Report of Activities Carried Out

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To: Special Recruited Professor Seiichi Nakamura, Director of Research Center for Next Generation Archaeological Studies, Komatsu University

Subject: Activities carried out during the trip to Japan.

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In this report, I would like to describe in detail all the activities that I carried out during the trip to Japan from November 12 to 28 of this year.

A trip that helped me acquire knowledge in various fields and allowed me to see a different culture and how things work in a country different from ours.

November 14 – Arrival in Japan.

During this day, we arrived in the morning hours and began our journey to the hotel, where we were able to have a brief meeting with Prof. Ogawa and discussed a little about the activities to be carried out. We were able to exchange yen and learn a bit about the subway system in Japan.

We walked around Asakusa and some of its tourist attractions such as Sensoji Temple. A place closely related to what we usually see about Japan on this side of the world. Some temple designs and some fountains and temples based on the Buddhist religion.

November 15 – Participation in Prof. Noguchi's training and visit to museums.

We visited the National Research Institute for Cultural Properties, Tokyo. A museum where one can truly observe a large number of artifacts and history in one place. We

were able to see pieces from the Jomon, Yayoi, Kofun, Asuka, Edo periods, etc.
In this same museum, I gained hands-on experience with stamps to create an ukiyo-e image. An activity that greatly interested me as a way to attract tourists and provide them with a small souvenir of the museum they visited.
I would like to implement something similar at the Regional Museum of Maya Archaeology. The creation of an image of a stela using stamps so that tourists can have a self-made souvenir and thus remember their visit to this site.
On the same day, we visited the Museum of Western Art, where I observed an exhibition of different types of drawing and painting techniques.
I was able to see some bust sculptures, some oil paintings, others made with charcoal, and among the techniques I saw some portraits and some abstract paintings.
I can say that the area I liked the most was the one about the history of Christ, as each important scene was portrayed in a painting with impeccable art.
As the final part, we listened to a portion of the lecture given by Prof. Noguchi on 3D



scanning and
documentation, and participated in a group dinner with all the participants.

November 16 – Participation in training at the National Research Institute for Cultural Properties, Tokyo.

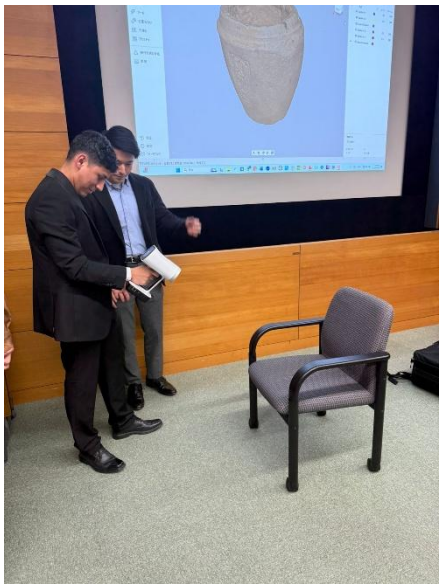
We began the day participating in the training given by Prof. Noguchi. A training session in which we were able to see a bit of what we have been doing in Copán during the past months.
In the afternoon, we had the honor of giving a presentation on the 3D activities carried

out in the PROARCO II project. Below, I will describe in more detail what I spoke about during this presentation.

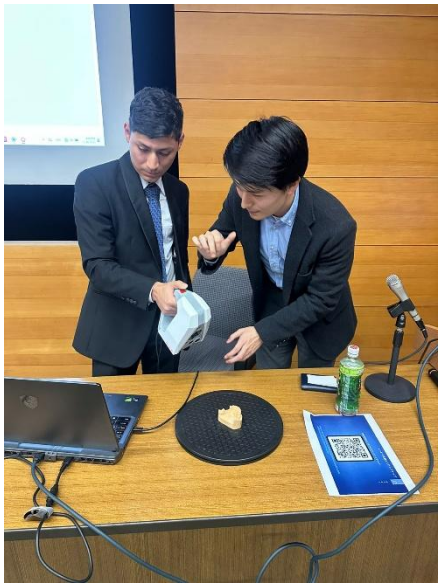
1. We started with personal introductions.
2. We introduced Honduras and Copán Ruinas so that participants who had some doubts about our country could learn a bit about it.
3. A presentation of the archaeological site was made, along with a public 3D survey, and we indicated the area where we are currently working with 3D at the archaeological site of Copán Ruinas.
4. I began presenting a bit about the equipment we use in Copán Ruinas and in what areas we are using 3D documentation.
5. We showed some of the scans and fieldwork processes, both from Temple 7 and Temple 8. We showed captures as well as some sectioned scans that I had merged using CloudCompare software.
6. We showed some scans of collection pieces and allowed participants to view some of the models we have on the project's iPads.

