World Gastroenterology Organisation - *Gut* commentary series on digestive health and climate change

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INTRODUCING A COMMENTARY SERIES RELATED TO DIGESTIVE HEALTH AND CLIMATE CHANGE

We are delighted to introduce to the *Gut* readership a compendium of nine commentaries, each summarising one, or a hybrid, of the nine educational webinars organised by the World Gastroenterology Organisation. The webinars covered the why, what and how in terms of climate change (CC) as related to digestive health hazards, disease implications and actionable interventions.[1] These 1-hour webinars were held every 2 weeks, 8 March to 28 June 2023, and will remain freely available for anyone to view any or all of them depending on the topic of interest to the viewer. Each webinar included presentations by two content experts and ended with a question-and-answer segment.[1] The webinars were viewed live by 987 participants from 117 countries, including gastroenterologists, trainees, nurses, general practitioners, paediatricians, surgeons, dietitians and pharmacists, and the freely available videos have already had nearly 2550 views over nearly 7 months since the course began.

The nine commentaries published by *Gut* in this December 2023 issue are coauthored by the webinar speakers and colleagues (figure 1) and provide a synopsis of the webinar topics and related resources and references. They also serve as a compendium of the impact of CC on gastrointestinal health for readers worldwide to use. The nine commentaries begin with an overview of the fundamentals to assist the readership in fully grasping the gravity of the CC crisis,[2] and close with an overview of climate action opportunities pertaining to education, empowerment of trainees and research.[3] Notably, the *Gut* commentary series will be freely available to any reader able to connect with the internet.

In terms of content, the commentary series includes several unique aspects: (1) a one-stop-shop in terms of providing a collection synopsis pertaining to CC fundamentals, greening digestive health including endoscopy, vulnerable populations, adaptation and resilience, an industry perspective, the carbon footprint of gastroenterology practice, how the National Health Service in England is mitigating the climate crisis, opportunities for nurses and gastroenterologists to unite in tackling CC health efforts, CC in paediatric health, how professionals can engage, then closing with opportunities and gaps that can be accomplished by education, trainees and research; (2) in most of what is covered by the commentaries, in the context of gastroenterology and hepatology, the issues raised and approaches towards mitigating the climate crisis can be extended to other medical specialties and subspecialties; (3) concrete actionable steps that may be undertaken are presented and (4) an industry approach and perspective is included which is critical since working with industry as partners towards a sustainable health sector and decrease waste is essential.[4 5]

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Commentary Series on Digestive Health and Climate Change

The fundamentals: Understanding the climate change crisis	Desmond Leddin, Hugh Montgomery
The effects of climate change on digestive health, and preventive measures	Mhairi C. Donnelly, Nicholas J Talley
Impact of climate change on vulnerable populations	Govind K Makharia, Anahita Sadeghi, Demond Leddin, Anthony Costello
Approaches for greening endoscopy and reducing waste	João A Cunha Neves, Enrique Rodríguez de Santiago, Lars Aabakken
Green gastroenterology adaptation, resilience, and an industry perspective	Cassandra L Thiel, Emma Pak, Rainer Burkard, Harald Huber
The carbon footprint of gastroenterology practice	Heiko Pohl, Robin Baddeley, Bu'Hussain Hayee
NHS efforts in England to mitigate the climate crisis: Uniting nurses and gastroenterologists	Robin Baddeley, Leigh Donnelly, Nick Watts
Climate change, pediatric health, and ways that digestive health professionals can engage	Rebecca Philipsborn, Madhumitha Manivannan, Todd L Sack
Gastroenterology climate action opportunities via education, empowerment of trainees and research	Aasma Shaukat, Brijen Shah, Cassandra DL Fritz, M Bishr Omary

Figure 1 The figure summarises the nine commentaries that appear in the current 2023 December issue of *Gut*.

