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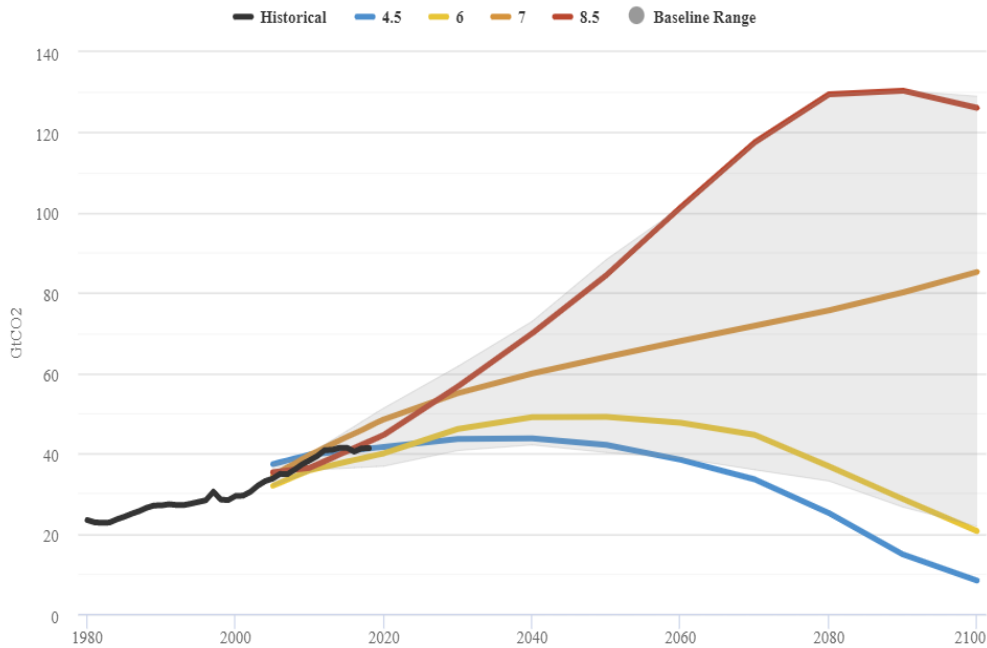
Reference: Senate Bill 854

Senator Dembrow and members of the Senate Committee on Education:

A review of the testimony submitted in opposition to SB854 reveals substantial confusion amid abundant evidence as to exactly why SB854 is so important. First, we find many of those claiming to oppose the bill actually support it. Second, many of those who actually oppose the bill do so because they reject the science. And then there's retired Physician Daniel Nebert who claims to represent the opinion of Oregon State University, probably to the embarrassment of the University Board of Trustees and almost certainly to the climate science faculty in the Oregon Climate Change Research Institute housed at that university.

Nebert (2023) makes a series of statements that are either of questionable merit or simply false. These deserve a response:

- 1) Nebert starts with the challenging claim that "the United Nations Intergovernmental Panel on



Climate Change (IPCC) recently shocked the global warming community by very discreetly announcing a retraction (27 October 2022) that "their computer-modeling estimates were wrong." They see

Figure 1. Comparing the annual greenhouse gas emissions trajectories if the IPCC 6 Shared Socioeconomic Pathways. The gray area represents the range for the range of no-policy baseline runs in the SSP database (Hausfather 2019).

“no ‘climate emergency’ between now and the end of the century.” My search to verify such a claim did not reveal any such IPCC statement. Instead, it seems to be a statement by Brill (2022) that refers to the United Nations Gap Report (UNEP 2022). Indeed, the UNEP

