using heavy liquid (sodium polytungstate, d = 2.89 g/cm³) separation, resulting in three divisions based on density: (1) <2.89 g/cm³ (2) ~2.89 g/cm³ and (3) >2.89 g/cm³ (See Fig. 4). The >2.89 g/cm³ separates (e.g., Fig 6a) were then washed twice to remove any residual liquid, dried, reanalyzed by XRF, and subdivided based on color (black, red, yellow, misc) (e.g., Fig 6b) under binocular microscope. Each color fraction was then analyzed using SEM/EDS to identify minerals and document compositional variation.

Fig. 5:
(a) Erlenmeyer flasks for three density separates with Kimble Separatory Funnel with heavy poly-tungstate liquid.
(b) Completed separates increasing in density from right to left.

Fig. 6:
(a) Heavy mineral separate prior to color separation.
(b) Black, Red, and yellow mineral separates.

Results

SEM and EDS analysis of 10 reprocessed samples show cassiterite in samples that had initially yielded non-detectable or non-significant Sn concentrations (<100 ppm). At least two optically and chemically distinct forms of cassiterite are present (black, low-Al; brown, high-Al). Other minerals that were identified, and which may act as tracer minerals for Sn-ore include the Nb-Ta bearing mineral columbite, and garnets that contain Ce ± La (see table and images below).

Sample	In situ Sn concentration (ppm)	Sn Concentration in heavy mineral separate (ppm)	Sn-Bearing minerals	Ore accessory Mineral	Other minerals
ML 1	ND	not yet reanalyzed	Cassiterite	Ce-La-Garnet	Garnet
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ML 6	ND	not yet reanalyzed		Ce-Garnet, Columbite	Garnet, Biotite, Hornblende
ML 8	21	24398	Al-Cassiterite, Cassiterite	Ce-Garnet, Columbite	Garnet, Biotite, Magnetite, Titanite
ML 9	2	ND		Ce-Garnet	Biotite, Garnet, Hornblende, Titanite
ML 11	ND	[illegible]	Cassiterite	Ce-Garnet	
ML 12	[illegible]	not yet reanalyzed	Cassiterite	Ce-Garnet	Garnet, Hornblende

Table 1 (above): Sn concentrations of samples prior to and after processing. Minerals recorded from SEM and EDS Analysis.

Fig. 7: Images and associated identification peaks from SEM and EDS analysis.

Future Work

The heavy liquid separate methodology has proven successful in confirming truly non-detectable samples, and showing previously non-detectable and sub-detectable samples to have evidence of Sn-bearing minerals. Associated ore minerals include columbite, Ce-garnet, and Ce-La-garnet. The data proves that there is tin draining from Mt. Cer into the Milina and Ravnajica tributaries of the Jadar, that could have possibly been a source of tin transported to the Aegean. Further sampling and expansion of the study area will be done in the summer 2011 field season. Heavy liquid mineral separation will be done on-site. Detailed SEM and EDS analysis to document minerals assemblages and compositions, and their variations, allow us to infer aspects of the bedrock geology of study area and the characteristics of the tin deposits in the region.

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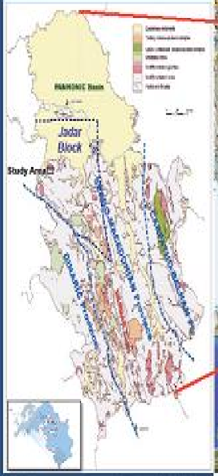

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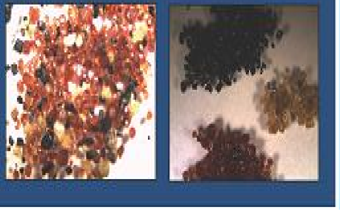

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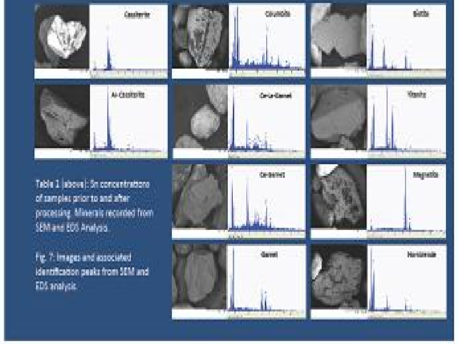
ML 9	2	ND		Ce-Garnet	Biotite, Garnet, Hornblende, Titanite
ML 11	ND	126	Cassiterite	Ce-Garnet	
ML 12	88	not yet reanalyzed	Cassiterite	Ce-Garnet	Garnet, Hornblende



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Title, Authors, & Logos

- What is your research hypothesis/question? Try and make it into a statement
- Be as concise as possible
- Logos of all associated programs
  - Can you think of any?

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NSF

PALYNOMORPHS OF THE CLAYTON FORMATION, SE MISSOURI, AS INDICATORS OF TIME & DEPOSITION THROUGH THE K/Pg MASS EXTINCTION EVENT

DASTAS, Natalie R., Dept. of Earth & Environmental Sciences, Brooklyn College, Brooklyn, NY 11210; CHAMBERLAIN, John A., JR., Dept. of Earth & Environmental Sciences, Brooklyn College, Brooklyn, NY 11210, and PhD Program in Earth & Environmental Sciences, CUNY Graduate Center, New York, NY 10016; GARB, Matthew P., Dept. of Earth & Environmental Sciences, Brooklyn College, Brooklyn, NY 11210

ABSTRACT

Sedimentary deposits in the southeast region of Missouri's boot-heel near the town of Bloomfield, reveal a biostratigraphic record across the K/Pg boundary. The K/Pg transition sequence is represented by the late Maastrichtian Owl Creek Formation and the Paleocene Clayton and Porters Creek Formations. The Clayton Formation is characterized by a basal fossiliferous coquinite that contains the late Maastrichtian index ammonites *Discoscaphites iris* and *Eubaculites carinatus*, as well as rip-up clasts containing tektite-like spherules which may be direct evidence of a bolide impact. We use dinoflagellate occurrences in these units to determine the timing of the coquinite layer and specifically whether or not it is the result of an impact-generated tsunami associated with the end-Cretaceous impact. Fourteen sediment samples were collected from the study site at 25 cm intervals from the upper Owl Creek Fm to the base of the Porters Creek Fm. Preliminary palynological results indicate the presence within the Clayton basal coquinite of two dinoflagellates considered to be indicators of the uppermost part of the upper Maastrichtian (*Palynodinium grallator* and *Disphaerogena carposphaeropsis*) and two middle late Maastrichtian forms (*Deflandrea galeata* and *Thalassiphora pelagica*). All of these taxa are found within the uppermost Owl Creek and the lowermost section of the coquinite of the lower Clayton. The middle horizons of the coquinite preserve sparse dinoflagellate occurrences representing only stratigraphically and temporally wide-ranging taxa. The uppermost coquinite has a higher dinoflagellate recovery, similar to the basal section, and contains the uppermost Maastrichtian index forms, *Palynodinium grallator* and *Deflandrea galeata*. So far no Danian dinoflagellates have been recovered from the coquinite. The dinoflagellate data support the ammonite record in indicating a latest Maastrichtian age for the basal Clayton coquinite, and suggest that the spherule-bearing [illegible] deposition from an impact-induced tsunami.

STUDY AREA

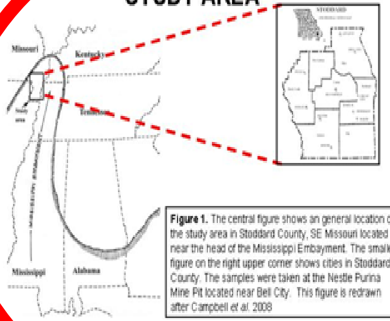


Figure 1. The central figure shows an general location of the study area in Stoddard County, SE Missouri located near the head of the Mississippi Embayment. The smaller figure on the right upper corner shows cities in Stoddard County. The samples were taken at the Nestle Purina Mine Pit located near Bell City. This figure is redrawn after Campbell *et al.* 2008

METHODOLOGY & EQUIPMENT

A total of 14 samples have been collected in approximately 25.2 cm intervals throughout the section, beginning [illegible] Creek clay, through the Clayton to the top of the Owl Creek Formation. Samples were sent out for the production of palynological slides. All samples have been processed using the standard palynological method by Global Geo Lab Unlimited, Medicine Hat, Alberta Canada. Palynological slides are prepared by acid reduction of a rock sample, and by filtration of the resulting organic residue. Slides are analyzed under a Nikon Eclipse E600 Polar Light Microscope (PLM) with an attached camera. Attached to the PLM is a mechanical stage which permits systematic movements laterally and vertically under high microscopic power to examine the entire slide area. Dinoflagellates are recorded, analyzed and identified. Palynomorph identification is done under the guidance of Dr. Lucy Edwards, U.S. Geological Survey, Reston, VA and Dr. John A. Chamberlain Jr.

