

DISCUSSION CONCLUDING AAS 13-506

DENNIS MCCARTHY commented that the manuscript by DAVID FINKLEMAN and KARA WARBURTON was a very fine paper on terminology, the depth of which he could not begin to criticize. However, he was not sure how one deals with the evolution of terminology over time. Words can have a way of changing their meaning with time without the terminology also changing. MCCARTHY cited the word ‘gay’ as an example of a word that would have a totally different meaning to MCCARTHY’s grandmother versus his son, and that the word ‘time’ has the largest set of definitions in the dictionary.

MCCARTHY also felt an ongoing need to speak to the origin of the word ‘coordinated’ used in the term *Coordinated Universal Time*. He thought that this word was often interpreted as implying coordination of clock time with the rotation of the Earth; however, the word first came into use to describe the coordination of time signals among international time services.¹ MCCARTHY added that it is not arguable that the civil time scale and UTC were based on the rotation of the Earth, citing his own recollection of circulating timing bulletins that once included “UTC–UT2” for the purposes of time coordination.

ROB SEAMAN asked if MCCARTHY’s point was that the current terminology is already meaningless, such that we need not worry about it. MCCARTHY replied that he does not necessarily make the following argument personally, and that he does not have a quarrel with the proposed label ‘International Time’ or whatever other label people want to use; nevertheless, MCCARTHY thought an argument could be made that “as long as it is coordinated among international laboratories, it remains *Coordinated Universal Time*.” ANDREW MAIN asked why this argument should not be made if the time scale “approximates Universal Time in its other senses?” MCCARTHY referred to that as an evolution of terminology far beyond its original intent. He felt that if the basis for civil time were renamed ‘International Time’, it would probably take on a different meaning fifty years from now and people would be sitting around a table much like this arguing about the intention of the people who decided to use the term ‘International Time’.

CHRIS TUASON wondered if MCCARTHY also had the “*Universal* part of the story” describing the early coordination of UTC among time services, because ‘Universal’ is the part of the term that seems overreaching.* MCCARTHY replied that ‘Universal’ referred to usage by the 1884 Meridian Conference held in Washington,² where the word first surfaced. It was used by the delegates to refer to a time to which all could refer to as being the same universally around the globe. MCCARTHY said they realized that “it would be nice to have one time,” and “it even says in the minutes of the meridian conference something about this is not meant to supersede national time scales or anything like that, but if you would like to refer to a single, universal time, that is a good idea, and that is where the word ‘Universal’ came from.” ARNOLD ROTS thought that ‘global’ might have been a better choice of term.

* *Editors’ Note:* The discussion concluding AAS 13-523 adds to this topic.

KEN SEIDELMANN clarified that the term ‘Universal Time’ is a case where the technical meaning evolved, because nobody has used ‘Universal Time’ purely in the sense of a ‘global’ time in the last one-hundred years. That supposed definition nowhere exists in MCCARTHY’s & SEIDELMANN’s recent textbook on timekeeping;³ rather, ‘Universal Time’ is defined as a scale based on the rotation of the Earth. MCCARTHY replied that was the case because the delegation of the 1884 Meridian Conference had no conception that timekeeping would be based on anything other than the rotation of the Earth, for there was not a better timekeeper known.

ROTS observed that the term ‘second’ had gone through the same evolution; it went from being based on a fraction of the tropical year to having an atomic definition. MCCARTHY added that it was defined as $1/86400$ of a day before that. By calling the metric unit of duration something other than “the second”, SEAMAN remarked this is a precise example of unseemly polysemy that should have been avoided from the beginning. MCCARTHY considered it to be an example of the evolution of terminology, particularly where the evolution is generated by imprecise interpretations. SEAMAN replied that, within the context of FINKLEMAN’s and WARBURTON’s manuscript, terminology is a precise language for precise purposes, not “a complex crazy-quilt of languages” like that of the earlier presentation (AAS 13-505) showing a table of 23 different language options resembling Greenwich mean time. MAIN thought there was lesson from that earlier discussion: terms do become ambiguous despite our best efforts, but it is not a reason to give up trying to be precise. It is our responsibility to not make things any worse.

SEIDELMANN bet that the definition of the second would need to be redefined due to the emergence of optical standards which can measure frequency more precisely. MCCARTHY agreed that the definition of the second would probably change, saying that the Consultative Committee for Time and Frequency (CCTF) had already recommended a long list of other atomic transitions that are meant to be “backwards compatible” with the caesium-based definition, yet more precise.^{4,5}

DANIEL GAMBIS pointed out the irony of MCCARTHY’s suggestion that delegates to the 1884 Meridian Conference had no clue as to what could happen in the future; that situation is arguably the same now because we do not have any certainty about what the future holds. STEVE ALLEN said that is essentially where the CCIR* left things when it first drafted Recommendation 460. Effectively, they “finished their work” with UTC as if nothing else might come along for which their definition might cause trouble—and then computers happened.

REFERENCES

- ¹ Seago, J.H., R.L. Seaman, S.L. Allen (2011), *Decoupling Civil Timekeeping from Earth Rotation—A Colloquium Exploring Implications of Redefining UTC*. American Astronautical Society Science and Technology Series, Vol. 113, Univelt, Inc., San Diego. p. 337.
- ² US Government, International Conference held at Washington for the purpose of fixing a prime meridian and a universal day, October 1884: Protocol of the Proceedings.
- ³ McCarthy D.D., P.K. Seidelmann (2009), *Time—from Earth Rotation to Atomic Physics*. Wiley –VCH, p. 335.
- ⁴ Quinn, T.J. (2003), “Practical realization of the definition of the metre, including recommended radiations of other optical frequency standards.” *Metrologia*, Vol. 40, No. 2, pp. 103-33.
- ⁵ Felder, R. (2005), “Practical realization of the definition of the metre, including recommended radiations of other optical frequency standards.” *Metrologia*, Vol. 42, No. 4, pp. 323-25.

* *Editors’ Note*: The Consultative Committee on International Radio, CCIR, is the predecessor to the ITU-R.