Writing from beyond, a window into Ancient Babylonia in the first millennium BCE.

Kurnugia NOW! is a collaboration that intersects art with climate and behavioural change. It strikes me as very fitting that the inaugural chapter of this work starts in Carrick-on-Shannon. A place that has experienced the very real and tangible impacts of a changing climate. The one in five hundred year flooding event of 2009 left extensive damage to the buildings and livelihoods of those living in and around the town. While still very much in memory, flooding returned again in 2015, a short six years later, and minor flooding again in 2020. The people of Carrick-on-Shannon are acutely aware of their spatial vulnerability and the damage that can occur without adaptation.

***Figure 1A**: Kayakers on the N4 in Carrick-on-Shannon, November 2009. Photo credit: Debbie Little, Flickr.com. **Figure 1B:** Aerial image of 2009 flooding with a northwest orientation, N4 towards Sligo bottom left of image. Photo credit: The Leitrim Observer, 30 July 2016.*

Adaptation, in climate science, is defined as "the ability of a society or a natural system to adjust to the (changing) conditions that support life in a certain climate region, including weather extremes in that region"[1]. It is my view that the arts provide space and capacity for people to explore issues relevant to them in a safe manner. Adaptation is no different. Climate change is deeply complex, with interconnecting systems changing and heading towards tipping points. As someone with a background in youth work, and an education in geography and climate science, I feel it is my duty to engage and collaborate with artists in order to explore ways to investigate and understand adaptation better for our intergenerational future. It is pure joy to work with Celina Muldoon, who is a vibrant and dynamic artist. Her work consistently seeks to link storytelling with modern day social issues, and her most recent works have used mythology as key to this. Although I went to school in south Donegal, where I met both Celina and Clare, I had never heard the term 'diffing', which is a unique type of doughnut performed by young drivers in Donegal. Celina, while working with young people from the county, explored the uniquely geographical social action and began to see threads between this modern world and that of the mythical Morrigan and Balor. Sirens presented a tangible way of using myth and story to explore important social issues. The greatest social challenge we face currently is to ensure we seek adaptation to our changing climate, ideally without tipping into a new system. Dr. Clare Kelly sees commonalities in her groundbreaking work on neuro-imagining and the crisis humanity currently faces:

[1] https://doi.org/10.1093/acrefore/9780190228620.013.635

> "The climate and biodiversity crises are globe-spanning, all-encompassing forces that, for decades now, have provided a slowly shifting background to our lives – or, to use an fMRI analogy, they have formed a slowly rising baseline. What grabs our attention are the big events that rise above this baseline – the unprecedented wild fires, the "record-breaking" temperatures, the lowest levels of sea ice, the once-in-a-century floods that now happen annually. But of course, the less rare and more frequent these events become, the more they become part of the background – they become the new baseline."[2]

As friends, we all care deeply about how our future plays out. We talked about behavioural change; motivational factors; tipping points to social change, as well as those of climate change. We understood that we needed to go deeper, and for that, we needed to engage in each other's worlds.

Figure 2: The location of Ancient Babylon, approximately 80km southeast of Baghdad, in modern-day Hillah, Iraq. Map produced by the author using open source software.

My world is that of Ancient Babylon in the First Millennium BCE. The city and the kingdom went through many dynasties and social changes throughout its lifetime. Through a need to record

[2] Dr. Clare Kelly, https://immalab.wordpress.com/climate-crisis/

administration data (ownership, taxes, historical events), as well as recording astronomical phenomena with the aim of successfully predicting the future, the Babylonians used cuneiform writing on clay tablets. Cuneiform is a complex script constructed from a variety of wedge and line shapes produced by pressing the tip of a reed into wet clay (Fig. 3). Clay hardens over time and it is one of the few mediums that benefits from fire, which is responsible for the destruction of many other types of historical documents. We are incredibly lucky that the Babylonians chose clay as their writing medium, as it provides us with a unique window into the daily lives of ancient people.

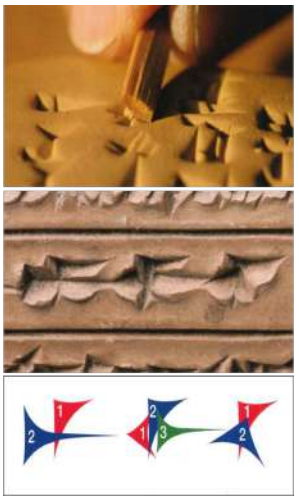

Figure 3: Production of cuneiform script. Finkel & Taylor, 'Cuneiform', 2015.