STRATIGRAPHY

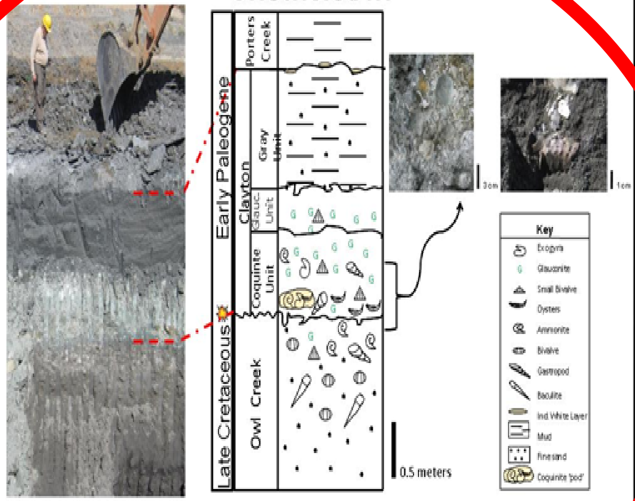


Figure 2. The image on the left is the exposure of the study site located in SE Missouri in Stoddard County. On the right side of the image is a stratigraphic column of the sedimentary sequence with relation to age. The boundary between the Owl Creek and Clayton Formation is marked by an orange symbol which is there to indicate the end of the K-Pg asteroid impact event. The stratigraphic column is accompanied by a key, fossils are not drawn to scale. [illegible] Creek Formation in southeastern Missouri is a micaceous quartz rich fossiliferous fine silty sand which lays unconformably below the Clayton Formation. [illegible] Clayton Formation can generally be described as an overall green glauconitic muddy sand with what appears to be a fossiliferous lag composed of [illegible] Cretaceous fossils within the basal 75-100 centimeters. This fossiliferous component is cemented with calcite in places making the coquinite appear pod-like and discontinuous in this section. Above the Clayton is the Porters Creek Formation which is an unfossiliferous gray claystone. The image in [illegible] upper right is a photo of the characteristic lithology of the basal Clayton (coquinite), to image to the right of that is [illegible] Late Maastrichtian index ammonite, [illegible] iris, which has been extracted from the Owl Creek and the coquinite of the Clayton.

AMMONITE & BACULITE SEM ANALYSIS

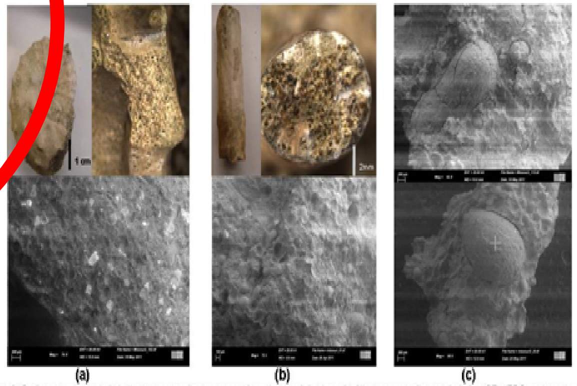
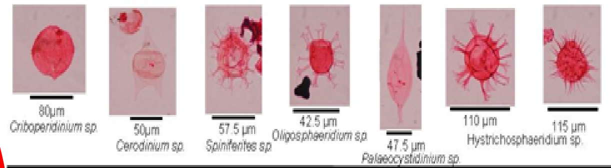


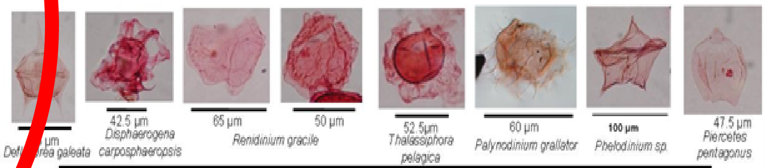
Figure 3. Sediment preserved within the two ammonites recovered from the coquinite deposit of the research site are dissimilar, SEM/EDS analyses have been done for the matrix of each fossil to identify mineralogical content. The sediment within the scaphite **(a)** contains material which is comparable to the mineralogy of the coquinite, the scaphite is composed of contains 80% quartz and 20% glauconite. Whereas, the matrix of the baculite **(b)** is similar to that of the tektite-containing rip-ups **(c)**, also found in the coquinite. Within the baculite, the 'tektite-like' spherules are Fe-rich and reside within a calcium rich matrix, as are the Fe-spherules found within the rip-ups. However, the rip-ups contain larger tektites which are green to dark brown in color. They are slightly different in composition. Palynological analysis of sediment preserved within the phragmacone of a baculite and scaphite discovered at the site will also be analyzed. Dinoflagellates preserved within the ammonites will provide some enlightenment as to whether survival for sometime after the K-Pg extinction.

MICROPALEONTOLOGY

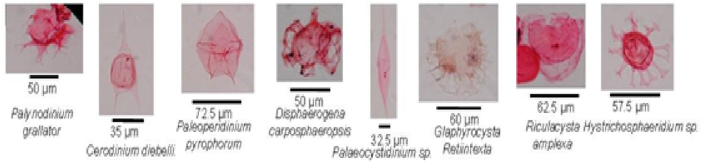
PALYNOMORPHS OF THE PORTERS CREEK FORMATION



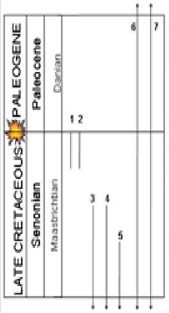
PALYNOMORPHS OF THE CLAYTON FORMATION (COQUINITE)



PALYNOMORPHS OF THE OWL CREEK FORMATION



SELECTED DINO RANGES



1. *Palynodinium grallator*
2. *Disphaerogena carposphaeropsis*
3. *Deflandrea galeata*
4. *Thalassiphora pelagica*
5. *Piercetes pentagonus*
6. *Cerodinium diebelii*
7. *Palaeoperidinium pyrophorum*

INTERPRETATIONS

Preliminary palynological results indicate the presence of two dinoflagellate species within the basal Clayton (coquinite) that are considered to be indicators of the uppermost part of the upper Maastrichtian: *Palynodinium grallator*–Gocht (1970), and *Disphaerogena carposphaeropsis*–Wetzel (1993), and two middle late Maastrichtian forms: *Deflandrea galeata*–Lejuene-Carpentier, 1942 (Lentin & Williams 1973) and *Thalassiphora pelagica*–Eisenack, 1954 (Eisenack & Gocht, 1960). All of these taxa are found within the uppermost Owl Creek and the lowermost section of the coquinite of the lower Clayton. The middle section of the coquinite preserve sparse dinoflagellate occurrences that represent only stratigraphically and temporally wide-ranging taxa. The uppermost coquinite has a higher dinoflagellate recovery, similar to the basal section, and contains the uppermost Maastrichtian index forms, *Palynodinium grallator* and *Deflandrea galeata*. So far no Danian dinoflagellates have been recovered from the coquinite. The dinoflagellate data support the ammonite record in indicating a latest Maastrichtian age for the basal Clayton coquinite, and suggest that the spherule-bearing rip-ups may represent deposition from an impact-induced tsunami as opposed to revealing a mixed assemblage of K-Pg dinoflagellate species that would be more supportive of transgressive lag deposit.

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I would like to acknowledge my Lucy Edwards for her guidance and support throughout the project. Special thanks to Dr. Brathwaite & the NYC - **L**ouis **S**tokes **A**lliance for **M**inority **P**articipation Program.

