

## DISCUSSION CONCLUDING AAS 13-516

CHRIS TUASON asked about KEVIN BIRTH's own religious background. BIRTH replied that he was raised Presbyterian but was presently Roman Catholic. TUASON said that Catholicism was steeped in timekeeping tradition, as well as the religions addressed in BIRTH's presentation (Judaism, Islam, and Hinduism). BIRTH agreed that this was true in many, many ways. The first clock shown in BIRTH's presentation seemed to be a Counter-Reformation clock within the Frick Collection.\* Although one might not think of clocks as being Counter-Reformation, BIRTH felt that a clock made in 1553, in Germany, with a saints calendar, was a candidate for being a Roman Catholic Counter-Reformation clock. With that said, BIRTH agreed that Catholicism is steeped in timekeeping tradition and that he was absolutely fascinated with some of the Christian timekeeping traditions as well.

ANDREW MAIN asked if the sorts of techniques presented by BIRTH ought to be applied to find out requirements for civil time. BIRTH suggested that it is probably the most useful way to go if one is interested in the breadth of the global conversation, the breadth of the global community, and the general public. However, the danger is to go to the public and say "What do you think of the leap second?" BIRTH said if this was tried by asking this question of someone in a restaurant over lunch, it is doubtful that useful information would result. But that does not mean that the leap second never affects them; if the question was "What did you think of your flight being delayed by Quantas?" a rather long discussion would probably ensue. That is the Princess and the Pea problem. How can one know whether this small change from the point of view of the general public will bother them or not? That is the trick: how is that evaluated?

TUASON thought an overriding argument was that religious concerns were a strong, compelling reason to keep civil time tied to solar time. "When Israeli astronaut Ilan Ramon was riding the Space Shuttle, it was a pretty big factor; sun angles for prayer times..." BIRTH asked TUASON to keep his thought about "sun angles for prayer times" for BIRTH's second talk.

Regarding BIRTH's practice of consulting trusted advisors to make up for the lack of sample, ARNOLD ROTS wondered how representative the advice is. For example, if one was to study something in the context of the Catholic Church, one might therefore go to a bishop. But if interest was with regard to the use of birth control among Catholics, would one really get a representative answer? BIRTH replied that is part of *participant observation*; these things go hand in hand. Participant observation leads BIRTH to the authorities to whom people listen. If BIRTH wanted to study birth control among the Catholic Church, his first stop would not be to a bishop; his first stop would be hanging out with Catholics. "Saying 'are you interested at all in birth control' would be a really dicey thing to get through the Human Subjects Review Board quite honestly," but assuming BIRTH was doing that kind of research, he might talk to Catholics and ask questions

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\* <http://www.frick.org/exhibitions/clocks/schaufel>

like “where do you get your information about birth control or human reproduction, who do you talk to, whose opinion do you value?” Those replies would steer BIRTH where to go.

For example, with something like timekeeping and Islam, every Muslim can name the Five Pillars of Islam. One of the five pillars is prayer; prayer at sunrise or other times is bad and every Muslim can name the specified times of prayer. “*Q*: Where should I get information about that? *A*: Well, there is this web site...” “*Q*: To whom should I talk to learn more about that? *A*: Well, there is this imam; let me put you in touch with him...” That is how BIRTH would go about it; it is not just deciding to whom he should talk, it is an initial groundwork of preparation and participant observation which steers the researcher to where the authoritative places are.

ROTS asked if this process gave BIRTH a good feeling for whether the advice of the trusted person is followed. BIRTH said not necessarily, and this applied not just to the person, but to the websites. Anybody can put up a web site or write a software application; that does not necessarily mean that people will follow it. But by this process BIRTH also learned of some of the juicier tidbits: “This is the website that most Muslims use, but they have some sort of love-hate relationship with it if they are not Saudi, because this is actually backed by the Saudi government.” And then there was a Moroccan one, and a Turkish one, and the Egyptian one, but “this is the one to which Muslims tend to gravitate.” BIRTH discovered MyZmanim.com from talking to Orthodox Jews, and then working up to find that is also what the former head of the Orthodox Union uses, and so on.

BIRTH called this the “Arlo Guthrie *Alice’s Restaurant* Principle”. At the end of the song *Alice’s Restaurant*, which is a military-draft protest song, Guthrie says that if one person walks into the psychiatrist’s office singing *Alice’s Restaurant*, the psychiatrist will think he is crazy. If two people walk in singing *Alice’s Restaurant*, the psychiatrist will think something funny is going on between the two people. If four people independently walk into the psychiatrist’s office singing *Alice’s Restaurant*, then it is a movement. So if BIRTH talked independently to four different people who do not know each other and they each said that MyZmanim.com was their source for Jewish time, or that IslamicFinder.com was their source for Islamic time, then BIRTH would take that very seriously.

DENNIS MCCARTHY asked how well standardized are these times; if one compared the results from five different websites, would they all give the same answer? BIRTH said the answers vary by religion and tradition. For example, regarding the timing for the end of the Sabbath, there is a split in Judaism between those that follow the tradition of Rabbeinu Tam and those that follow the tradition of the Vilna Gaon. But with regard to particular calculations, BIRTH had noticed some variations between websites even within the same tradition, to be addressed in BIRTH’s next presentation. They were not using UTC to determine this, but rather they were doing something akin to triangulation, using several different sources of data to determine a point in time which is represented in terms of UTC.