The Astronomical Diaries and Related Texts from Babylonia are a series of clay tablets written in the first millennium BCE, which were transliterated, translated, and published into a seven series volume of books (Table 1). The Akkadian designation (Babylonian dialect) for the diaries is '*naṣāru ša ginê',* which translates as 'regular watching'. These texts were written by scribes who were employed to watch the skies, taking their position on the tops of temples in Ancient Babylon to record their observations. The internal structure of the diaries begins with observations of contemporary astronomical features recorded every night and day, followed by the daily recording of meteorological phenomena. In addition, each month is summarised with commodity price data (barley, dates, mustard, cress, sesame and wool), astronomical observations, river levels for the Euphrates, and events of contemporary importance.

Volume	Content	Published
1. Diaries from 652-262 BCE	Systematic daily observation of lunar, planetary and meteorological phenomena along with monthly river heights from the Euphrates river, market data for six commodities (barley, dates, mustard, cress, sesame, wool) and historic information for the years 652-61 BCE.	1988
2. Diaries from 261-165 BCE	Systematic daily observation of lunar, planetary and meteorological phenomena along with monthly river heights from the Euphrates river, market data for six commodities (barley, dates, mustard, cress, sesame, wool) and historic information for the years 261-165 BCE.	1989
3. Diaries from 164-61 BCE	Systematic daily observation of lunar, planetary and meteorological phenomena along with monthly river heights from the Euphrates river, market data for six commodities (barley, dates, mustard, cress, sesame, wool) and historic information for the years 164-61 BCE.	1996
4.	Undateable fragments	Forthcoming
5. Lunar & Planetary Texts	Monthly observations of lunar and planetary data,747-10 BCE	2001
6. Goal Year Texts	Contains "raw materials for the prediction of planetary and lunar phenomena for a given year" (Sachs, 1948: 282)	2006
7. Almanacs	Contains astronomical almanacs from 3rd - 1st century BCE	2014

Table 1: The Astronomical Diaries and Related Texts from Babylonia volume of works. The first three volumes form the foundation of the research undertaken and discussed here.

The recording of these observations was a systematic and scientific endeavour that entailed precise language for precise phenomena. Some of the data is recorded in sub-daily resolution making it more detailed and unprecedented in the context of the ancient world[3]. Many researchers have used this incredible resource to explore the astronomical, economic, or fluvial history of the region[4]. To date, nobody has extracted the weather data to examine the climate of the region, this is what my research will cover. This will be the oldest written weather record for a sustained period. The weather is often a hot topic, pardon the pun. We have so many ways to describe slight differences in our daily experiences. "A soft day" depicts the very gentlest of rain; "bucketing from the heavens" characterising heavy showers that soak everything rapidly; "the sun splitting the stones" for an almost oppressive heat. This is not exclusive to Ireland, and the Ancient Babylonians were no different.

"*u_4-mu i-ru-up-ma šá-mu-ú- ul iz-nu-un šá-mu-ú iz-nun-ma šá-na ul ip-ṭur*" 'the weather became cloudy, but rain did not fall; rain fell but it did not loosen the sandal'

Old Babylonian Proverb (Sachs & Hunger, 1988)

Climates of Conflict in Ancient Babylonia (CLICAB) is an interdisciplinary project funded by the Irish Research Council's Laureate Starting Award, which was awarded to the principal investigator, Dr. Francis Ludlow. The project seeks to explore linkages between patterns of conflict and violence in the Ancient Near East with climatic changes such as periods of drought, flooding events, and other extreme weather. In order to achieve this, my research colleagues will examine the complex societal dynamics to assess for mitigation strategies. They will also investigate how the evolving historical context mediates any contributory role for climate in conflict and violence.

I am responsible for developing a new climatic reconstruction of Babylon using the *Astronomical Diaries and Related Texts from Babylonia*. These diaries span 652 to 61 BCE with the majority of recorded observations from ~390-61 BCE. The process involves systematically cataloguing and coding weather phenomena into a spreadsheet. The extraction of weather information from the diaries was complete at the end of 2021, which resulted in the creation of over 230,000 individual units of data. This data continues to be cleaned and analysed and will be used to produce a sub-daily resolution of the climate which will provide a precise window from which to examine how past societies dealt with and responded to changes in the weather and to climatic events. Changes to river flow impacting on the ability to grow and sell crops, evidenced through the market prices recorded in the diaries, or through records of irrigation work: "That month, pregnant women dug the river which is above Seleucia which is on the Euphrates, as before. A heavy work obligation (94 BCE)"[5]. Climatic events such as volcanoes are seen to impact on the Babylonian view of the sun: "*the disk of the sun looked like that of the moon*". This is considered to represent volcanic dust veils. The Icelandic volcano Eyjafjallajökull had a series of eruption events from March to June 2010. This caused major flight disruptions, grounding European flights for up to five weeks in April and May. Figure 4 shows an image taken in Leiden, the Netherlands on the 18th May 2010 showing a diminished sun, also known

[3] Travis et al, 'Cowboys, Cod, Climate, and Conflict' in *Routledge Handbook of the Digital Environmental Humanities* (1st ed., London, 2022), pp 17–39, DOI: 10.4324/9781003082798-3.