Presented at the Joint NE Sectional GSA Meeting, Hartford, CT, March 18, 2012

Background Information/Introduction

- Introducing your study area
- Why your research question is important or interesting
- Information about what we already know about your topic (summarize background research)

TRACE ELEMENT CHEMISTRY OF MODERN SHARK TEETH AND IMPLICATIONS FOR SHARK TOOTH GEOCHRONOMETRY

JOHN, Jesse, Geology, Brooklyn College, 2900 Bedford Avenue, Brooklyn, 11210, jesseajohn@gmail.com

ABSTRACT

We have determined the average trace element concentration in the dentine and enameloid of teeth from a variety of coastal, inshore and pelagic shark species: *Galeocerdo cuvier* (tiger shark), *Carcharhinus limbatus* (black tip), *Carcharias taurus* (sand tiger), *Carcharhinus leucas* (bull shark), *Prionace glauca* (blue shark), *Isurus oxyrinchus* (mako shark), *Carcharhinus brevipinna* (spinner shark), *Sphyrna zygaena* (smooth hammerhead) and *Hexanchus griseus* (bluntnose six gill shark). Teeth were collected from the jaws of recently deceased individuals of these species, and the trace element concentration of aliquots prepared from samples of the interior and root dentine and cusp enameloid were analyzed using the inductively coupled plasma mass spectrometer housed in the Environmental Sciences Analytical Center at Brooklyn College. The average concentration ranges for each shark species measured so far are: REE and U, <1 ppm; Ba, Ni, Mn, Vn, 1 to 10 ppm; Al, Zn, Cu, 10 to 100 ppm; and Sr, 1000 to 3000 ppm. Dentine, which is much more porous than enameloid, shows significantly wider fluctuations in within-species trace element concentrations than does enameloid. We have not yet been able to detect noticeable trace element differences among species in tooth enameloid. This result supports the view that trace element uptake and deposition in tooth enameloid reflects the average trace element concentration of ocean water. Sharks do not appear to be preferentially fractionating trace elements metabolically and concentrating them in their teeth. We interpret this to mean that the life habits of the animals we tested, and the food sources they utilized, are sufficiently broad to have exposed our sharks to [illegible] in oceanic chemistry. This result needs further corroboration but suggests that the trace element composition of well preserved fossil shark teeth may be indicative of the trace element distribution in the ancient oceans which they inhabit. It also suggests a possible approach to developing a mechanism for evaluating the degree of diagenetic alteration in the trace element composition of fossil shark tooth enameloid, and possibly make fossil shark teeth reliable geochronometers for post-Silurian marine sediments.

METHODOLOGY

Individual teeth were extracted from the jaw of one pelagic shark using a Dremmel moto tool. The extracted teeth were then then soaked in sodium hydroxide (24hrs) and Sodium Hypochlorite (12hrs) to remove any remaining organic compounds.

Using the precision of a diamond scribe tool we can then sample the enamel and dentine in the teeth individually. We then digest the teeth in hydrochloric acid and prepare them for ICP-MS analysis.

RESULTS

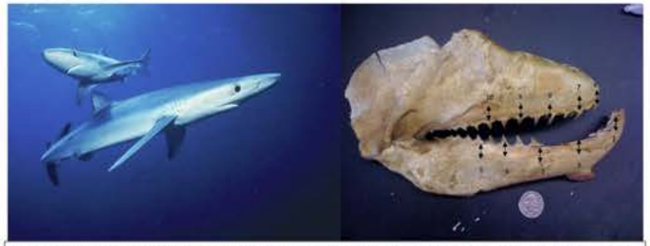
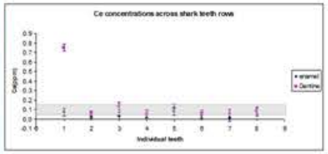
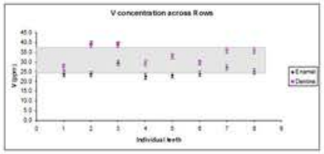
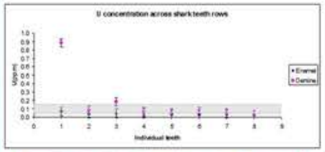


Fig. 1.1 Blue shark (*Prionace Glauca*) is an open-water pelagic shark, its teeth composition should reflect the composition of ambient ocean water and are not affected by diagenetic processes or alterations as can be observed in fossil shark teeth. (Right) jaw showing sample teeth locations that were chosen for analysis. The tooth at sample site 1 and 2 was already removed when this photo was taken.







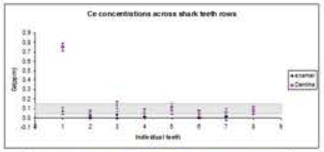
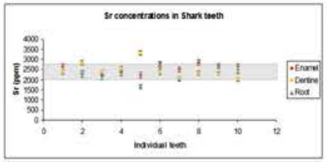
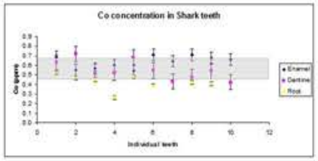
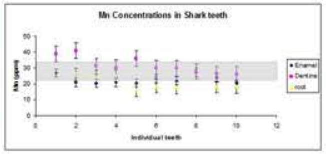
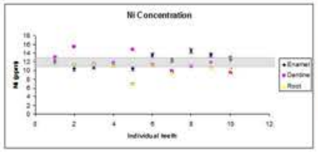


Fig. 2 Tiger Shark (*Galeocerdo Cuvier*) migrate back and forth from coastal to pelagic waters, they are renowned for their vivacious appetites and will feast on anything it can sink its teeth into from turtles to dolphins. (Right) jaw showing sample teeth locations that were chosen for analysis.









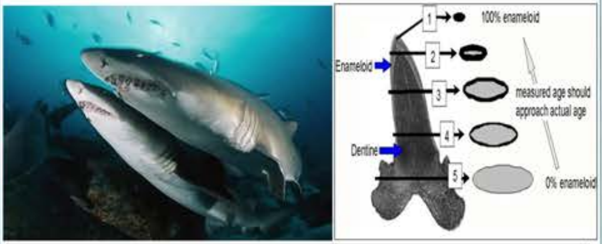


Fig 3. Sand Tiger shark (*Carcharias Taurus*) lives in coastal waters. Despite their rows of ragged teeth and vicious appearance, sand tiger sharks are actually rather docile, usually attacking humans only in self-defense.

Discussion

-Our preliminary data suggests that there is no significant difference in trace element concentration between the front (symphysis), middle (lateral) and back (posterior) teeth within a given row of teeth. This evidence supports the argument that different teeth within a row contain homogenous trace element concentrations .

- Modern shark teeth contain low concentrations of Rare Earth Elements (REE) such as U, La, Ho amongst others; these elements have the potential to be utilized to detect and possibly circumvent diagenetic alteration of fossil shark teeth. In the event that we are successful In this endeavor shark teeth will provide a useful venue as a Rb/Sr geochronological tool.

- Shark teeth enameloid appears to be slightly enriched (<100ppm) with Sr compared to dentine; more species need to be analyzed to confirm these findings. However in the event that these trends are accurate, this difference needs to be factored into any geochronological investigation due to the fact that excess Sr could lead to older erroneous dates

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Supported by: CUNY Brooklyn College GIP Award Fall 2011

Methodology

- Similar to a scientific procedure as done in class
  - Written in paragraph form
- Where you got your data
  - What were the steps you did in order to collect your data
  - Any special devices used?
  - How did you analyze your data?