Cumulative emissions since 2005

Gt CO₂

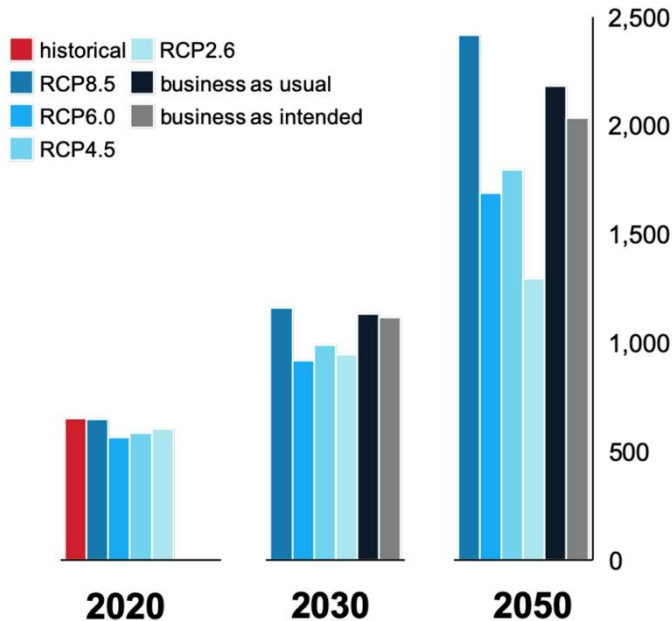


Figure 2 The data indicate a remarkable agreement between RCP 8.5 and observed data from 2005 to 2020. (Schwalm et al. 2020)

(range: 1.9–3.3°C) for a 66 per cent chance.” Note also that the UNEP (2022) statement refers to ‘warming over the twenty-first century.’ This implies that, to assess warming from the pre-industrial level to 2100, we need to add about 0.75°C to the total. When this correction is applied, the huge sigh of relief implied by Brill (2022) and Nebert (2023) seems to dwindle profoundly since the IPCC (2018) urged a limit on warming at 1.5°C above preindustrial levels. The UNEP (2022) adjustment may be an improvement over previous projections, but it still leaves us way above the IPCC goal by the end of the century. In addition, the reality that neither Nebert (2023) nor Brill (2022) face is that when we look at the emissions trajectory we are currently following (Figure 1) this seems mostly to have been following or exceeding the Shared Socioeconomic Pathway (SSP) 8.5. (Figure 1). Only for the most recent year or two has that seemed to follow a lower scenario. Curiously, shortly before Nebert (2023) claims the IPCC was making his statement, the IPCC (2021) itself was actually stating: “Scientists are observing changes in the Earth’s climate in every region and across the whole climate system.” This caution continued “Many of the changes observed in the climate are unprecedented in thousands, if not hundreds of thousands of years, and some of the changes already set in motion—such as continued sea level rise—are irreversible over hundreds to thousands of years.” They added: “However, strong and sustained reductions in emissions of carbon dioxide (CO₂) and other greenhouse gases would limit climate change. While benefits for air quality would come quickly,

(2022) Gap report offers the statement that: “...a continuation of the level of climate change mitigation efforts implied by current unconditional NDCs [National Determined Contributions] is estimated to limit warming over the twenty-first century to about 2.6°C (range: 1.9–3.1°C).” However, missing from the Brill (2022) and Nebert (2023) inference that we should breathe a huge sigh of relief and cease to worry are two stated caveats that they ignore: “...with a 66 per cent chance, and warming is expected to increase further after 2100 as CO₂ emissions are not yet projected to reach net-zero levels...” and since “...current policies are insufficient to meet even the unconditional NDCs, a continuation of current policies would result in about 0.2°C higher estimates of 2.8°C

it could take 20-30 years to see global temperatures stabilize..." (IPCC 2021). Looking at cumulative emissions from 2005 through 2020 Schwalm *et al.* (2020) concluded that during that period we were above the RCP 8.5 scenario. It's important to understand that when developed, the RCP8.5 scenario wasn't identified as Business-As-Usual. Rather it represented the case where no remedial action was being taken to address emissions (Hausfather 2019). It has gained the 'Business as Usual' nickname because it seems to be the trajectory we are following. RCP8.5 was described by van Vuuren *et al.* (2011) as "characterized by increasing greenhouse gas emissions over time, representative of scenarios in the literature that lead to high greenhouse gas concentration levels." There is nothing here that suggests the climate crisis has waned.