TUASON said that one measure of how strongly some cultures are tied to solar time is how late they were to adopt GMT, and the Kingdom of Saudi Arabia (KSA) was one of the latest. BIRTH said it may come as a surprise that for most liturgical practice they still have not adopted GMT; it is all about local apparent solar time. From their perspective, time became decoupled from Earth when mean time became predominant.

KEN SEIDELMANN noticed that the Jewish times on the website displayed by BIRTH were given to the second; SEIDELMANN wondered if that was “for real”. BIRTH said things can get even more detailed, and showed that the website allows for adjustments for elevation, temperature, and barometric pressure. The reason is that the morning prayer is considered to be particularly blessed

if the *Amidah* can be recited at the exact moment of sunrise. Before the morning prayer service is begun, the local meteorological conditions are entered in to get an exact calculation for sunrise, such that the prayer can be paced to hopefully hit that exact moment of sunrise. SEIDELMANN asked if they put in the real horizon versus a spherical Earth; BIRTH replied “Yes, the really obsessive ones do.” It would be a misconception to think that people just roll out of bed, look up at the sky, and decide when to pray. There is actually a great deal of sophistication taking place. As an anthropologist, BIRTH could not say for sure whether it was valid or not, but it looked impressive.

To illustrate, BIRTH displayed the Muslim website Moonsighting.com, which focused on the ability to see the crescent Moon. The experts behind these websites were very much aware of UTC and the leap-second problem and astronomy. The *Astronomical Almanac* is of critical importance for Islamic practice, because they take that data and run their calculations, and with other sets of data determine the prayer times at any given location. It is then disseminated to people who rely on UTC to know when to pray. TUASON thought that the stereotypical design of mosques incorporates towers which are not just aesthetic, but for the purposes of astronomical sighting. BIRTH agreed that in Islamic countries the towers are for sighting.

GEORGE KAPLAN said that, although much of what BIRTH said was aimed at communicating this issue with the general public, it actually applies to the way the folks in the room should communicate with the rest of the astronomical community. Most of technical terms BIRTH picked up from specialists have little meaning to the average astronomer. Half of the astronomers in the world are dealing with data that come from spacecraft, so their experience with “what time is” is totally disconnected with the Earth.

Also, what is traditionally considered ‘fundamental astronomy’ is not taught much anymore. KAPLAN remembered attending the IAU meeting in Sydney, where there was an evening reception on the patio at the Sydney Opera House. Several people came up to KAPLAN and said “Oh, I hear you are from the Naval Observatory—can you point out to me the Southern Cross?” which was right in front on them. So most astronomers do not have much connection with timekeeping or the motions of the Sun or Moon, and many of them cannot even find constellations anymore. Some of the people within the audience, and within the IAU, and elsewhere, have tried to conduct surveys involving astronomers where they basically asked the same question posed by BIRTH “What do you think about leap seconds? Should we discontinue leap seconds from UTC?” What comes back is “Huh?” or nothing. BIRTH said this does not mean that astronomers will not complain loudly if something happens, because they will. But they may not know what has happened; they will just complain.

SERVANDO DIAZ asked if the Vindolanda Roman calendar artifact\* displayed by BIRTH had some sort of function, or if it was perhaps part of a dial. BIRTH said that its function is a major debate. The initial interpretation was that it was a fragment from one of the *horologia hiberna*, or what are sometimes called “anaphoric water clocks” described by Vitruvius Pollio in his book *De architectura* (c. 15 B.C.). However, that interpretation was generated by somebody who specializes in the study of water clocks and knows nothing other than water clocks, thus he sees water clocks in everything, which is the “fish in the water” problem. The problem is that this particular artifact is not engineered well enough to have been useful in an anaphoric water clock. Making something out of a copper alloy, in the climate of Northumberland in northern England, that is

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\* <http://archive.archaeology.org/0901/etc/artifact.html>

powered by water, and is supposed to work in winter, is implausible. So there is a debate as to what the artifact actually is.

BIRTH thought that the artifact was probably inspired by a water clock, but it is most likely something akin to an equatorial or the much-later astrolabe—something that could have been adjusted by hand rather than something powered by water and running on its own. DIAZ wondered if it could have been an indicator or a faceplate. BIRTH said it was a fragment of a disc approximately 35 cm (14") across with the names of the months written around the edge. It may have had other astronomical information on it, but BIRTH doubted it had an anaphoric representation of the heavens.

TUASON observed that the developer of the webpage portraying the fragment seemed convinced that it was a calendar. BIRTH said the problem with that interpretation is that the official Roman state calendar, known as the *fasti*, would never have labeled the autumnal equinox 'AE'. Instead, the autumnal equinox would have been acknowledged as Caesar Augustus' birthday, since the Emperor was associated with the Sun. Only calendrical devices associated with meteorology or agriculture emphasized the equinoxes or the solstices, rather than the cult of the Emperor.