TIN SOURCES ASSOCIATED WITH BRONZE AGE ARCHAEOLOGICAL SITES IN WEST SERBIA

HUSKA, Andrea[1], POWELL, Wayne[1], BANKOFF, H. Arthur[2], and BOGER, Rebecca[1], (1) Department of Earth and Environmental Sciences, Brooklyn College, 2900 Bedford Avenue, Brooklyn, NY 11210, huska.andrea@gmail.com, (2) Department of Anthropology and Archaeology, Brooklyn College, 2900 Bedford Avenue, Brooklyn, NY 11210

Abstract

The discovery of Bronze Age archaeological sites in West Serbia has led to a search of local tin-bearing minerals and their bedrock sources. A rare metal, tin is essential for making the alloy bronze (about 90% copper and 10% tin). To test the hypothesis that at least some of the tin used by Serbian Bronze Age settlements was mined locally from placer deposits, sand and gravel samples were collected every 50 meters from sand bar, bank and stream bottom deposits of the Milina and Ravnajica tributaries flowing south of Mt Cer. In the field, samples were washed, separated into sand and gravel fractions, dried, and analyzed for metal contents using a hand-held X-ray fluorescence apparatus with an approximate detection limit of 50-150ppm for Sn. Only two of 130 samples yielded Sn levels above detection limits. However, subsequent heavy -mineral separates produced by a float/sink process using sodium-polytungstate increased the Sn signal in reprocessed samples. For example, one sample that yielded a statistically invalid concentration of 21ppm in the total sand fraction, yielded a tin concentration of 24,398 ppm in the heavy mineral concentrate. SEM and EDS analysis of Sn-bearing heavy mineral concentrates indicate that tin is present in at least two optically and chemically distinct forms of cassiterite (black, low-Al; brown, high-Al), and that cassiterite-bearing sands also contain the Nb-Ta-bearing mineral columbite. Having documented the presence of tin ore in the region, sampling and analysis will expand in 2011 with field implementation of heavy mineral concentration by heavy liquids.

Historical Context

The European Bronze Age (2200-1050 B.C.E.) was a period in which bronze was the material predominantly used to make functional parts of implements, and signifies a stage in technological evolution. Bronze is made by alloying copper with tin. During the Bronze Age it quickly became fundamental in economic production and social reproduction. There was an abrupt transition to Bronze over a large area.

Copper was present in many places, while tin was rare, and it is uncertain whether tin was mined by Bronze Age people. The majority of societies had neither copper nor tin, and as a result, there was an increase in exchange systems along long-distance trade routes that ran through a series of concentrated settlements, including settlements in western Serbia. We hypothesize that there was a tin source in West Serbia that was directed to the Aegean along this established trade route.

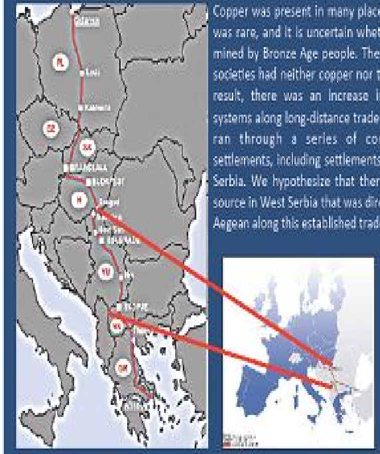


Fig. 1: Ancient international trade route connecting the north and south of Europe through Serbia

Geology of the Jadar Region

Serbia is composed of four geologic regions: the Dinarides, the Serbo-Macedonian Massif, the Carpatho-Balkanides and overlying Neogene sediments (Fig. 1). The field area lies within the Jadar Block Zone, an accreted terrane within the Vardar Zone of the Serbo-Macedonian Massif (Fig. 2). The Jadar Block Terrane is an exotic terrane that represents a detached continental slope block dominated by flysch and olistrostromal siliciclastics. These units were unaffected by Variscan deformation and metamorphism (Late Carboniferous). The Jadar Block Terrane had docked with the Vardar Superterrane prior to the Late Cretaceous and is thrust over the highly tectonized Dinarides (including an ophiolite belt) to the southwest. Following collision, the Jadar Block was overlain by a Middle Permian to Triassic shallow marine overstep sequence consisting of limestone, evaporites, and siliciclastics.

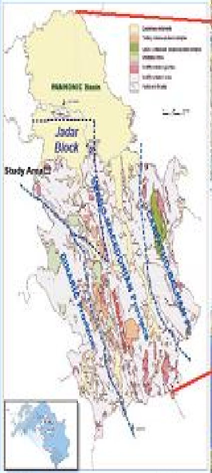


Fig. 2: Basic geologic divisions of Dimitrijevic (1997) of Serbia.

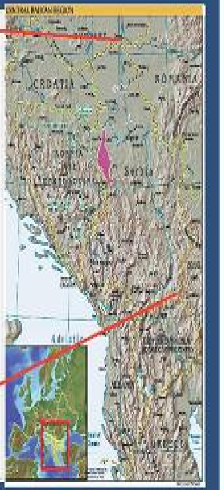


Fig. 3: West Serbia and highlighted Jadar drainage basin.

Oligocene to Neogene collision between Africa and Europe resulted in deposition of Neogene sediments and a magmatic activity during which dacites, quartz latites and andesites (and subvolcanic equivalents) were emplaced. Most metallic ore deposits in the Jadar Block Terrane are associated with the deep-seated bounding fault along the southwest edge of the Jadar Block. Hydrothermal Pb-Zn and Sb deposits are the most abundant type economic ore deposits in the Jadar Block. Sub-economic Sn deposits occur as low-grade in-situ greisen deposits that contain cassiterite, wolframite, and columbite (e.g., Cer) and cassiterite-bearing placers, but these deposits have not been described or documented in any detail.

Methodology

Samples were taken during the summer 2010 field season from sand bars, banks, and stream bottoms along the Milina and Ravnajica tributaries of the Jadar flowing south from Mt. Cer. Samples included both sand and gravel, and were washed, panned and sieved in situ. The fine and coarse sand sediments were then tested for elemental constituents using a hand-held X-ray fluorescence apparatus (XRF) with a detection limit for tin of 50-150ppm. Over 130 samples were taken and processed in this manner. Tin was non-detectable in most of the samples. Only three samples yielded statistically significant Sn concentrations, however, many samples yielded low concentrations (10-30ppm) that were below the detection limit of the XRF (Fig. 3).

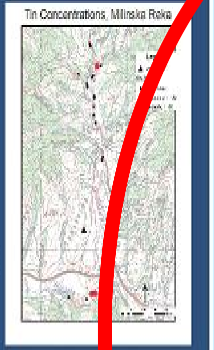
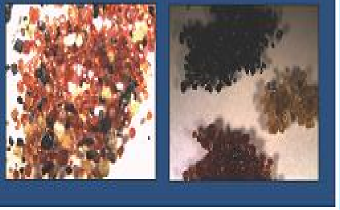


Fig. 4: Map showin[illegible] [illegible]tions and relative tin concentrations [illegible]mples.

Samples with non-significant Sn (<100 ppm) were further processed [illegible]ing heavy liquid (sodium polytungstate, d = 2.89 g/cm^3) separation, resulting i[illegible]ree divisions based on density: (1) <2.89 g/cm^3 (2) ~2.89 g/cm^3 and (3) >2.89 g/cm[illegible]ee Fig. 4). The >2.89 g/cm^3 separates (e.g., Fig 6a) were then washed twice to re[illegible]ve any residual liquid, dried, reanalyzed by XRF, and subdivided based on colo[illegible]lack, red, yellow, misc) (e.g., Fig 6b) under binocular microscope. Each color fracti[illegible] was then analyzed using SEM/EDS to identify minerals and document composition[illegible]ariation.

Fig. 5:
(a) Erlenmeyer f[illegible] for three density separa[illegible] with Kimble Separatory Fun[illegible] with heavy poly-tungsta[illegible] liquid.
(b) Completed separates increasing in density from right to left.

Fig. 6:
(a) Heavy mineral separate prior to color separation.
(b) Black, Red, and yellow mineral separates.



Results

SEM and EDS analysis of 10 reprocessed samples show cassiterite in sample[illegible]at had initially yielded non-detectable or non-significant Sn concentrations (<100 pp[illegible] At least two optically and chemically distinct forms of cassiterite are present (black, [illegible]w-Al; brown, high-Al). Other minerals that were identified, and which may act as trac[illegible] minerals for Sn-ore include the Nb-Ta bearing mineral columbite, and garnets that contain Ce ± La (see table and images below).