2) It is clear that Nebert (2023) does not understand biology (see 4 below) so there is little surprise

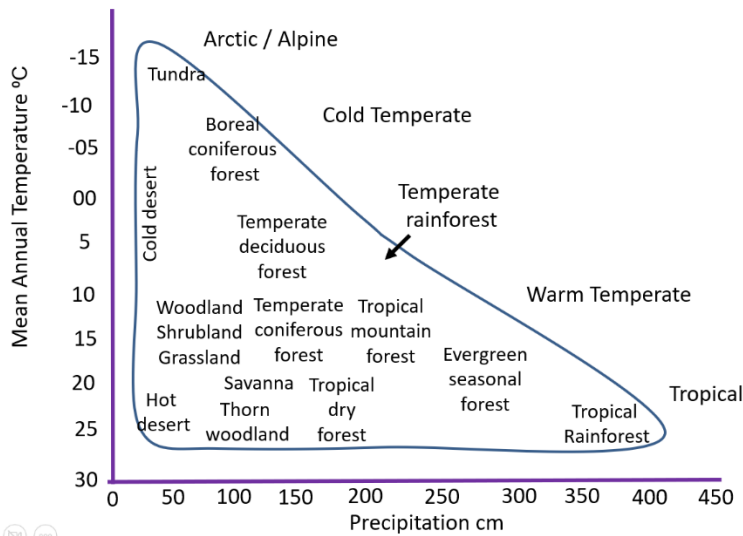


Figure 3. Distribution of natural ecosystems in relation to mean annual temperature and precipitation. Modified from Whittaker 1975

that he dismisses the impact of the global warming that he accepts as likely this century on our natural ecosystems. Many years ago, Whittaker (1975) developed a chart depicting the distribution of natural ecosystems across the planet in relation to average annual temperature and precipitation. A modified version of this (Figure 3) displays our natural ecosystems in such a graph, depicting the climatic needs of our natural systems. It should be evident that a

change of a few degrees or a few cm of precipitation may shift conditions away from those necessary to these ecosystems – resulting in massive extinctions, or – at best – local extirpations. Those who have heard about the sixth extinction will be familiar with this issue. What should concern us even more, maybe, than the impact of temperature increases on our natural systems that Nebert (2023) finds acceptable, is the fact that our agriculture, forestry and fisheries are dependent on the same variables. What lead Brill (2022) and Nebert (2023) to breathe a sigh of relief and allows them to criticize climate scientists for alarmism, would likely destroy natural ecosystems, agriculture, forestry, and fisheries across the planet.

- 3) Nebert (2023) states that ‘they report’ global warming of “0.017°C per year” but it remains unclear who ‘they’ are since it isn’t the IPCC or UNEP (2022). Of course, a warming of 0.017°C

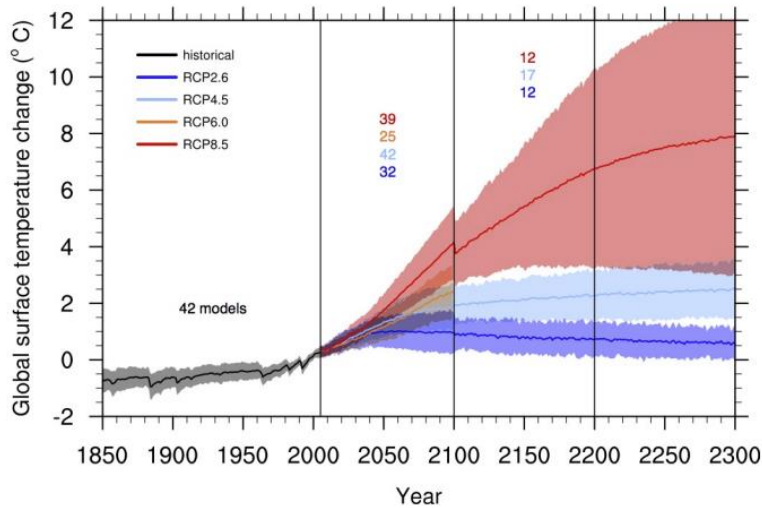


Figure 4 Projected global temperature trends compared to 1986-2005 according to Representative Concentration Pathways. (IPCC 2013)

per year reaches 1.7°C per century, to which must be added the warming of about 0.75°C before 2000. This places us well beyond the necessary target established by the IPCC (2018) of 1.5°C above the pre-industrial level. This offers no great relief from previous projections. Certainly, the extreme case projection represented by RCP8.5 (Figure 4) suggests a warming of some 4°C with a large ± range. But note

also, the RCP 6.0 scenario suggests only a warming of 2°C or so by 2100 which is not far away from what the UNEP (2022) offers. Apparently, Brill (2022) and Nebert (2023) are excited and relieved that the evidence suggests we are not on that extreme RCP8.5 trajectory, even though the trajectory does not meet the IPCC (2018) goal.

