PROPOSED NATIONAL DEUTENOMICS INSTITUTE FOR THE 2025 USA HEALTH ADMINISTRATION

László G. Boros, M.D.

Professor of Pediatrics (retired)

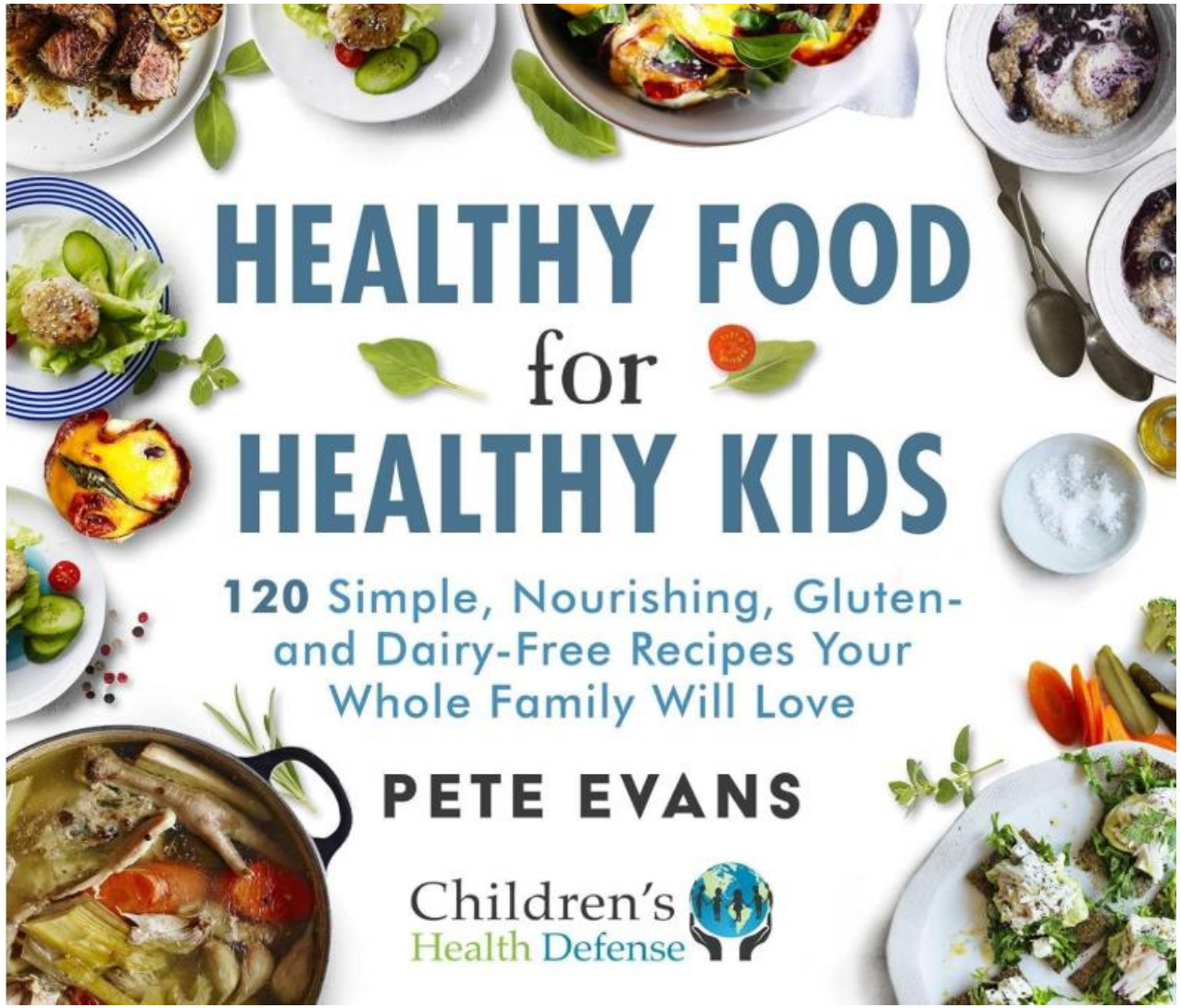
UCLA School of Medicine, Torrance, CA, USA

Division of Chemistry I., MBB, Biomedicum, Karolinska Institutet, Stockholm, Sweden