Sample	In situ Sn concentration (ppm)	Sn Concentration in heavy mineral separate (ppm)	Sn-Bearing minerals	Ore accessory Mineral	Other minerals
ML 1	ND	not yet reanalyzed	Cassiterite	Ce-La-Garnet	Garnet
ML 2	26	not yet reanalyzed	Cassiterite	Ce-Garnet	Biotite
ML 3	12	not yet reanalyzed		Ce-La-Garnet, Columbite	
ML 4	1	not yet reanalyzed		Ce-La-Garnet, Columbite	
ML 5	18	not yet reanalyzed		Ce-Garnet	Biotite, Hornblende
ML 6	ND	not yet reanalyzed		Ce-Garnet, Columbite	Garnet, Biotite, Hornblende
ML 8	21	24398	Al-Cassiterite, Cassiterite	Ce-Garnet, Columbite	Garnet, Biotite, Magnetite, Titanite
ML 9	2	ND		Ce-Garnet	Biotite, Garnet, Hornblende, Titanite
ML 11	ND	126	Cassiterite	Ce-Garnet	
ML 12	88	not yet reanalyzed	Cassiterite	Ce-Garnet	Garnet, Hornblende

Table 1 (above): Sn concentrations of samples prior to and after processing. Minerals recorded from SEM and EDS Analysis.

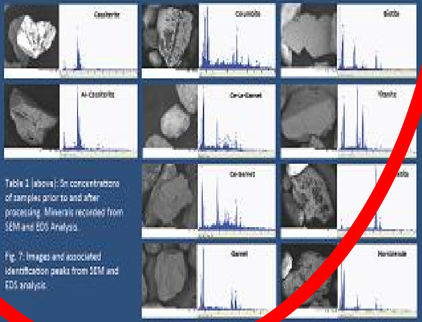


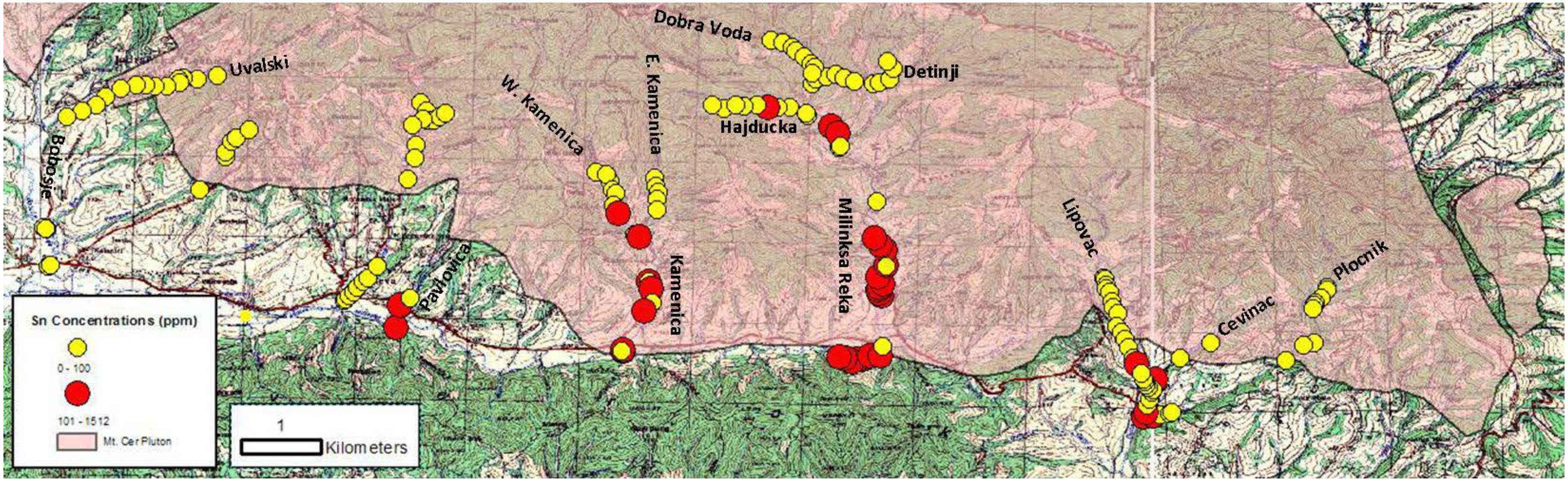
Fig. 7: Images and associated identification peaks from SEM and EDS analysis.

Future Work

The heavy liquid separate methodology has proven successful in confirming truly non-detectable samples, and showing previously non-detectable and sub-detectable samples to have evidence of Sn-bearing minerals. Associated ore minerals include columbite, Ce-garnet, and Ce-La-garnet. The data proves that there is tin draining from Mt. Cer into the Milina and Ravnajica tributaries of the Jadar, that could have possibly been a source of tin transported to the Aegean. Further sampling and expansion of the study area will be done in the summer 2011 field season. Heavy liquid mineral seperation will be done on-site. Detailed SEM and EDS analysis to document minerals assemblages and compositions, and their variations, allow us to infer aspects of the bedrock geology of study area and the characteristics of the tin deposits in the region.

Results and Figures

- What will our results look like?
  - Map? Table, Chart?
  - 5-7 sentence summary of correlations that you found in your research.
  - All figures must be labeld and have captions



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RESULTS

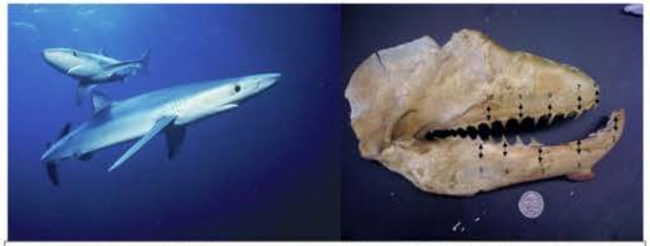
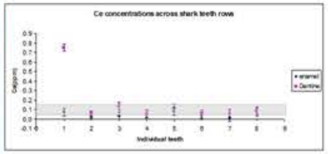
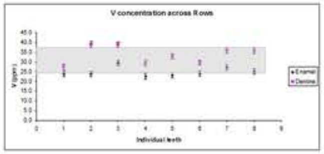
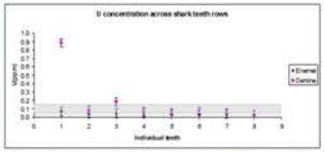


Fig. 1.1 Blue shark (*Prionace Glauca*) is an open-water pelagic shark, its teeth composition should reflect the composition of ambient ocean water and are not affected by diagenetic processes or alterations as can be observed in fossil shark teeth. (Right) jaw showing sample teeth locations that were chosen for analysis. The tooth at sample site 1 and 2 was already removed when this photo was taken.







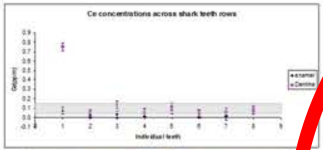
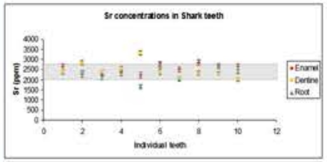
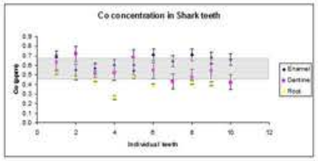
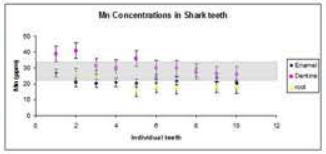
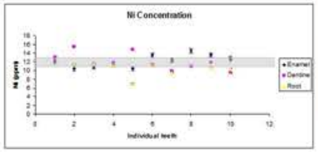


Fig. 2 Tiger Shark (*Galeocerdo Cuvier*) migrate back and forth from coastal to pelagic waters, they are renowned for their vivacious appetites and will feast on anything it can sink its teeth into from turtles to dolphins. (Right) jaw showing sample teeth locations that were chosen for analysis.









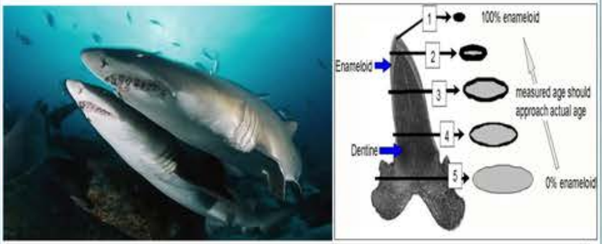


Fig 3. Sand Tiger shark (*Carcharias Taurus*) lives in coastal waters. Despite their rows of ragged teeth and vicious appearance, sand tiger sharks are actually rather docile, usually attacking humans only in self-defense.

Discussion

-Our preliminary data suggests that there is no significant difference in trace element concentration between the front (symphysis), middle (lateral) and back (posterior) teeth within a given row of teeth. This evidence supports the argument that different teeth within a row contain homogenous trace element concentrations.