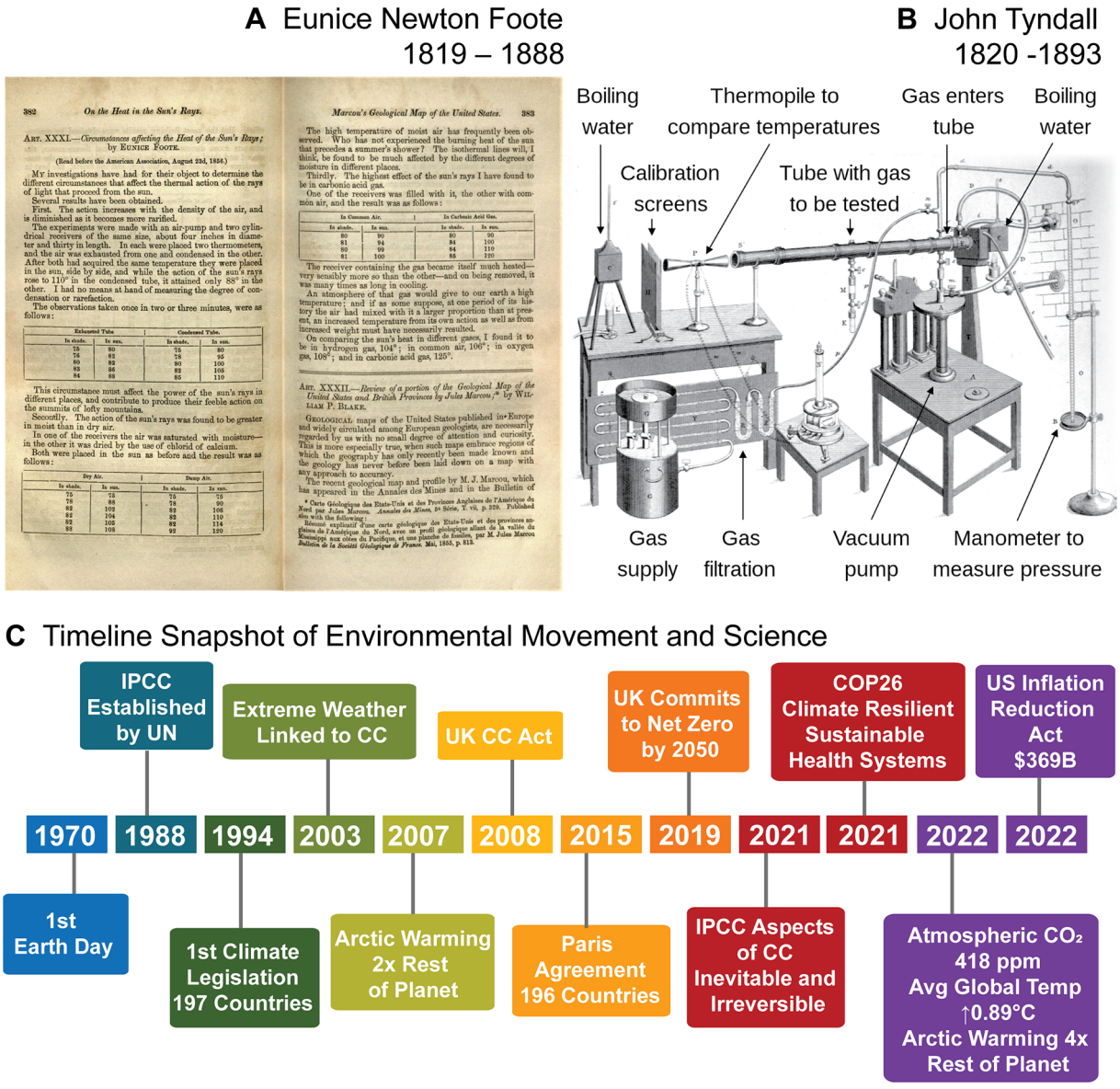

Figure 2 Founding trail blazers in climate change, and snapshot timeline of environmental advocacy, policies and science. (A) Classic article, published in 1856 by Eunice Newton Foote, that presented groundbreaking experiments in climate change science. (B) Figure from a landmark 1861 publication by John Tyndall on the absorption and radiation of heat by gases. (C) Panel shows a timeline (1970–2022) overview of several key advocacy events and international meetings, release of key findings pertaining to mitigating the global and individual country impact of climate change (CC), in addition to highly concerning CC 'vital signs'.[10 11] The highlights displayed in the timeline do not minimise in anyway the thousands of important discoveries, policies, investments and advocacies taking place at the individual, local, regional, national and international levels. The rise in atmospheric carbonic acid gas (CO_2), and the change in global surface temperatures levels are staggering.[18] For example, the average CO_2 parts per million (ppm), which represents CO_2 molecules per one million molecules of dry air, were as follows for the years: 2022 (418 ppm), 1992 (354 ppm) and 1962 (317 ppm). This represents a 32% increase during the most recent 60-year span. Equally concerning increases in average global temperatures, compared with long-term averages from 1951 to 1980 levels, were as follows for the years: 2022 (0.89°C), 2002 (0.63°C) and 1982 (0.14°C). This global warming is even more dramatic in the arctic region, which experienced during 2007 2× the extent of warming compared with rest of the planet and became even more dramatic (4×) in 2022.[18]

TIMELINE OF DISCOVERY HIGHLIGHTS, ALARM BELLS AND INTERNATIONAL RESPONSE STEPS

In making the case for our specialty to take proactive measures, it is important to pay tribute to, and acknowledge, the early pioneers of CC discovery (figure 2A,B), and to highlight some of the wakeup calls of why inaction is detrimental,[6] while also being encouraged by the international response steps highlighted in figure 2C. One of the early pioneers who explored climate science is Eunice Newton Foote. She published a classic study in 1856 (figure 2A) aiming to 'determine the different circumstances that affect the thermal action of the rays of light that proceed from the sun'.[7] Not only was she a scientist and inventor but also a women's rights advocate. Her study findings suggested that carbonic acid gas (ie, CO_2) leads to an increase from the sun's generated heat (measured under her experimental conditions) from 104°C (under air conditions) to 125°C,[7] which represents the phenomenon now referred to as the greenhouse effect.