As the final activity of the day, we observed the presentation of some 3D scanners from the company Artec3D. During this presentation, the Leo and Spider II scanners were shown.
I had the opportunity to use both scanners to gain more experience and further my knowledge. I was able to ask some questions based on the work we are currently doing.
Leo Scanner – a handheld device with a digital screen to view the results immediately without needing a computer. Another favorable point of this scanner is that it works wirelessly, which helps mobility during scanning.
Spider II – a wired scanner that uses computer software to process the information. The advantage of this scanner is its greater precision and that it is slightly lighter than the previously mentioned one. A device capable of merging two scans quickly and effectively. Similar to the Eva scanner but with many improvements in all aspects. The price is definitely more accessible than the Leo scanner, and it would be useful to fully scan collection pieces in a faster and more effective manner.
Using both scanners is simple, and processing the scans is not very complicated as the computer software helps greatly in completing the work.

Presentation of practice case in Honduras.



Leo Scanner



Spider II Scanner

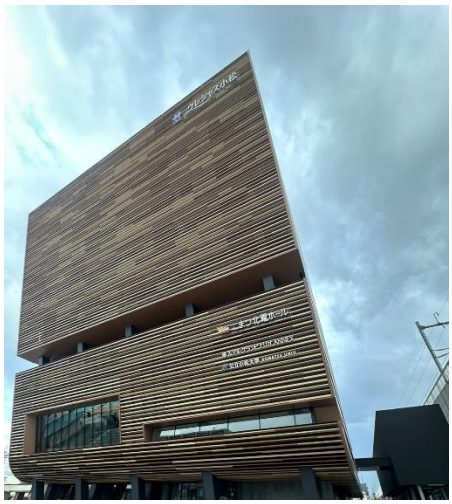
November 17 – Visit to Komatsu University

We were able to tour the Komatsu University campus, where we saw some of the new campus facilities along with Prof. Ogawa and S.R.Prof. Seiichi Nakamura.

We made a courtesy visit to the president of Komatsu University in Central Campus II, where we had the opportunity to speak with University President Prof. Hiroshi Yamamoto, M.D., Ph.D.

We discussed some of the activities we are currently carrying out in Copán Ruinas thanks to their support and expressed our desire to continue learning with the help of the university, as they have been assisting us throughout this process.

During this meeting, I presented a small gift of Café San Rafael so they could enjoy a taste of the coffee from our region, Copán Ruinas.
To end the day, we visited Komatsu No Mori, a place where large-scale heavy machinery is exhibited. We observed a dump truck and an excavator, where we could walk underneath and around them.



Komatsu University, Central Campus II

Komatsu No Mori

November 18 – Visit to Kanazawa University and participation in Spanish class at Komatsu University.

We visited the facilities of Kanazawa University and received a tour of the university museum, where Prof. Atsushi MATSUNAGA helped clarify our questions and explained everything found there and the history of this university.
During the visit, we conducted a test with an EVA scanner, where we were able to scan a piece and see how this scanner works. We were also able to test a screen with a console controller to navigate through the Kanazawa University campus.
We had lunch with three students who had accompanied us during several days in Copán Ruinas and Tikal. It was a pleasure to spend time with them again as they recommended aspects of their culture that we should try or learn about.
In the evening, we participated in the Spanish class taught by Prof. Ogawa at Komatsu University in Central Campus I, where we gave a brief presentation about the activities recently carried out in Copán Ruinas. Then we helped conduct conversation activities in Spanish to support the students during their class. We carried out conversations about

personal introductions, musical tastes, favorite shows or programs, and important Spanish vocabulary.