- Modern shark teeth contain low concentrations of Rare Earth Elements (REE) such as U, La, Ho amongst others; these elements have the potential to be utilized to detect and possibly circumvent diagenetic alteration of fossil shark teeth. In the event that we are successful In this endeavor shark teeth will provide a useful venue as a Rb/Sr geochronological tool.

- Shark teeth enameloid appears to be slightly enriched (<100ppm) with Sr compared to dentine; more species need to be analyzed to confirm these findings. However in the event that these trends are accurate, this difference needs to be factored into any geochronological investigation due to the fact that excess Sr could lead to older erroneous dates

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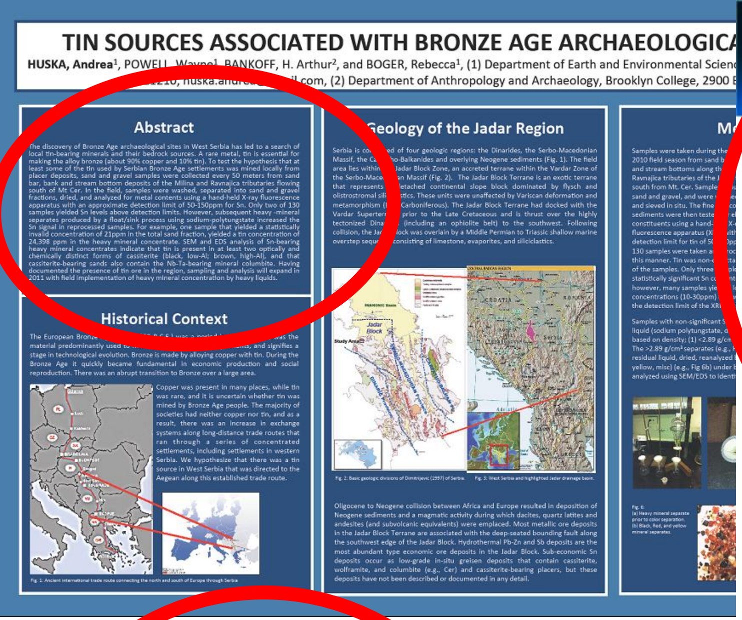
Supported by: CUNY Brooklyn College GIP Award Fall 2011

Conclusions/Discussion

- These should be a paragraph summary of your answer to your research question
- Should discuss how we can work toward environmental justice for this problem.



TIN SOURCES ASSOCIATED WITH BRONZE AGE ARCHAEOLOGICA

HUSKA, Andrea[1], POWELL, Wayne[1], BANKOFF, H. Arthur[2], and BOGER, Rebecca[1], (1) Department of Earth and Environmental Scienc
…1210, huska.andre…il.com, (2) Department of Anthropology and Archaeology, Brooklyn College, 2900 B

Abstract

The discovery of Bronze Age archaeological sites in West Serbia has led to a search of local tin-bearing minerals and their bedrock sources. A rare metal, tin is essential for making the alloy bronze (about 90% copper and 10% tin). To test the hypothesis that at least some of the tin used by Serbian Bronze Age settlements was mined locally from placer deposits, sand and gravel samples were collected every 50 meters from sand bar, bank and stream bottom deposits of the Milina and Ravnajica tributaries flowing south of Mt Cer. In the field, samples were washed, separated into sand and gravel fractions, dried, and analyzed for metal contents using a hand-held X-ray fluorescence apparatus with an approximate detection limit of 50-150ppm for Sn. Only two of 130 samples yielded Sn levels above detection limits. However, subsequent heavy -mineral separates produced by a float/sink process using sodium-polytungstate increased the Sn signal in reprocessed samples. For example, one sample that yielded a statistically invalid concentration of 21ppm in the total sand fraction, yielded a tin concentration of 24,398 ppm in the heavy mineral concentrate. SEM and EDS analysis of Sn-bearing heavy mineral concentrates indicate that tin is present in at least two optically and chemically distinct forms of cassiterite (black, low-Al; brown, high-Al), and that cassiterite-bearing sands also contain the Nb-Ta-bearing mineral columbite. Having documented the presence of tin ore in the region, sampling and analysis will expand in 2011 with field implementation of heavy mineral concentration by heavy liquids.

Historical Context

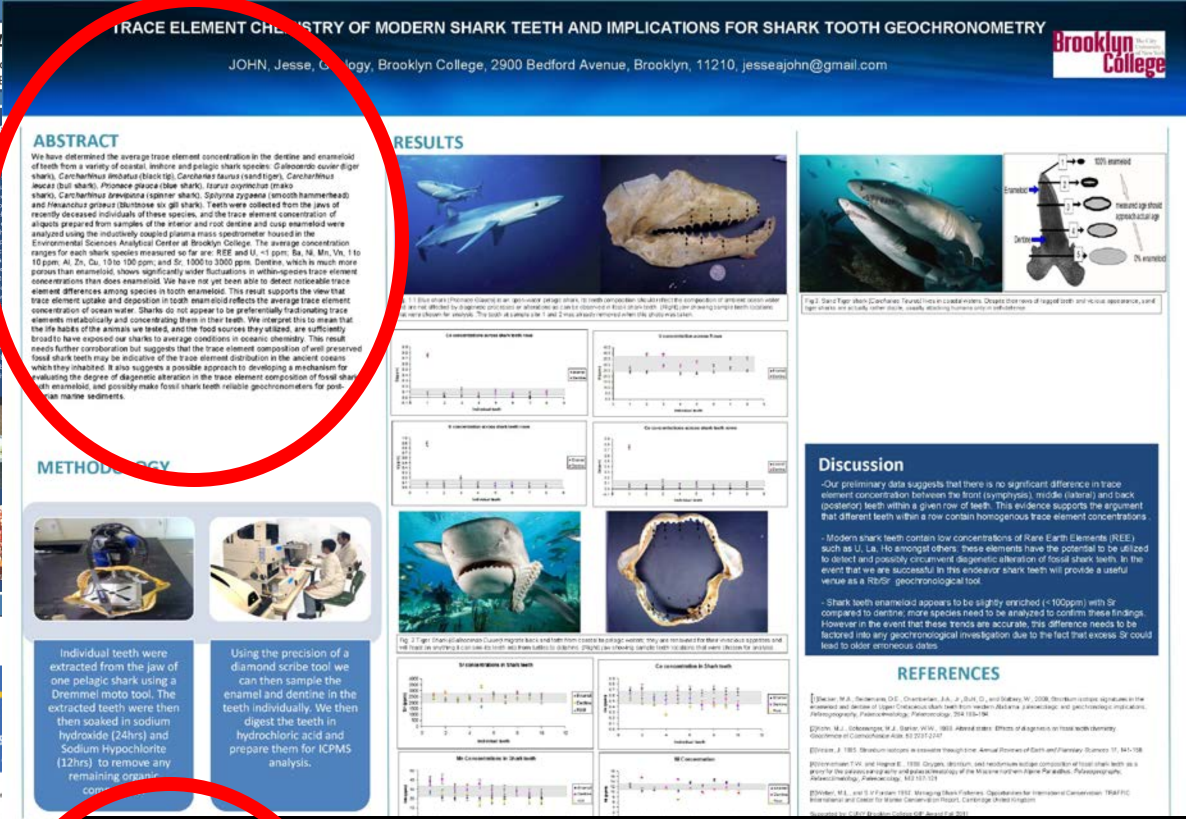
Copper was present in many places, while tin was rare, and it is uncertain whether tin was mined by Bronze Age people. The majority of societies had neither copper nor tin, and as a result, there was an increase in exchange systems along long-distance trade routes that ran through a series of concentrated settlements, including settlements in western Serbia. We hypothesize that there was a tin source in West Serbia that was directed to the Aegean along this established trade route.

Geology of the Jadar Region

Fig. 2: Basic geologic divisions of Dimitrijevic (1997) of Serbia.

Fig. 3: West Serbia and highlighted Jadar drainage basin.