February 12, 2025

Zoom: https://ki-se.zoom.us/j/61941833610

KENNEDY JR. - 2025 COOKBOOK FOR KIDS

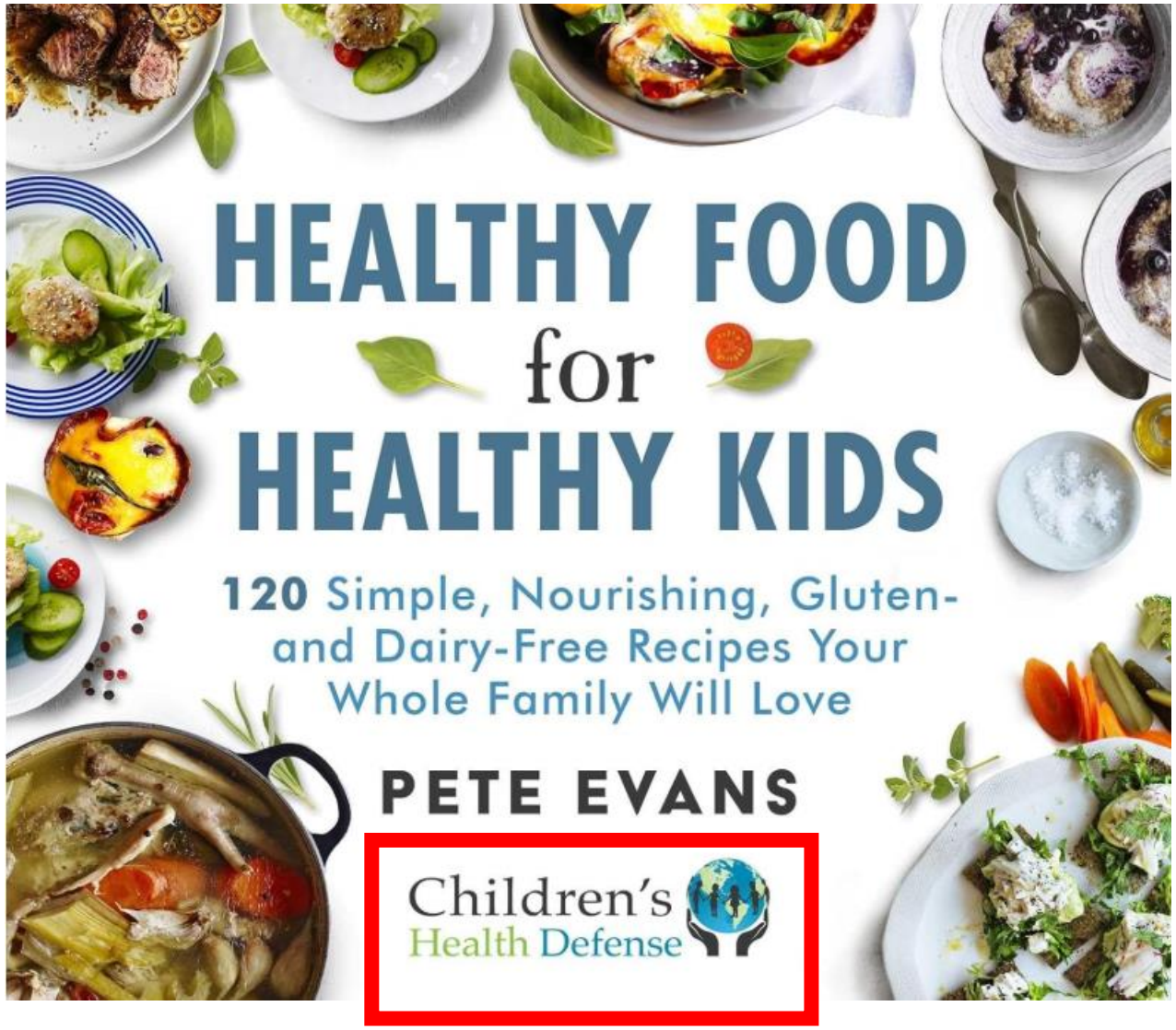


https://www.amazon.com/Healthy-Food-Kids-Nourishing-Dairy-Free/dp/1648210872/

KENNEDY JR. - 2025 COOKBOOK FOR KIDS

pork roast

chicken feet - interiors



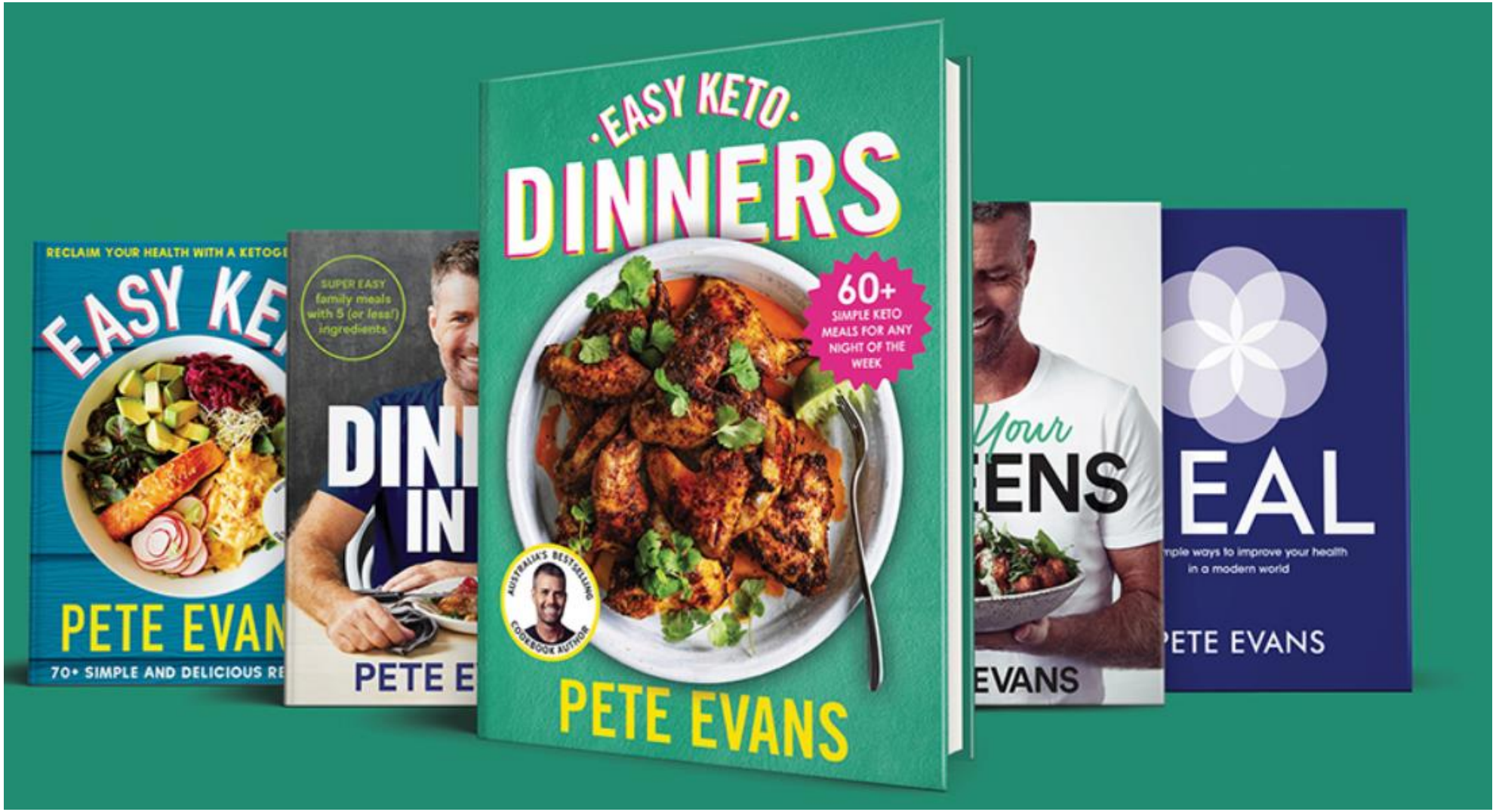
https://www.amazon.com/Healthy-Food-Kids-Nourishing-Dairy-Free/dp/1648210872/

