DISCUSSION CONCLUDING AAS 13-517

KEVIN BIRTH ended his presentation by stating a preliminary conclusion. "Because eliminating the leap second will not affect these populations, these populations would not support eliminating the leap second." Playing devil's advocate, CHRIS TUASON noted the irony that the information shown by BIRTH on their websites presented an obvious reason for them to care. BIRTH asked TUASON "Care about what?" TUASON replied that they care about their websites being up and running so they can get out information. BIRTH repsonded, "They care about people being responsible." BIRTH was struck when the developer of MyZmanim.com, Dovid Eisikowitz, told him that the worst systems are automated. There needs to be a human constantly monitoring the system to ensure that it is producing the right information. This work shows that they are not content with calculations. The Muslims BIRTH interviewed saw calculations as diminishing the spirituality of prayer times. They do not like the idea of a timescale that chugs along without frequent monitoring, without awareness that it needs to be adjusted, without it needing to be set to something else.

JIM KIESSLING commented that "the tradition of expecting Joshua to ask for the Sun to stand still in the sky[1] has to be a basis of direct observation; future predictions cannot be expected to be valid in the face of the acts of God." TUASON jested that there was a need to poll for God's position on the leap second; BIRTH replied that some of the people he had talked to would probably say that they could tell TUASON His position. From the Jewish perspective, God's position on the leap second is Genesis 1:14: God created the lights in the sky for the purpose of measuring Time. However, this is not the Catholic position, which is "Oh, clock time—we love it!"

SERVANDO DIAZ asked how Muslims consider the Islamic calendar year versus the Gregorian calendar. BIRTH said that question steers into a debate among Muslims. There is a divide between those who claim they can predict the beginning of Ramadan, and those who wait until two reliable witnesses report that the crescent Moon has been seen. The result of this, and the nationalism involved with various nations having their own calculations, such as Turkey, Saudi Arabia, Morocco, and so on, means that Ramadan begins and ends on different days in the Muslim world. In BIRTH's classes in Queens, it often happens that one of his Muslim students may be feasting at the end of Ramadan while the student's best friend continues to fast for two more days.

The Islamic calendar is in theory a strict lunar calendar based on the direct observation of the Moon. In practice there are multiple traditions that emphasize either just direct observation, or, direct observation in combination with calculation. The Saudis calculate when the crescent Moon will be seen and then they put two witnesses on an airplane and send them up in search of the crescent Moon in order to determine when Ramadan begins. It is serious business. BIRTH reported that Dr. Mohammad Ilyas of IAU Commission 4 (Ephemerides) and Commission 46 (Education) is a major advocate for a unified Islamic calendar; unfortunately for him, many Muslims feel that a unified calendar means that direct observation is unnecessary, yet "you need to directly observe to really, really be spiritual."

STEVE ALLEN said that in the time-zone discussion lists, it comes up every year that Morocco does not know when Ramadan starts, and thus no one knows when daylight-saving time stops in

Morocco when Ramadan happens in summer. And the people who maintain the time-zone databases learn the news maybe a day in advance, or maybe a day after, and have to push to get that information out. The point of ALLEN's technical hack on leap-seconds-in-time-zones from the Exton Colloquium[2] was that the way things work at the IERS is far more amenable to airline scheduling than the way things work in Morocco. ALLEN thought if a time-zone database can handle Morocco, it can handle the leap second even better. BIRTH said that it is really interesting how much competition there is between the applications that can be downloaded to a smartphone. Just how nationalistic they are is one feature of it. Sometimes being the last to say when Ramadan starts is an indication of faithfulness, because there is reliance on seeing the crescent Moon as opposed to calculation.