- 4) Nebert then offers the statement: “As any grade-school science student will tell you, “Plants require CO₂ and expel oxygen (O₂). Animals and fungi take up O₂ and give off CO₂. CO₂ is necessary for the Cycle of Life on Earth!” Any biologist will testify (even Nebert’s hypothetical grade-school student), that plants both photosynthesize and respire (i.e., they both take in carbon dioxide and emit it) while animals only respire (i.e., only emit carbon dioxide). This fundamental misunderstanding of biological reality is present in many nonsensical claims by climate science deniers and leaves informed readers wondering exactly from where they generate their understanding of the world. The argument by extension that carbon dioxide cannot be a problem is naïve. Salt is a natural molecule that is needed by all living things, but too much will kill them.
- 5) Nebert continues with the claim: “During the past 800,000 years of ice-core data, there is no consistent correlation between global warming and global-cooling cycles and global atmospheric CO₂ levels.” This is just false as Figure 5 (Herndon 2017) demonstrates. While the correlation between temperature and atmospheric carbon dioxide is evident, the story is a little more complex than might at first appear to be the case. This relationship has been well-understood for over a decade (e.g. Extance 2012).

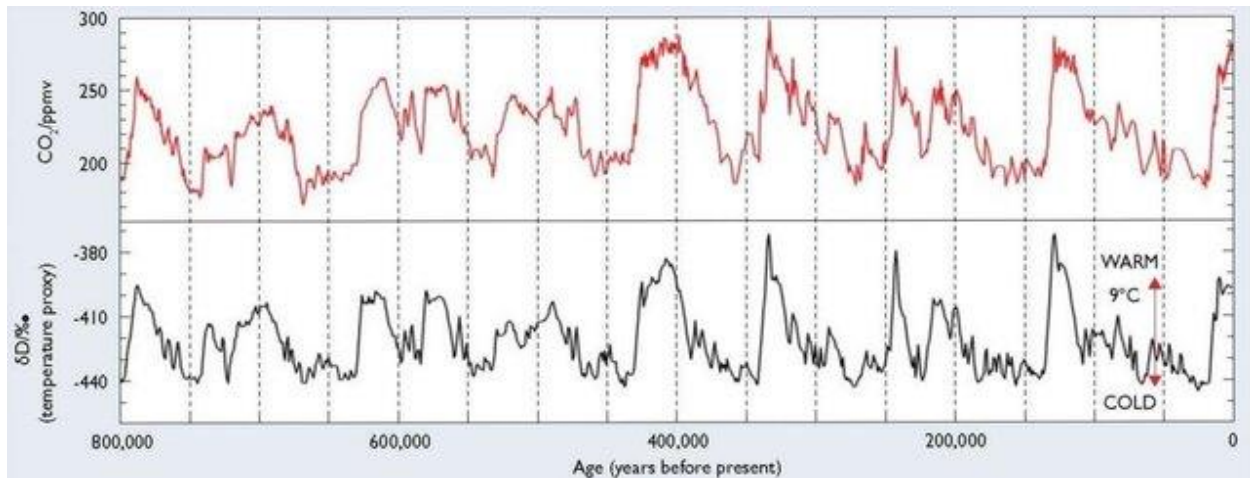


Figure 5. The parallel between atmospheric carbon dioxide concentration and temperature as depicted in Antarctic ice core data (Herndon 2017)

6) Nebert’s reported carbon dioxide equivalent balance computation and conclusions is also remarkably naïve. The question to ask is not “what is the proportion of human-induced emissions versus natural ecosystem emissions of carbon dioxide equivalent gases? Rather, the