KENNEDY JR. - 2025 COOKBOOK FOR KIDS

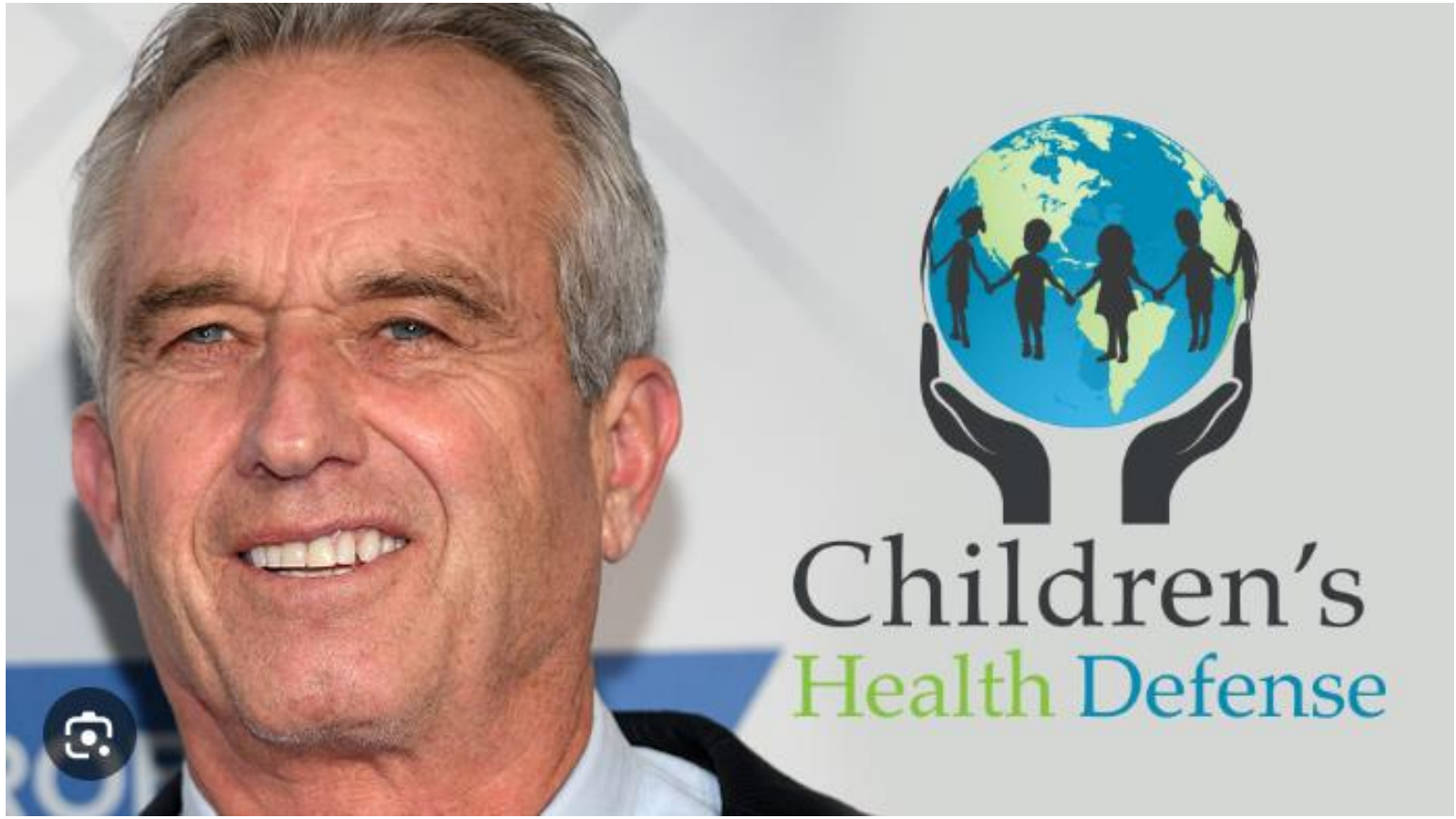
- **discover the ultimate guide to delicious, (deuterium depleted) paleo- and keto-friendly meals that your kids will love**

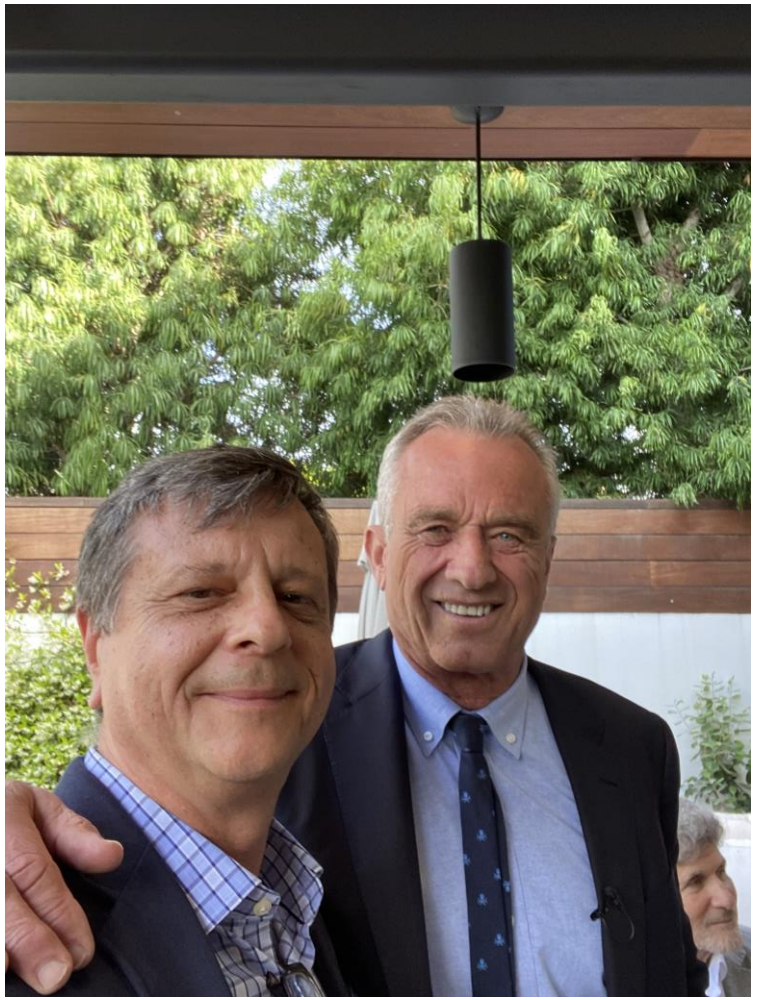
- **in this groundbreaking cookbook, renowned chef Pete Evans presents 120 easy, mouthwatering recipes designed to keep your little ones happy and healthy**