Another major foundational investigator is John Tyndall. Using the apparatus displayed in figure 2B, he demonstrated that the absorption of heat by nitrous oxide (N_2O) is 250× that by air, and showed that the heat absorption by CO_2 is 100× that by oxygen alone.[8] A significant aspect of these early findings is that greenhouse gas (GHG) emissions are currently measured in CO_2 equivalents which factors-in the global warming potential (GWP) of different gasses (eg, N_2O has a GWP 273× that of CO_2 for a 100-year timescale, while CO_2 effects last for 300–1000 years).[9] The reason that CO_2 is used as the unit to estimate GHG emission is because it accounts for nearly 80% of all GHG emissions.[9]

Focusing on some of the milestone events during the past 63 years (figure 2C),[10 11] an important advocacy milestone is Earth Day that began in 1970 in the USA and mobilised at that time nearly a million participants. Since then, Earth Day now engages one billion participants from 192 countries![12] One of the areas of focus of the Earth Day movement is a 60% reduction, by 2040, in the production of all plastics ('planet vs plastics') in addition to widespread awareness on the health risks of plastics and the phasing out of all single use plastics.[12] This is highly relevant to our medical specialty and subspecialty organisations that publish nearly 15 000 medical journals, many of which continue to be wrapped in plastic covers, coupled with the multiplier impact of their thousands of members.[13]

The timeline snapshot (figure 2C) highlights several other noteworthy events. These include establishment in 1988 of the Intergovernmental Panel on Climate Change (IPCC), which is the United Nations (UN) body for assessing the science related to CC.[14] For example, IPCC publishes a series of detailed assessment reports (ARs) that use scientific modelling, as detailed by the AR6 2023 report that incorporates data pertaining to the risk of increasing temperature conditions on human health and food production.[14] The timeline includes the landmark Paris Agreement of 2015 that came about at a UN Conference of the Parties (COP21) that included 196 countries who signed a 'legally binding' international treaty to mark the beginning of a shift towards a net-zero emissions world.[15] This was followed in 2019 by Britain being the first member of industrialised nations to commit to net zero carbon emissions by 2050. Although there is criticism that wealthy countries are not doing enough, the COP meetings provide a unique convening opportunity for policy negotiations, needed financing measures and implementation approaches, as took place at the 2021 COP26,[16] and the related special report by the WHO on CC and health.[17] An example of the evidence-based data that supports the CC crisis and global concern is that CO_2 levels, average global land temperatures, and arctic warming continue an unabated steady rise to record levels (figure 2C),[10 11 18] and thereby leading to extreme temperatures, worsening wildfires (that further generate CO_2) and catastrophic record flooding.[2]

IS OUR SPECIALTY TURNING THE CORNER AND CAN WE MAKE A DIFFERENCE

The good news is that our digestive health subspecialty organisations are heeding the call to action, by undertaking several measures to combat the CC crisis and initiating potentially transformative changes. Such efforts include developing actionable strategic plans; featuring CC studies, strategic plans, opinion pieces, and strategic plan progress in the organization/society journals; and developing CC or sustainability committees, task forces or working groups which are supported and charged with specific goals and include members with content expertise and interest.[13 19–22] However, embracing the need to undertake and implement such efforts remains limited. This assessment is based on a significant (49%) response rate to a 2022 survey of the leadership of 117 global gastroenterology societies.[23] Such limitations are reflected by 80% of the responders deeming other more pressing needs than CC mitigation, only 26% indicating that they plan to decrease their society's carbon emissions, 16% having CC-related educational programmes, and nearly 90% lacking a CC working group (or equivalent entity) within their organisation.[23] However and although anecdotally, there are some silver linings that we are aware of: (1) several digestive heath societies are planning to establish CC working groups, (2) several societies now hold minisymposia relating to the topic during their annual scientific meetings, (3) several society journals have discontinued the use of plastic covers for their journals, (4) some endoscopy units are beginning to measure their carbon footprint or are intending to do so, and are planning to designate a 'CC champion' in their units, and (5) some societies are looking into decreasing their carbon emissions, with sustainability metrics being developed for endoscopy units.[22]

Additional approaches to consider include empowering trainees and early career healthcare providers. Those empowered include nurses, physicians and other unit team members, with the unit/team being the endoscopy unit, or other digestive disease clinics, all being involved in sustainability efforts and celebrating such efforts and successes.[3 24] Furthermore, seeking evidence-based measures via research,[3] and demonstrating the economic impact of such measures are likely to provide buy-in from the health system leaders to support investment and implementation of additional planetary health changes. Our commentary series, and its related course webinars, provide insights and approaches that are presented by experts from across the planet, all interested in planetary health.[1] Working and advocating together for science and solutions, while winning over sceptics, make is possible to save our planet for those who follow us. The *Cover of Hope* of this December issue also makes the case, as does the statement by the polio vaccine pioneer, Jonas Salk "*our greatest responsibility is to be good ancestors*."

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