Oligocene to Neogene collision between Africa and Europe resulted in deposition of Neogene sediments and a magmatic activity during which dacites, quartz latites and andesites (and subvolcanic equivalents) were emplaced. Most metallic ore deposits in the Jadar Block Terrane are associated with the deep-seated bounding fault along the southwest edge of the Jadar Block. Hydrothermal Pb-Zn and Sb deposits are the most abundant type economic ore deposits in the Jadar Block. Sub-economic Sn deposits occur as low-grade in-situ greisen deposits that contain cassiterite, wolframite, and columbite (e.g., Cer) and cassiterite-bearing placers, but these deposits have not been described or documented in any detail.



TRACE ELEMENT CHE…STRY OF MODERN SHARK TEETH AND IMPLICATIONS FOR SHARK TOOTH GEOCHRONOMETRY

JOHN, Jesse, G…logy, Brooklyn College, 2900 Bedford Avenue, Brooklyn, 11210, jesseajohn@gmail.com

ABSTRACT

We have determined the average trace element concentration in the dentine and enameloid of teeth from a variety of coastal, inshore and pelagic shark species: *Galeocerdo cuvier* (tiger shark), *Carcharhinus limbatus* (black tip), *Carcharias taurus* (sand tiger), *Carcharhinus leucas* (bull shark), *Prionace glauca* (blue shark), *Isurus oxyrinchus* (mako shark), *Carcharhinus brevipinna* (spinner shark), *Sphyrna zygaena* (smooth hammerhead) and *Hexanchus griseus* (bluntnose six gill shark). Teeth were collected from the jaws of recently deceased individuals of these species, and the trace element concentration of aliquots prepared from samples of the interior and root dentine and cusp enameloid were analyzed using the inductively coupled plasma mass spectrometer housed in the Environmental Sciences Analytical Center at Brooklyn College. The average concentration ranges for each shark species measured so far are: REE and U, <1 ppm; Ba, Ni, Mn, Vn, 1 to 10 ppm; Al, Zn, Cu, 10 to 100 ppm; and Sr, 1000 to 3000 ppm. Dentine, which is much more porous than enameloid, shows significantly wider fluctuations in within-species trace element concentrations than does enameloid. We have not yet been able to detect noticeable trace element differences among species in tooth enameloid. This result supports the view that trace element uptake and deposition in tooth enameloid reflects the average trace element concentration of ocean water. Sharks do not appear to be preferentially fractionating trace elements metabolically and concentrating them in their teeth. We interpret this to mean that the life habits of the animals we tested, and the food sources they utilized, are sufficiently broad to have exposed our sharks to average conditions in oceanic chemistry. This result needs further corroboration but suggests that the trace element composition of well preserved fossil shark teeth may be indicative of the trace element distribution in the ancient oceans which they inhabited. It also suggests a possible approach to developing a mechanism for evaluating the degree of diagenetic alteration in the trace element composition of fossil shar… …th enameloid, and possibly make fossil shark teeth reliable geochronometers for post-…rian marine sediments.

METHODO…OGY

Individual teeth were extracted from the jaw of one pelagic shark using a Dremmel moto tool. The extracted teeth were then then soaked in sodium hydroxide (24hrs) and Sodium Hypochlorite (12hrs) to remove any remaining organic com…

Using the precision of a diamond scribe tool we can then sample the enamel and dentine in the teeth individually. We then digest the teeth in hydrochloric acid and prepare them for ICPMS analysis.

RESULTS

Discussion

-Our preliminary data suggests that there is no significant difference in trace element concentration between the front (symphysis), middle (lateral) and back (posterior) teeth within a given row of teeth. This evidence supports the argument that different teeth within a row contain homogenous trace element concentrations.

- Modern shark teeth contain low concentrations of Rare Earth Elements (REE) such as U, La, Ho amongst others; these elements have the potential to be utilized to detect and possibly circumvent diagenetic alteration of fossil shark teeth. In the event that we are successful in this endeavor shark teeth will provide a useful venue as a Rb/Sr geochronological tool.

- Shark teeth enameloid appears to be slightly enriched (<100ppm) with Sr compared to dentine; more species need to be analyzed to confirm these findings. However in the event that these trends are accurate, this difference needs to be factored into any geochronological investigation due to the fact that excess Sr could lead to older erroneous dates.

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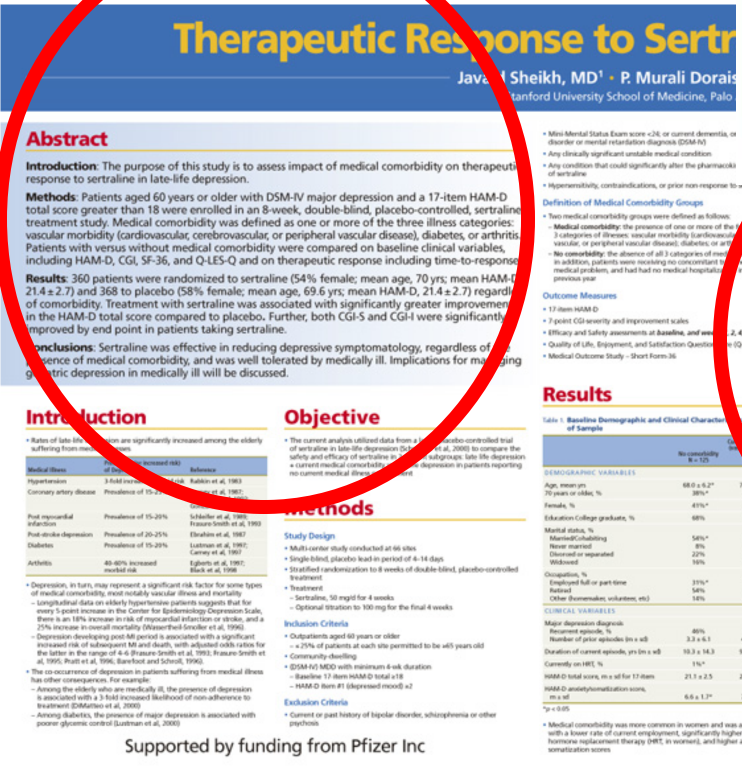


Therapeutic Re…ponse to Sertr

Java… Sheikh, MD[1] • P. Murali Dorais…
…tanford University School of Medicine, Palo

Abstract

Introduction: The purpose of this study is to assess impact of medical comorbidity on therapeuti… response to sertraline in late-life depression.

Methods: Patients aged 60 years or older with DSM-IV major depression and a 17-item HAM-D total score greater than 18 were enrolled in an 8-week, double-blind, placebo-controlled, sertraline treatment study. Medical comorbidity was defined as one or more of the three illness categories: vascular morbidity (cardiovascular, cerebrovascular, or peripheral vascular disease), diabetes, or arthritis. Patients with versus without medical comorbidity were compared on baseline clinical variables, including HAM-D, CGI, SF-36, and Q-LES-Q and on therapeutic response including time-to-response

Results: 360 patients were randomized to sertraline (54% female; mean age, 70 yrs; mean HAM-D 21.4 ± 2.7) and 368 to placebo (58% female; mean age, 69.6 yrs; mean HAM-D, 21.4 ± 2.7) regardl… of comorbidity. Treatment with sertraline was associated with significantly greater improvemen… in the HAM-D total score compared to placebo. Further, both CGI-S and CGI-I were significantly improved by end point in patients taking sertraline.

…onclusions: Sertraline was effective in reducing depressive symptomatology, regardless of … …sence of medical comorbidity, and was well tolerated by medically ill. Implications for ma…ging g…tric depression in medically ill will be discussed.