DEUTENOMICS COOKING

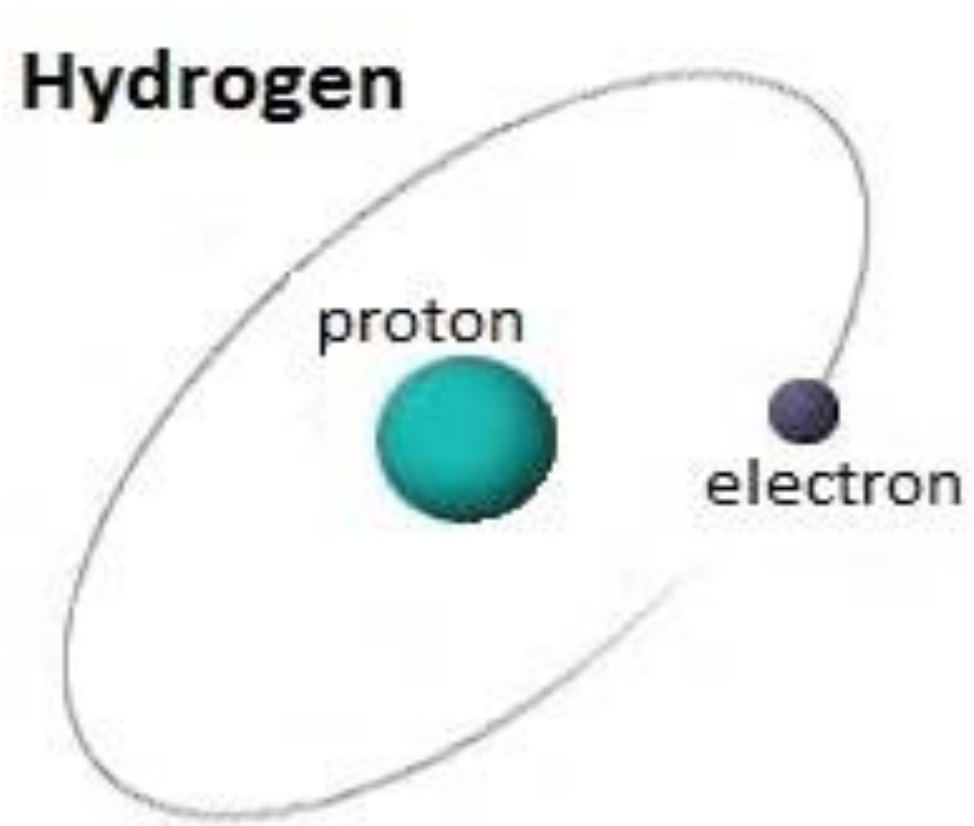


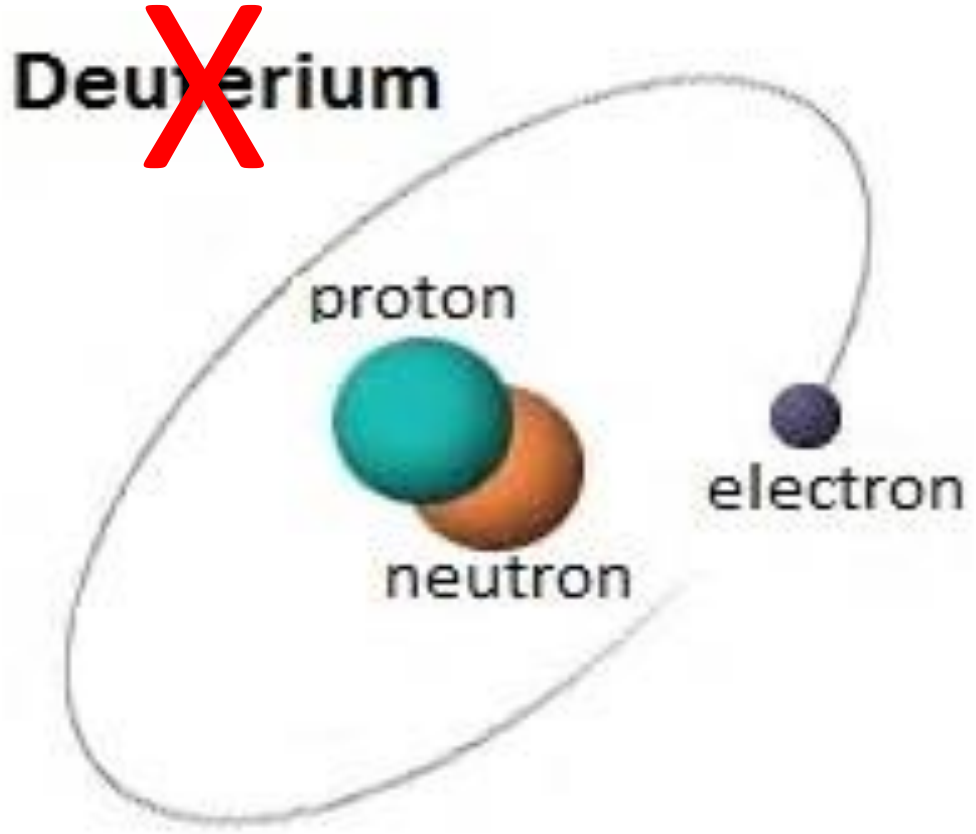
NATIONAL DEUTENOMICS PROPOSAL





KENNEDY JR. - 2025 COOKBOOK FOR KIDS

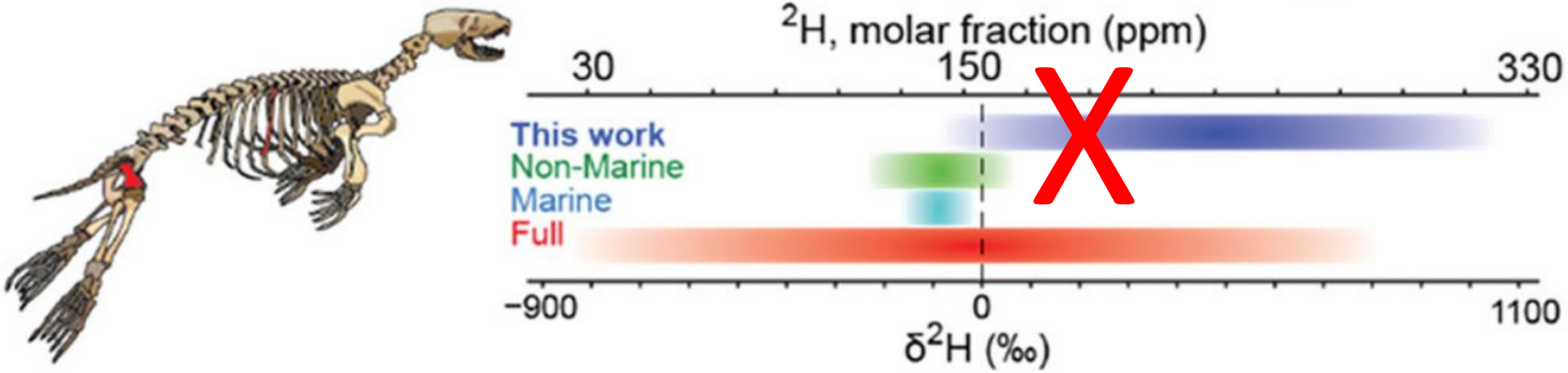




DEUTERIUM AND PHENOTYPE

JACS
JOURNAL OF THE AMERICAN CHEMICAL SOCIETY

https://doi.org/10.1021/jacs.1c12512



Abnormal (Hydroxy)proline Deuterium Content Redefines Hydrogen Chemical Mass

Hassan Gharibi,[¶] Alexey L. Chernobrovkin,[¶] Gunilla Eriksson, Amir Ata Saei, Zena Timmons, Andrew C. Kitchener, Daniela C. Kalthoff, Kerstin Lidén, Alexander A. Makarov, and Roman A. Zubarev*

DEUTENOMICS

- **how deuterium is distributed in nature and living organisms**
- **how and why deuterium behaves in nature and living organisms in particular ways**