It is interesting to see the commitment they show in learning our language and the progress they have made in the short time they have been studying with Prof. Ogawa.

University of Kanazawa

November 19 – Testing spatial reality screen and work with S.R.Prof. Nakamura.

We began the day by visiting Komatsu University, where we were able to test a spatial reality screen that featured a tunnel tour and Temple 16. With this experience, I was able to observe from above the temple how that area looks, as it is currently not accessible.

We then went to S.R.Prof. Nakamura's office, where we helped with some needed office tasks. I scanned some documents and organized them into PDFs to share with him.

November 20 – Visit to Komatsu City Buried Cultural Properties Center and Suehiro Campus.

A very interesting visit to the Buried Cultural Properties Center of Komatsu City. A well-organized building in all aspects. We were able to observe the entire process carried out within the center and also see some of the pieces stored there.

What stood out to me in the process was storage distribution, and I left with many ideas I would like to propose for the CRIA in Copán Ruinas. For example, the storage system. It has always been said that the space in CRIA is becoming insufficient for the growing number of materials. During this visit, I observed a shelving system with rails that helps reduce space and provides better security for the pieces.

I observed storage of pieces in display cases with their respective temperature sensors. Something that seemed quite interesting, as temperature is a factor that has not been given much importance at CRIA, despite our interest in conservation.

They showed us proper conservation materials for each type of artifact. In this case, they showed us a chemical used to preserve wood called PEG-4000BCP.

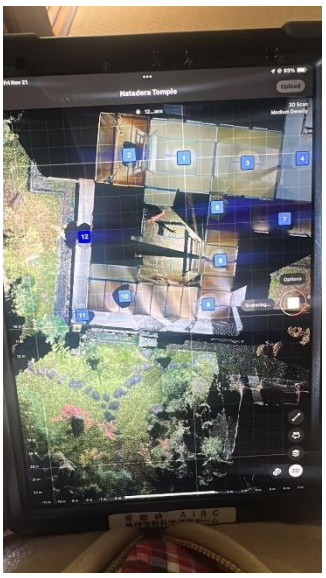
What also caught my attention was their method of documenting each artifact brought into the center. One person was in charge of hand-drawing the piece to scale, another person digitized the same drawing in Adobe Illustrator, and finally, they were beginning to implement photogrammetry to obtain more detailed digital records.
I would like to apply this process of digitizing hand-drawn illustrations in Adobe Illustrator to publish these drawings physically while also continuing to implement 3D scanning to maintain records and create digital exhibitions.
At the end of the tour, we began our presentation on the activities recently carried out in Copán Ruinas in the PROARCO II project.
We followed the same methodology used for the earlier presentation at the National Research Institute for Cultural Properties, Tokyo—from presenting our country to showcasing the 3D scanning work at the Maya site of Copán. This presentation was given in Spanish, and S.R.Prof. Seiichi Nakamura helped with translation for the staff at the Buried Cultural Properties Center of Komatsu City.
They were very interested in some of the models of the collection pieces we have in Scaniverse.

After finishing the visit, we headed to the Suehiro Campus where we met Prof. Izawa. She gave us a brief talk about cardboard VR goggles through which we could watch 360° videos of some Maya structures at Copán and also explained a bit about Xtion2, a compact 3D sensor camera. She then gave us a tour of the entire campus, which is focused on the medical field. We observed some medical equipment used during historical disease outbreaks and some advanced technology we had never seen before.
To end the day, we toured Ataka Park – Kanjincho Museum. In this museum, we learned how Ataka once functioned as a port of call for ships.
We observed the costumes of the characters Benkei, Togashi, and Yoshitsune, and interacted with a fun technology that allowed us to virtually try on the characters' clothes.
It would be a very good idea to implement something similar in the digital museum or community museum being planned. We could create costumes of Maya rulers or warriors for visitors to see how they would look wearing them. The same could be done with masks or artifacts used during the Maya civilization. It would offer tourists a greater experience in Copán Ruinas and make the museum a more interactive attraction.