[4] Abraham Sachs, A classification of the Babylonian Astronomical Tablets of the Seleucid Period, 1948; Sachs, *Babylonian observational astronomy*, 1974; Bert Van der Spek et al. *A History of Market Performance From Ancient Babylonia to the Modern World*, 2019; Alice Louise Slotsky, *Bourse of Babylon - Market Quotations in Astronomical Diaries of Babylonia*, 1997.

[5] Abraham Sachs & Hermann Hunger, *Astronomical Diaries & Related Texts from Babylonia, Vol. 3*, 1996.

as a bishop's ring. This is the type of sky the Babylonians saw when they recorded "*the disk of the sun looked like that of the moon*".

Figure 4: Image of a diminished sun / bishop's ring / volcanic dust veil in Leiden, Netherlands on 18th May 2010, following a series of eruptions from the Icelandic Eyjafjallajökull volcano. Image taken by Marco Langbroek.

Examining the recorded observations of cold in the diaries: "the cold became severe", also points us towards an indication of volcanic activity. We get energy from the sun every day which hits the surface of the earth in an uneven manner due to the spherical shape of the planet. This uneven energy impacts on our patterns of circulation and high and low pressure systems. When the energy from the sun approaches our atmosphere, approximately 29% is reflected back into space, about 23% is absorbed in our atmosphere, and a further 48% continues to earth and is absorbed by our surface. Explosive volcanic activity can eject large quantities of particles into the atmosphere. These particles can migrate through the atmosphere creating a layer or a 'blanket' which inhibits solar radiation reaching the surface. Overall, this creates a global cooling effect.

Project colleagues Dr. Francis Ludlow and Dr. Conor Kostick were both authors on the 2015 ground-breaking publication '*Timing and climate forcing of volcanic eruptions for the past 2,500 years*'. This work provided an updated chronology for volcanoes for the past 2,500 using polar ice core data. This newly improved chronology allows an examination of the data in the diary against known volcanoes. From this I can look for signature events or phenomena that indicate the presence of the impacts from volcanic activity, such as volcanic dust veils or observations of cold.