- **what is deuterium's role in adaptive biology, disease and health (e.g.: oncoisotope)**

DEUTENOMICS

- **how deuterium is distributed in nature and living organisms**
- **how and why deuterium behaves in nature and living organisms in particular ways**
- **what is deuterium's role in adaptive biology, disease and health (e.g.: oncoisotope)**

DEUTENOMICS

https://doi.org/10.1103/PhysRev.39.164

Phys. Rev. **39**, 164 – **Published 1 January, 1932**

A Hydrogen Isotope of Mass 2

Harold C. Urey, F. G. Brickwedde, and G. M. Murphy

DEUTENOMICS

The Nobel Prize in Chemistry 1934 was awarded to Harold Clayton Urey "for his discovery of heavy hydrogen"

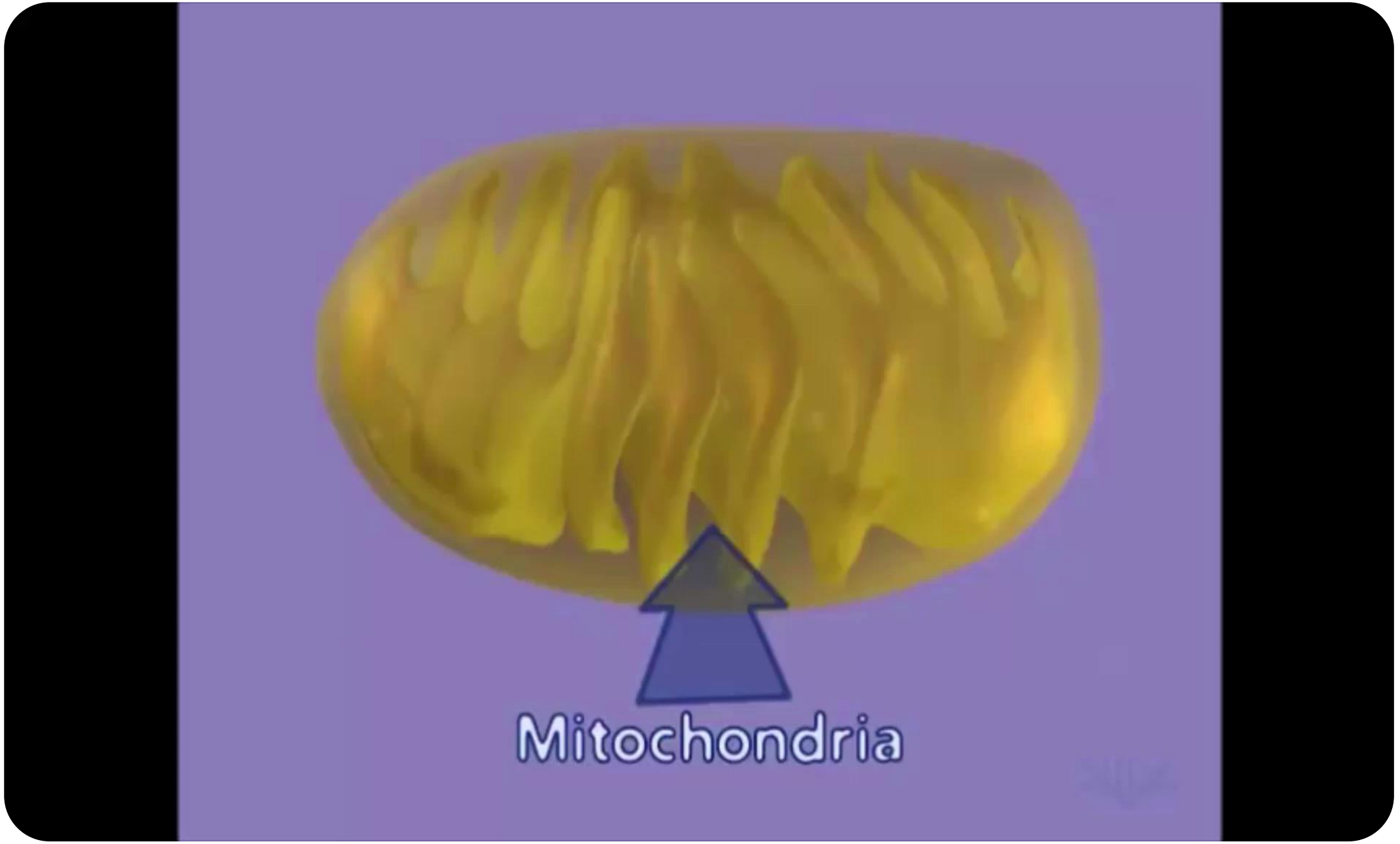
https://www.nobelprize.org/prizes/chemistry/1934/summary/

