THE SENIOR COLLEGE MESSENGER

Issue 21: July, 2023

This is an organ for members of Senior College to submit short articles that share news, letters to the editor, reactions to the program and anything that they feel will be of general interest. Its regular appearance will allow for an exchange of opinion of topics of interest to the members. In particular, it would be interesting to record reactions to the talks, colloquium topics and books discussed.

Please submit contributions to the editor, Ed Barbeau at barbeau@math.utoronto.ca .

SYMPOSIUM LINKS

In case you missed the annual symposium in April or wish to have a record of the proceedings, here are a couple of links. The first directs you to the abstracts.

The second will take you to four recorded talks, by Jim Balsillie, Avi Goldfarb, Jon Penney and Laura Rosella.

IN MEMORIAM

Clive Mackie Beck (January 5, 1939 - June 30, 2023)
Ontario Institute for Studies in Education

CALENDAR OF COMING EVENTS

Events marked with **F** are for fellows and external fellows. Registration a few days ahead is necessary for each event. This can be done in response to a weekly email from Senior College to its members that describes the events or by going on line at www.seniorcollege.utoronto.ca .

Book Club: Mondays 2-4 pm (Zoom only) (**F**)

July 3: Niccolo Machiavelli, *The Prince* (1532) (Leader: David Milne)

September 11: David Graeber & David Wengrow, *The dawn of everything: a new history of humanity* (2021) (Leaders: Daphne Maurer, Susan Pfeiffer)

October 2: Tom Stoppard, *Arcadia* (1993) (Leader: Alexander Leggatt)

November 6: Charles Darwin, *On the origin of species* (1859) (Leader: Sara Shettleworth)

December 4: Jennifer Raff, *Origin: a genetic history of the Americas* (2022) (Leader: Susan Pfeiffer)

January 8, 2024: Kevin Rudd, *The avoidable war: the dangers of a catastrophic conflict between US the Xi Jinping's China* (2022) (Leaders: Max Nemni, David Milne)

February 5: Alistair MacLeod, *No great mischief* (1999) (Leader: Meg Fox)

March 4: Ed Yong, *An immense world: how animal senses reveal the hidden realms around us* (2022) (Leader: Sara Shettleworth)

April 1: Willaim Carlsen, *Jungle of stone: the extraordinary journey of John L. Stephens and Frederick Catherwood and the discovery of the lost civilizations of the Maya* (2017) (Leader: Jim Gurd)

May 6: Siddhartha Mukherjee, *The song of the cell: an exploration of medicine and the new human* (2022) (Leader: William Logan)

June 3: Helen Macdonald, *H is for Hawk* (2014) (Leader:Peter Alberti)

July 8: Alex Ross, *The rest is noise: listening to the twentieth century* (2007) (Leaders: Linda Hutcheon, Michael Hutcheon)

Meet your colleagues: Thursday, 2-4 pm (Zoom only)

July 6: Cynthia Smith
July 13: Ed Barbeau
July 20: Hugh Gunz
July 27: Suzanne Hidi

Aftermath

In the table, we have listed the first few powers of 2 and 10. As the exponent n gets larger, so do the corresponding powers, and every once in a while, the power gets longer by one digit. Every time we increase the exponent by 1, **exactly one** of the two powers gets longer by one digit. Both powers cannot increase their length together, nor can they both keep the same length.

n	2^n	5^n
1	2	5
2	4	25
3	8	125
4	16	625
5	32	3125
6	64	15625
7	128	78125
8	256	390625
9	512	1953125
10	1024	9765625

There is a related phenomenon. Express the powers of 10 to base 2 and to base 5. For example, since

$$\begin{aligned}1000 &= 512 + 256 + 128 + 64 + 32 + 8 \\ &= 1 \times 2^9 + 1 \times 2^8 + 1 \times 2^7 + 1 \times 2^6 + 1 \times 2^5 + 0 \times 2^4 \\ &\quad + 1 \times 2^3 + 0 \times 2^2 + 0 \times 2 + 0 \times 1,\end{aligned}$$

we can write 1000 in base 2 numerations as $(1111101000)_2$, where it has 10 digits. Since

$$1000 = 625 + 375 = 1 \times 5^4 + 3 \times 5^3 + 0 \times 5^2 + 0 \times 5 + 0 \times 1,$$

we can write 1000 in base 5 numeration as $(13000)_5$ with five digits.

If we write out all the powers of 10 in these two bases, for each whole number greater than 1, there is a power of 10 that has a representation with that number of digits in **exactly one** of the two bases 2 and 5. Successive powers of 10 in base 5 have 2, 3, 5, 6, 8, 9, 11, ... digits, while successive powers of 10 in base 2 have 4, 7, 10, ... digits ($10 = (1010)_2$, $10^2 = (1100100)_2$).