November 21 – Participation in 3D topographic survey work at Natadera Temple.
We began the day traveling with Prof. Noguchi and Mrs. Shimohama to Natadera Temple, where we started a 3D survey of an area currently closed to the public.
Using the Matterport tripod scanner, we began working quickly and efficiently.
I liked very much how this scanner works because it is simple and fast to operate with an iPad. Basically, I only needed to think about where to place the Matterport tripod to connect each scan. I completed around 18 correct scans and repeated some due to incorrect positioning or failure to recognize the connection points.
This scanner works on a tripod in 360 degrees and must be rotated at its own rhythm to

avoid appearing in the scan.

After finishing the 3D survey, we visited an excavation being conducted at Natadera Temple. They were looking for buried structures and signs of burning. The excavation method was similar to that in Copán, so it was easy for us to understand how they worked using levels and material sampling.



November 22 and 23 – Participation in XR Meetup Aichi event.

During the first day, we observed some of the newest models based on XR.

The first talk that caught my attention due to my profession was titled *Total Engineering*, which focused on implementing XR in engineering. I saw a model in which a small loading robot could be programmed to pick up a box. First, the box had to be scanned, and then the robot was programmed to retrieve it at a certain time and deliver it to a designated location. A very useful function for moving equipment or materials in archaeology.

The second talk that caught my attention was about an app called *Spatial Snap*. An app currently in development but with great potential in 3D scanning and XR. With this

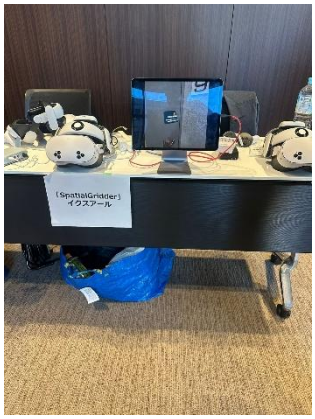
technology, we can scan an object such as a stela and add annotations so that others can view the information and gain better context.

The third talk discussed the 3D BIM system, an important tool in research and, in our case, archaeology. A system capable of scanning a wall and determining factors such as stone angles, sizes, types, etc.

The fourth talk that caught my attention was *XRegion*. It consists of connecting a remote location to the site so that one can be in constant communication while observing the site. This technology seems very interesting, especially when one cannot be physically present at research activities but could be virtually connected both visually and auditorily to explore the site.

Additionally, we saw simulators for games and fire emergencies, useful for training companies on how to react during such events.

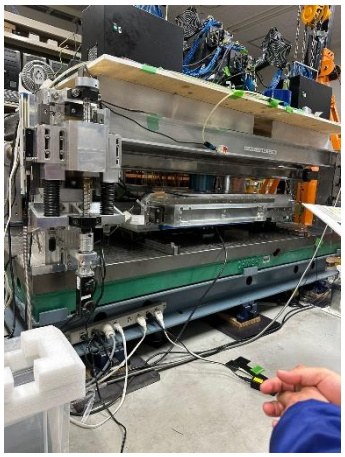
In the afternoon, we were able to test some of the activities presented. My favorite experience was a virtual reality maze with VR goggles. It consisted of completing challenges and interacting as we moved through the maze.



During this, we shared some Scaniverse scans, and participants were impressed by the number of pieces we had. We received questions about our work and were able to share scanning tips that have worked well for us.
The next day, the talks continued, and the Scaniverse app was presented. We practiced scanning at Nagoya Castle, mainly using the Splat method. An incredible experience, as we demonstrated the skills we had acquired when scanning at the castle.

November 24 – Visit to Prof. Morishima's Laboratory at Nagoya University.
At Nagoya University, we visited Prof. Morishima's laboratory. He had previously been to Copán to work on a project in which we were responsible for scanning every 20 cm as excavation progressed in Temple 8.
Their work in Copán Ruinas is based on a system of plates or films that use muons. The goal is to perform an X-ray-like process without damaging the structure and determine empty spaces depending on the angle where the plates are placed. The time required for this process was 90 days (3 months). It took longer to remove the plates, making the development process more difficult since radiation levels in Copán are higher, causing the plates to darken and making the results more difficult to interpret. The idea in Temple 8 was to place the plates at a 60º angle to cover an area of 0.9 m.
They gave us a presentation on what was originally planned and how a collapse affected 50% of the results by moving one of the plates inside Temple 8. They also showed a bit of the plate process in Temple 11.