Photo from the Nobel Foundation archive.

Harold Clayton Urey

Prize share: 1/1

https://youtu.be/XI8m6o0gXDY?si=iV1piiFa71b3g2ec



https://drive.google.com/file/d/1LBr1OW1aItDY1Z8d0pNpegrvfPDKnMlS/view?usp=sharing

DEUTERIUM FRACTIONATION

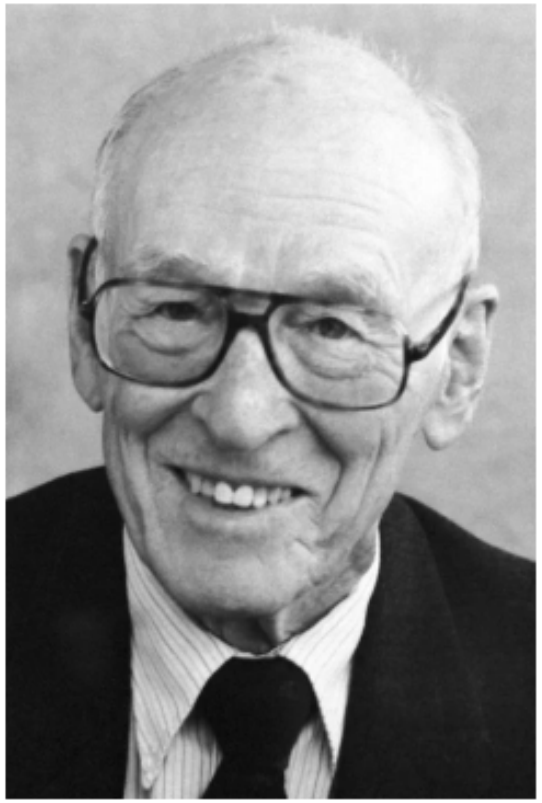


Photo from the Nobel Foundation archive.

Paul D. Boyer
The Nobel Prize in Chemistry 1997

Born: 31 July 1918, Provo, UT, USA

Died: 2 June 2018, Los Angeles, CA, USA

Affiliation at the time of the award: University of California, Los Angeles, CA, USA

Prize motivation: "for their elucidation of the enzymatic mechanism underlying the synthesis of adenosine triphosphate (ATP)"

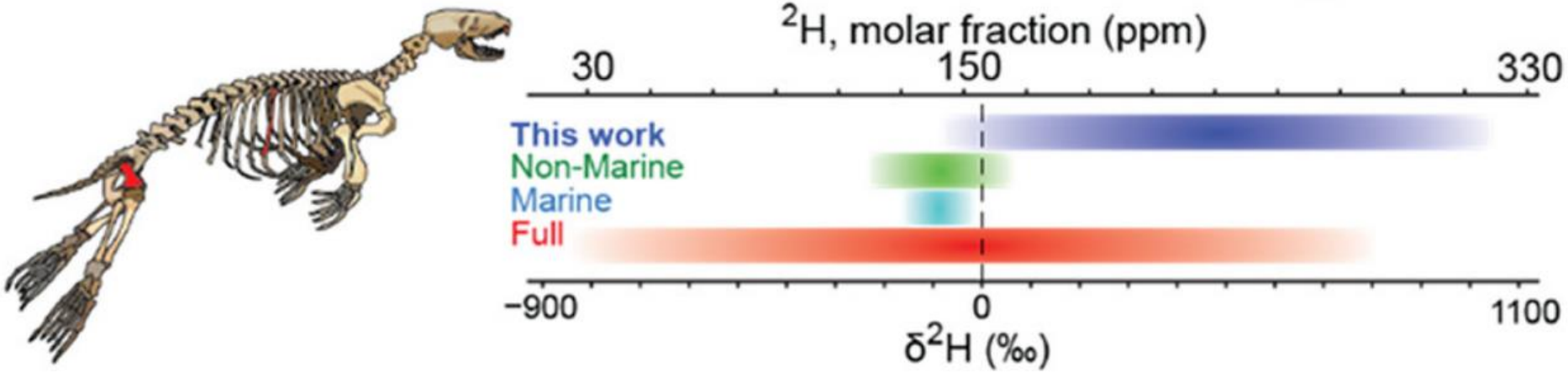
Prize share: 1/4

https://www.nobelprize.org/prizes/chemistry/1997/boyer/facts/

DEUTERIUM AND PHENOTYPE

JACS
JOURNAL OF THE AMERICAN CHEMICAL SOCIETY

https://doi.org/10.1021/jacs.1c12512



Abnormal (Hydroxy)proline Deuterium Content Redefines Hydrogen Chemical Mass

Hassan Gharibi,[¶] Alexey L. Chernobrovkin,[¶] Gunilla Eriksson, Amir Ata Saei, Zena Timmons, Andrew C. Kitchener, Daniela C. Kalthoff, Kerstin Lidén, Alexander A. Makarov, and Roman A. Zubarev*