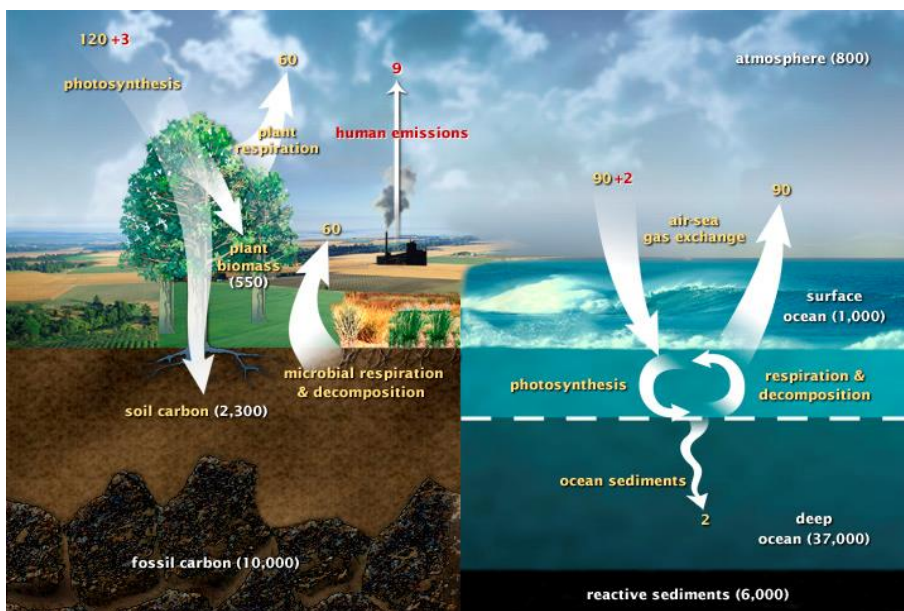


Figure 6. The Carbon Cycle depicting carbon flux in gigatons. NASA 2011

question is: “to what extent do human-induced emissions disrupt the natural balance of emissions and absorption of these gases and what is the impact of any imbalance on the atmospheric concentration of these gases? Yue and Gao (2018) reported that natural

ecosystem emissions annually amounted to about 29 gigatons of carbon dioxide equivalent while human-induced (anthropogenic) emissions amounted to 36.2 gigatons. Before human intervention, the natural world was largely in balance in terms of the emissions of carbon dioxide into the atmosphere and its capture in natural processes. The data from Yue and Gao (2018) demonstrate that human activities are substantially disrupting this balance and adding considerable greenhouse gases to the atmosphere. Nebert’s ‘back of the envelope’ calculations seem far divorced from reality. Nevertheless, the key question is: what do the anthropogenic

emissions do to the long term atmospheric concentration. Given the long-lived nature of many of these gases, the discrepancy imposed by human activity on the historic balance does not have to be great to cause a cumulative impact. Figure 6 from NASA (2011) demonstrates this balance on land and ocean and shows that human activities are disrupting the balance of the natural cycle to the tune of some 8 gigatons of carbon annually (increased emissions of 11, minus increased photosynthesis of 3). As this builds up, the impact increases, which is precisely why global warming has become so acutely evident since the 1970s.

- 7) Nebert offers the thought that: “Increases in atmospheric CO₂ levels have helped “green” the Earth and enhanced crop production substantially.” Nebert (2023) either does not understand, or merely fails to mention two problems with this simplistic conclusion. (a) the apparent ‘greening’ is restricted to arid zones where an increase in atmospheric carbon dioxide results in plants becoming more efficient water users (e.g. Ogutu *et al.* 2021). As a result, some plant growth is enhanced. (b) While some crop growth is enhanced by the increased carbon dioxide concentration, the warming that this induces actually depresses crop yield and renders the crops less nutritious (Ziska 2022). Again, apparently, Nebert could benefit from the science that SB854 might impart.
- 8) I conclude by noting that the links Nebert (2023) offers do not provide confirmation of his claims. They are merely ‘window-dressing’ designed to create the impression that there is support for the claims offered. In particular, his first citation does not support the claim that the IPCC stated what Nebert claimed it stated, and his second is a website (not peer-reviewed) by a well-known contrarian who rejects the scientific consensus while his data generally support it.

Like so many of the comments submitted in opposition to SB854, those of Nebert (2023) actually demonstrate the need for informed climate science instruction across the curriculum and throughout the grade levels.

Respectfully submitted,

A handwritten signature in black ink that reads "Alan Journet". The signature is written in a cursive, flowing style with a large initial 'A' and 'J'.

Alan Journet Ph.D.

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