We were shown the plate development process from manufacturing using chemicals, the darkroom used for developing them, and the HTS2 (HyperTrackSelector2) machine that digitally analyzes the condition of the plates on a computer.



November 25 – Visit to Yamaha Motors and Elysium.

We began the day visiting Yamaha Motors, where we saw up close the helicopter planned for the 3D survey of Copán Ruinas.

This helicopter exceeded my expectations regarding its weight and size. It measures approximately 3.10 m with detachable blades and weighs less than 200 lbs including the scanner.

After observing the helicopter, we went to the offices to watch a presentation about it and some of its advantages. Some interesting facts about the Fazer R G2 are its full-fuel flight time of 100 minutes without extra load, and about 85–90 minutes with the scanner. The scanner emits around 750,000 signals per second and its maximum altitude is 2,800 m. The helicopter's maximum speed is 20 m/s, and it has a scanning range of approximately 30 degrees.

Generally, this machine replaces drones that require constant battery changes and can only fly short distances due to the scanner's weight. The Fazer R G2 has an efficiency of over 80% and would give us a much better result in Copán Ruinas.

We had the opportunity to present some of the 3D documentation work recently carried out in Copán Ruinas as part of PROARCO II.

We then headed to Elysium, where we observed the entire company—from software development to processing of their completed projects. They also presented some of their work done at Hamamatsu Station using the Meet NavVis VLX3.
Meet NavVis VLX3 is a wearable mobile scanner, similar to a backpack, equipped with a LiDAR system with great range and resolution. By simply walking through a site, it is capable of capturing large buildings in great detail, and using Elysium's software, the model can be navigated in third-person as if in a video game.

I would like to use this scanning method in downtown Copán Ruinas and at the archaeological site. It would be a new model for the city and a way to digitally showcase what our town offers to tourists. This tool would help document our history and serve as a backup in case of deterioration.

November 26 – Visit to excavation in Shizuoka

Together with Prof. Noguchi, we visited an excavation taking place in the Shizuoka area. We observed the working system used at the site. We saw that, similar to us, they work by identifying floor levels and conducting topographic measurements using a total station and computer. The excavation system uses the same tools—pickaxes and shovels—but soil removal was done using electric conveyor belts to avoid repeatedly going out to dump soil and thus save time.

They told us that excavation begins with the help of a small machine when access allows it.

November 27 – Visit to Hololab

During our visit to Hololab, we met Eng. Sekine in person. It was a pleasure to meet him, as we had previously held virtual meetings to resolve an error occurring with the

VR goggles installed at the Regional Museum of Maya Archaeology in Copán Ruinas. He provided the experience of testing the virtual tour in two different ways compared to what we normally see at the museum. We tried it using an Xbox controller and without Meta Quest goggles.

In the first display, the tour was shown in a sectional way where the parts we walked through disappeared as if cut away, allowing us to observe all areas. In the second display, I observed the tour in first person—I could walk anywhere and explore the tunnels of Copán more freely.

I would like to offer this experience in Copán Ruinas because some people feel dizzy when using Meta Quest 3, and the controller is somewhat complicated to handle, but I believe the experience would be better because the user progresses at their own rhythm.

We then tested a new technology for me, but one with great impact on city or site planning. It is called Trynome, and it links a city's 3D model to augmented reality using a generated hyperlink. Buildings, hospitals, and schools can be placed through virtual cards and viewed on an iPad. This app can instantly add a person or a photograph to the 3D model being created.

A bit complex to explain, but impressive in how it helps organize a city, as one can evaluate how certain constructions would fit and whether they comply with zoning requirements such as height and size.

Finally, we tried 3D scanning with AR goggles. This method is called *Space Escape*, an application included in the goggles, where one can later move freely through the scanned area.