DEUTERIUM AND PHENOTYPE

https://drive.google.com/file/d/1lG0xI5c52F4wTaOf1hgIGFhUWpS6PvLa/view?usp=sharing
COMPILATION BY ESZTER ANNA BOROS

PNAS Proceedings of the National Academy of Sciences of the United States of America

DEUTENOME

https://doi.org/10.1073/pnas.2310771121

RESEARCH ARTICLE | ENVIRONMENTAL SCIENCES |

Large enrichments in fatty acid $^{2}H/^{1}H$ ratios distinguish respiration from aerobic fermentation in yeast *Saccharomyces cerevisiae*

Ashley E. Maloney, Sebastian H. Kopf, Zhaoyue Zhang, +3, and Xinning Zhang Authors Info & Affiliations

Edited by Mark Thiemens, University of California San Diego, La Jolla, CA; received June 26, 2023; accepted March 21, 2024

May 6, 2024 | 121 (20) e2310771121 | https://doi.org/10.1073/pnas.2310771121

PNAS Proceedings of the National Academy of Sciences of the United States of America

DEUTENOME

https://doi.org/10.1073/pnas.2310771121

Abstract

…

"Our findings point to the broad potential of lipid $^{2}H/^{1}H$ ratios *as a passive natural tracker* of eukaryotic metabolism with applications to distinguish health and disease, complementing studies that rely on complex isotope-tracer addition methods."

PNAS Proceedings of the National Academy of Sciences of the United States of America

DEUTENOME

On 10 Jun 2024, at 19:50, LASZLO G Boros <contact@laszlogboros.com> wrote:

We would like to emphasize the phenotypic role of 2H/1H ratios with adaptive significance, based on many other contributions in the field (please see suggested co-authors).

PNAS Proceedings of the National Academy of Sciences of the United States of America

DEUTENOME

On 10 Jun 2024, at 19:50, LASZLO G Boros <contact@laszlogboros.com> wrote:

We would like to emphasize the phenotypic role of 2H/1H ratios with adaptive significance, based on many other contributions in the field (please see suggested co-authors).

On Tue, Jun 11, 2024 at 9:48 AM Roman Zubarev <roman.zubarev@ki.se> wrote:

I also think that the PNAs paper in question is a) remarkable, and a potentially crucial point for paradigm changing, and b) disappointing, as it still sticks to the old paradigm that isotopes are spectators rather than active participants, viewing "lipid 2H/1H ratios as a passive natural tracker of eukaryotic metabolism".

It would be great to write a piece promoting the view that heavy isotopes, particularly deuterium, are not merely passive trackers, but are active participants in metabolism, modulating it. If this is the aim of the letter you suggested, am willing to participate.

DEUTENOMICS

https://doi.org/10.1073/pnas.2412390121

PNAS LETTER | MICROBIOLOGY

Active involvement of compartmental, inter- and intramolecular deuterium disequilibrium in adaptive biology

László G. Boros [a,2,1], Stephanie Seneff [b], Marianna Túri [c], László Palcsu [c], and Roman A. Zubarev [d,e,f,2]

August 30, 2024 | 121 (37) e2412390121

PNAS Proceedings of the National Academy of Sciences of the United States of America

DEUTENOME

https://doi.org/10.1073/pnas.2412390121

The biosynthetic natural depletion of deuterium (^2H) in palmitic acid of tumor cells, when compared to water of fresh growth medium, readily distinguishes respiration from fermentation, as elegantly reported by Maloney et al. https://doi.org/10.1073/pnas.2310771121

PNAS Proceedings of the National Academy of Sciences of the United States of America

DEUTENOME

https://doi.org/10.1073/pnas.2412390121

Accelerated cellular growth remarkably decreased deuterium to protium ($^{2}H/^{1}H$) ratios, particularly in glycerol-respiring cells, by about 200‰ (~125 ppm).

PNAS Proceedings of the National Academy of Sciences of the United States of America

DEUTENOME

https://doi.org/10.1073/pnas.2412390121

The authors conclude that metabolite $^{2}H/^{1}H$ ratios may be used “as passive natural trackers of eukaryotic metabolism” that complement complex isotope-tracer methods.

PNAS Proceedings of the National Academy of Sciences of the United States of America

DEUTENOME

https://doi.org/10.1073/pnas.2412390121

The importance of water and product isotope chemistry is evident, which allows a systematic and, more importantly, a mechanistic interpretation, shifting the emphasis from passive to active role of deuterium in the regulation of metabolism in adaptive biology.

PNAS Proceedings of the National Academy of Sciences of the United States of America

DEUTENOME

https://doi.org/10.1073/pnas.2412390121

While fatty acids show a deuterium depleted ("deupleted") profile over extracellular water in rapidly dividing cells, another natural ^{2}H tracer study showed abnormally high deuterium content in collagen, just to redefine hydrogen chemical mass in biology.

PNAS Proceedings of the National Academy of Sciences of the United States of America

DEUTENOME

https://doi.org/10.1073/pnas.2412390121

Notably, δ^2H values in (hydroxy)proline of collagen extracted from grey seals show about twice as much deuterium as its ceiling (~157 ppm) in seawater. This corresponds to at least four times higher δ^2H than in any previously reported biogenic sample.

https://doi.org/10.1021/jacs.1c12512

PNAS Proceedings of the National Academy of Sciences of the United States of America

DEUTENOME

https://doi.org/10.1073/pnas.2412390121

As diet was ruled out as a plausible mechanism for such anomalous enrichment, evolution seems to depend on deuterium-related regulatory processes via submolecular proton tunneling event (reaction) architectures, with coinciding significant isotope fractionation properties.