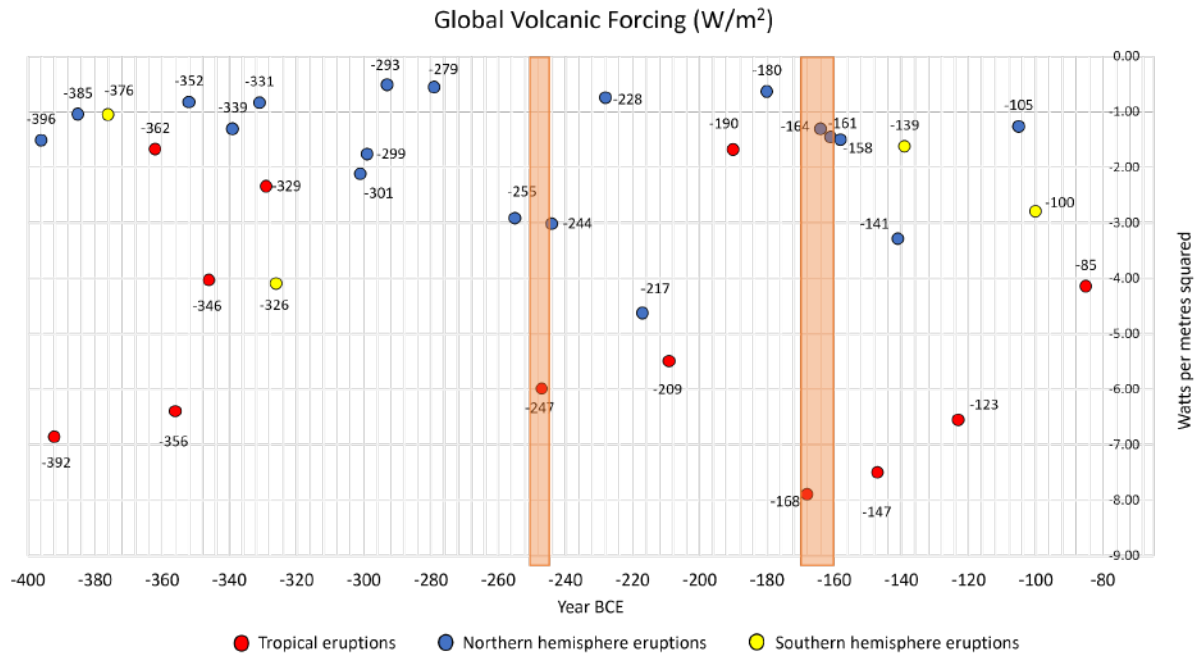

Figure 5: Graph depicting the decrease in energy reaching the earth as a result of volcanic activity. Red indicates tropical eruptions, blue northern hemisphere and yellow southern hemisphere. The lower the dot the larger the cooling impact on the earth. Areas highlighted in orange are discussed below. Source of data: Sigl et al, 2015 Timing and climate forcing of volcanic eruptions for the past 2,500 years. DOI: 10.1038/nature14565.

There are two very distinct signals of volcanic activity recorded in the diaries. At the start of January of 247 BCE, the cold was severe, but as the month progressed it became very severe. This is the highest adjectival indicator associated with the recording of cold in the diaries, and when considered within a scale for intensity is the coldest period recorded in the entire series of the diaries. In June of that year the Babylonians recorded the "*disk of the sun looked like that of the moon*", indicating that the volcanic dust veil had migrated across the Babylonian sky. From figure 5 above, it is evident that this is not the largest volcano, however the diaries are limited by what is available. There are many tablets from the series housed in the British Museum that are undateable. Equally there may be many tablets that have either been destroyed or have yet to be found. We can see from the graph, however, that the impacts felt by the Babylonians in 247 BCE were the result of a tropical eruption. Tropical eruptions often create larger impacts than a solo hemisphere eruption as the particles ejected travel both north and south of the equator, inhibiting a larger region from accessing solar energy.

There were multiple eruptions in the 160s BCE beginning with a tropical eruption in 168, followed by northern hemisphere eruptions in 164, 161 and 158 BCE. There is very little data available for 168 BCE in the diaries and therefore no evidence of volcanic activity. The diaries do provide evidence in January 163 BCE with an observation of "*the disk of the sun looked like that of the moon*" and cold recorded, which then became severe in February. These recorded observations indicate that the volcano of 164 took place in the latter half of year, allowing the impacts to be felt early in the following year of 163 BCE.

It is highly probable that the impacts of the earlier tropical eruption in 168 BCE, followed by the northern hemisphere eruption in 164 BCE, compounded the situation for the people in Babylonia. In

September 163 BCE the diaries record: "*That month, the citizens who are in Babylon brought their women, their people, their [....] out of Babylon. That month, the Šaknu of the king …. they plundered the citizens who were out in the countryside.*" This illustrates that people had to move out of Babylon, and even then, the authorities followed them to forcefully collect taxes. The following month the historical section of the diaries record: "*That month, the 5th, 6th, and 7th, the sacrifices which are made to Bel, Beltija and Istar [....]*" (25-27th October 164 BCE). It is not unusual for sacrifices to be made, but it is less common for so many gods to be included in the ritual. This may indicate the Babylonians were appealing for more help than usual by making sacrifices to more gods than usual. In December 163 BCE severe cold was recorded between 19-26th of the month. The following year, drinking water is affected and people die resultantly: "*and the people drank from it, and a little [....] was much in the land. That month, corpses in the streets*" (September 163 BCE).

It is diary entries like those above that piqued Celina's interest in this research. We had a few meetings online and decided that in order to delve deeper into the material it was imperative that we spend a few days immersed in the project. Ballinglen Arts Foundation provided a cottage and studio space for a few days in late November / early December 2021. Through close reading of the historical content of the diaries we found that we each viewed the material with very different lenses, each focusing on different aspects of entries. I would always seek out material that conveyed societal impacts from weather and climate related events, while Celina found the cultural and mythical within the mundane. Entries such as "[….] on the 24th (and) 25th, they made (it) at the lesser (meal) of the afternoon; the 27th, they made (it) at the main (meal) of the afternoon" (2nd, 3rd, & 5th May 157 BCE). What was invisible to me was a shining beacon to Celina. I knew then that a collaboration would result in symbiosis. No matter what direction this collaboration took, it was guaranteed that through Celina's work, it would always bring more to the fore than I would focussing on the climate aspects alone. I am continuously learning from her reading of the material and I hope that it is mutual. I am delighted that the inaugural chapter of this work is being showcased here in the Dock, the definition of which is a floating platform used to secure, protect and provide access to a boat. A place of safety for our maiden voyage of KURNUGIA NOW!, a project which spans another two years. We hope you enjoy this, and the forthcoming works.