DENNIS MCCARTHY continued to express interest in how the numbers that appear on the websites come about. Obviously somebody is entering the numbers and there must be a process for arriving at those numbers. Regarding BIRTH's earlier reference to a "triangulation scheme" for data combination (concluding AAS 13-516), MCCARTHY asked if that was a weighted scheme and how sophisticated was that process. BIRTH replied that the developers of these websites are not willing to share all of their algorithms. BIRTH could only confirm what they admit to be their sources of data; Moonsighting.com admits that its source of data is the USNO. MCCARTHY replied that they could then just be making it up somehow. BIRTH agreed that was possible, but "given their army of observers that are constantly reporting in", BIRTH felt that Moonsighting.com was "probably doing some adjustment" based on observations. MyZmanim.com was not willing to reveal any of its algorithms or source data, but was willing to say that they had observers in the field on a daily basis checking things and they were constantly honing their algorithms. In fact, it was during the course of BIRTH's research that MyZmanim.com got down to the precision of one second in their representations. BIRTH thought it interesting that they do not seem to fully trust themselves, quoting part of the MyZmanim.com disclaimer:[*] "Although our times are compiled to the highest accuracy standards, one should not rely on *zmanim* to the last moment." With that said, My-Zmanim.com was using professional astronomers; there are many Orthodox Jewish scientists and they draw on them to come up with their algorithms and their calculations.

MCCARTHY noted that BIRTH did not think that dropping the leap second would be successful because of astrological and religious business, post-colonial politics, *etc*. But theoretically, the ITU is not supposed to consider anything but technical arguments, and those would not be technical arguments by anyone's estimation. At the 2012 Radiocommunication Assembly (RA-12), MCCARTHY reported that many countries claimed "we do not have enough information." MCCARTHY therefore asked BIRTH if those claims might be "a smoke screen for 'It ain't gonna happen because of these things'?" BIRTH felt that it was probably a bit more complicated than that. The other information these nations seek might be to look around the room to see who else would back them up. If, say, Malaysia supported it, that might bring a few votes with it. If Saudi Arabia was supportive, it would bring a few votes and it would exclude a few votes. BIRTH thought the idea that Israel, Saudi Arabia, Arab Emirates, Malaysia, *etc*., do not have enough technical information to make up their minds on this was questionable. "There is something else going on." BIRTH felt the information they were seeking was not purely technical; rather, he felt they wanted to know who else would go along—who else is willing to stick their neck out to vote either for or against it. Abstention by saying "we need more information" is by far the safest position because it offends everybody equally.

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[*] http://www.myzmanim.com/messagebox.aspx?messageid=accuracy

RUSSELL REDMAN clarified that polling at RA-12 "was done very much behind the scenes." The Chairman was contacting everybody as part from the process. There were a few administrations that stood up and said "Yes, we must do this!" and a few that stood up and said "Absolutely not under any circumstances!" but the rest would get very quiet. BIRTH wondered how many of the quiet majority behind the scenes might have asked something like "Do you know how Turkey is voting?" "Which way will Brazil go?" REDMAN affirmed there were just a handful of people in the middle who actually knew that; the rest were very quiet. REDMAN had no idea whether India supported or opposed, he had no idea what position Israel had, *etc*.

BIRTH said India possibly had no idea either because part of this may be post-colonial politics. A former colony does not want to be alone on anything. So India could probably be persuaded if somebody else was persuaded, but then that somebody else could be persuaded if India was persuaded. ROB SEAMAN later remarked, somewhat tongue-in-cheek, that the United States is also a post-colonial power. REDMAN said that if there had been a consensus within Working Party 7A, then there probably would have never been an issue. Regardless of whether anyone thought it was going to cause problems, "if the experts all agree, that is what happens."

BIRTH felt that the moment the United States appears on one side, and China and Russia appear to be on the other, it conjures up the whole Non-Aligned Movement. As soon as that happens in a global assembly, BIRTH conjectured that it becomes far easier to table anything than to move forward. REDMAN agreed, thinking that if only China, or only Russia, disagreed, then there may have been room for discussion. BIRTH added that "we live in an era where, if the United States is taking a position, it is probably pretty easy to rally support against it."

KIESSLING added that another aspect is that the United States is advocating a position of change from a working standard. If one is going to be appropriately conservative, then one needs to be able to explain why a change is needed. BIRTH said it gets even worse because it is all coming from Department of Defense. If it was coming out of the Department of Labor, we would have a different reaction. KIESSLING said that was a good point.

REFERENCES

[1] Joshua 10:12-14.

[2] Allen, S.L. (2011), "Timekeeping System Implementations: Options for the *Pontifex Maximus*." Paper AAS 11-681 from *Decoupling Civil Timekeeping from Earth Rotation—A Colloquium Exploring Implications of Redefining UTC*, American Astronautical Society Science and Technology Series, Vol. 113, pp. 325-33.