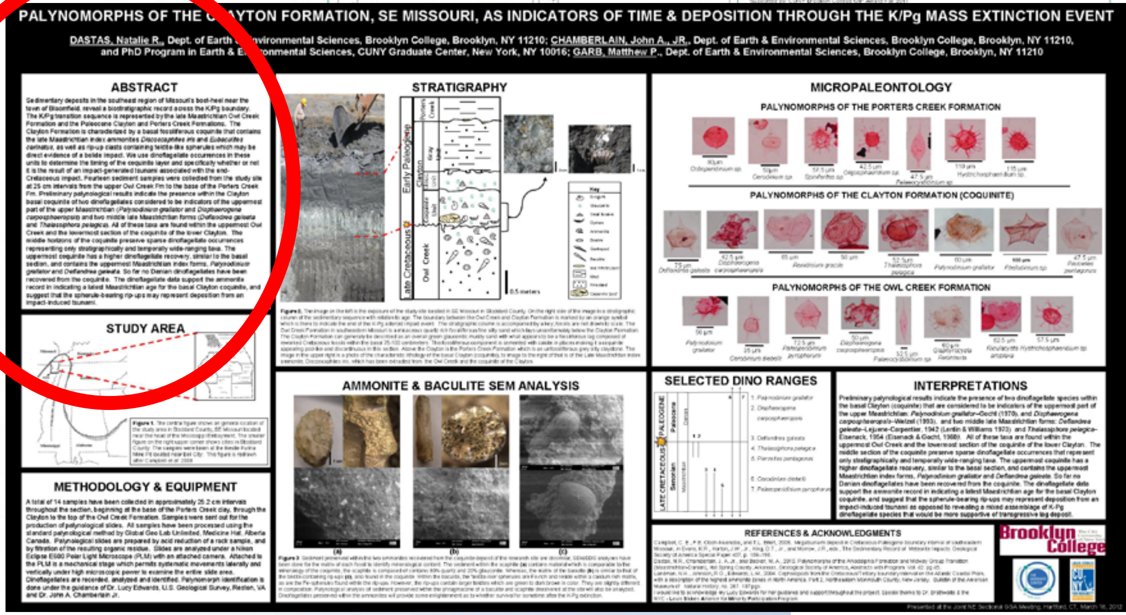
Intr…luction

Objective

…ethods

Results

Supported by funding from Pfizer Inc



PALYNOMORPHS OF THE C…AYTON FORMATION, SE MISSOURI, AS INDICATORS OF TIME & DEPOSITION THROUGH THE K/Pg MASS EXTINCTION EVENT

DASTAS, Natalie R., Dept. of Earth …nvironmental Sciences, Brooklyn College, Brooklyn, NY 11210; CHAMBERLAIN, John A., JR., Dept. of Earth & Environmental Sciences, Brooklyn College, Brooklyn, NY 11210,
and PhD Program in Earth & E…onmental Sciences, CUNY Graduate Center, New York, NY 10016; GARB, Matthew P., Dept. of Earth & Environmental Sciences, Brooklyn College, Brooklyn, NY 11210

ABSTRACT

Sedimentary deposits in the southeast region of Missouri's boot-heel near the town of Bloomfield, reveal a biostratigraphic record across the K/Pg boundary. The K/Pg transition sequence is represented by the late Maastrichtian Owl Creek Formation and the Paleocene Clayton and Porters Creek Formations. The Clayton Formation is characterized by a basal fossiliferous coquinite that contains the late Maastrichtian index ammonites *Discoscaphites iris* and *Eubaculites carinatus*, as well as rip-up clasts containing tektite-like spherules which may be direct evidence of a bolide impact. We use dinoflagellate occurrences in these units to determine the timing of the coquinite layer and specifically whether or not it is the result of an impact-generated tsunami associated with the end-Cretaceous impact. Fourteen sediment samples were collected from the study site at 25 cm intervals from the upper Owl Creek Fm to the base of the Porters Creek Fm. Preliminary palynological results indicate the presence within the Clayton basal coquinite of two dinoflagellates considered to be indicators of the uppermost part of the upper Maastrichtian (*Palynodinium grallator* and *Disphaerogena carposphaeropsis*) and two middle late Maastrichtian forms (*Deflandrea galeata* and *Thalassiphora pelagica*). All of these taxa are found within the uppermost Owl Creek and the lowermost section of the coquinite of the lower Clayton. The middle horizons of the coquinite preserve sparse dinoflagellate occurrences representing only stratigraphically and temporally wide-ranging taxa. The uppermost coquinite has a higher dinoflagellate recovery, similar to the basal section, and contains the uppermost Maastrichtian index forms, *Palynodinium grallator* and *Deflandrea galeata*. So far no Danian dinoflagellates have been recovered from the coquinite. The dinoflagellate data support the ammonite record in indicating a latest Maastrichtian age for the basal Clayton coquinite, and suggest that the spherule-bearing rip-ups may represent deposition from an impact-induced tsunami.

STUDY AREA

METHODOLOGY & EQUIPMENT

STRATIGRAPHY

AMMONITE & BACULITE SEM ANALYSIS

MICROPALEONTOLOGY

PALYNOMORPHS OF THE PORTERS CREEK FORMATION

PALYNOMORPHS OF THE CLAYTON FORMATION (COQUINITE)

PALYNOMORPHS OF THE OWL CREEK FORMATION

SELECTED DINO RANGES

INTERPRETATIONS

Preliminary palynological results indicate the presence of two dinoflagellate species within the basal Clayton (coquinite) that are considered to be indicators of the uppermost part of the upper Maastrichtian: *Palynodinium grallator*–Gocht (1970), and *Disphaerogena carposphaeropsis*–Wetzel (1933), and two middle late Maastrichtian forms: *Deflandrea galeata*–Lejuene-Carpentier, 1942 (Lentin & Williams 1973) and *Thalassiphora pelagica*-Eisenack, 1954 (Eisenack & Gocht, 1960). All of these taxa are found within the uppermost Owl Creek and the lowermost section of the coquinite of the lower Clayton. The middle section of the coquinite preserve sparse dinoflagellate occurrences that represent only stratigraphically and temporally wide-ranging taxa. The uppermost coquinite has a higher dinoflagellate recovery, similar to the basal section, and contains the uppermost Maastrichtian index forms, *Palynodinium grallator* and *Deflandrea galeata*. So far no Danian dinoflagellates have been recovered from the coquinite. The dinoflagellate data support the ammonite record in indicating a latest Maastrichtian age for the basal Clayton coquinite, and suggest that the spherule-bearing rip-ups may represent deposition from an impact-induced tsunami as opposed to revealing a mixed assemblage of K-Pg dinoflagellate species that would be more supportive of transgressive lag deposit.

REFERENCES & ACKNOWLEDGMENTS

ABSTRACT

- The abstract is a short summary of your whole project that has 1 or 2 summary sentences from each of the sections above
- This will determine if a person will continue reading your poster or move on to the next
- Generally, it is the last piece of the poster that is done, as it incorporates all sections

DO NOW

- Breaking up into teams, each group will write a rough draft of the sections they are assigned
- The examples are to be used as **guides**
- Prepare to present what you have written to the class

Title

Name, Name, Name

Abstract

Background

Image

Data Collection Methods

Image

Results

Conclusion

Acknowledgements

Image

References Cited

Title

Abstract

Introduction

Figures& Results

Methodology

Conclusions

Acknowledgements

Title Team Mission:

For this section think of 4-5 creative titles that are concise and clearly state the research hypothesis/questions. Be ready to share your titles.

Titles should be in statement form and are *not* questions.

TIME TO COMPLETE: 10 min

***you must join the Introduction group when finished**

Methodology Team Mission:

This section is similar to writing a scientific procedure except you are explaining your methods in paragraph form (do not number and/or list the steps).
Remember to be as concise and informative as possible.

Guiding Questions: How did you collect your data?
How did you analyze your data? What tools did you use?

TIME TO COMPLETE: 30 min

Results Team Mission:

You are in charge of looking at the data and writing a 5-7 sentence summary of correlations that you found in your research. Was the hypothesis right? Are there any patterns that you notice and if so, can these patterns be explained? Think about the implications of our results. This paragraph is important so do *not* rush through it.

TIME TO COMPLETE: 20min

***if you finish early, or are having trouble with writing, sketch out some figures that you think will best represent the results of the study and explain them.**

Conclusions Team Mission:

This section should be a paragraph (about 5-7 sentences) summary of your answer to your research question. There should be a discussion of the hypothesis, results and implications of the research. What could be done better next time? How can we work toward environmental justice for this problem?

TIME TO COMPLETE: 30min

Figures Team Mission:

What will our results look like? Be sure you are able to *explain* your ideas clearly to the rest of the class

- Map? Table, Chart? Which one(s) and *why*
- Sketch out some ideas of the figures you envision for the poster
  - Be as thorough as possible using the data given to you
- All figures must be labeled and have captions

TIME TO COMPLETE: 30min

***Hint: you may want to use Microsoft Excel to make graphing easier**