PNAS Proceedings of the National Academy of Sciences of the United States of America

DEUTENOME

https://doi.org/10.1073/pnas.2412390121

There are apparent adaptive mechanisms: Some derive from traditional biochemistry, whereas others are yet to be clarified behind the overwhelming disequilibrium patterns in compartmental, inter- and intramolecular deuterium levels reported in recent studies.

https://doi.org/10.1016/S0306-9877(98)90178-5

PNAS Proceedings of the National Academy of Sciences of the United States of America

DEUTENOME

https://doi.org/10.1073/pnas.2412390121

The mechanism of accumulation of deuterons in specific imino acids of bone collagen high above natural mean oceanic water abundance is another example, yet more challenging to answer.

https://doi.org/10.1021/jacs.1c12512

PNAS Proceedings of the National Academy of Sciences of the United States of America

DEUTENOME

https://doi.org/10.1073/pnas.2412390121

This phenomenon, seen in predators with phenotypic adaptation to rapid dives in water, likely involves instant, reversible isomerase reactions with selective proton tunneling, nuclear quantum destabilization of metabolic water protons, and thus significant deuterium discriminating properties in hydrophobic cellular and mitochondrial nanoconfinements.

https://doi.org/10.1021/acs.accounts.8b00226

https://doi.org/10.1021/acs.jpclett.9b01835

PNAS Proceedings of the National Academy of Sciences of the United States of America

DEUTENOME

https://doi.org/10.1073/pnas.2412390121

We suggest that deutenomics, the study of inherent autonomic hydrogen isotope discrimination processes in nature, should be introduced into translational research. It is important to determine the magnitude of intrinsic kinetic isotope effects, as they are critical in deuterium fractionation, yet often misinterpreted.

PNAS Proceedings of the National Academy of Sciences of the United States of America

DEUTENOME

https://doi.org/10.1073/pnas.2412390121

The Human Deutenome should also not be ignored as an active player (as opposed to passive tracker) in forming the biological reaction coordinate.

https://doi.org/10.1074/mcp.RA120.002231

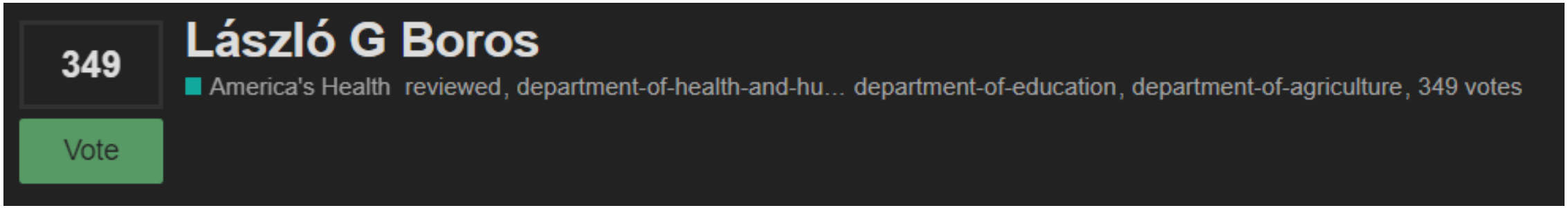
MCP MOLECULAR & CELLULAR PROTEOMICS OPEN ACCESS

Slight Deuterium Enrichment in Water Acts as an Antioxidant: Is Deuterium a Cell Growth Regulator?

Xuepei Zhang [1] · Jin Wang [1,2] · Roman A. Zubarev [1,3,4]

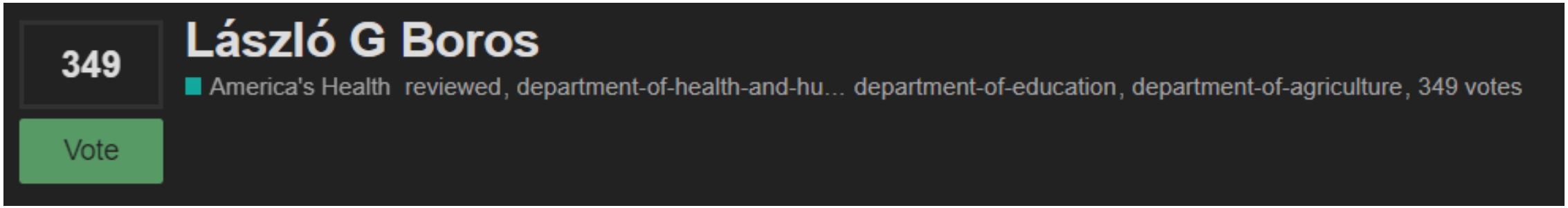
NATIONAL DEUTENOMICS INSTITUTE - USA

https://discourse.nomineesforthepeople.com/t/laszlo-g-boros/73708/14



NATIONAL DEUTENOMICS INSTITUTE - USA

https://discourse.nomineesforthepeople.com/t/laszlo-g-boros/73708/14

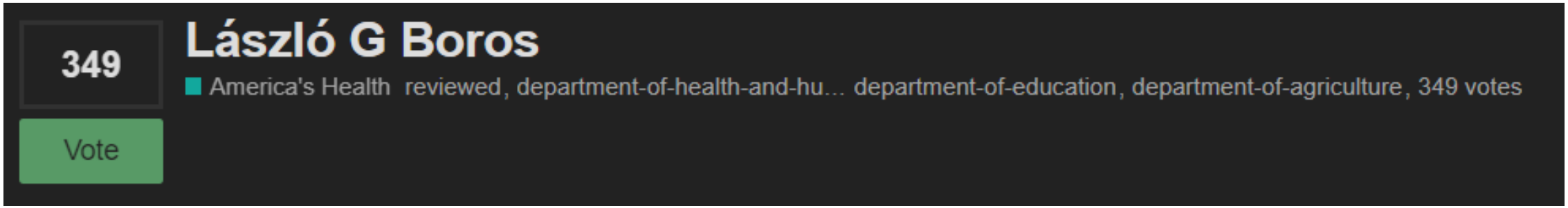


Agency or agencies for which nominator feels nominee is best suited:

- **Department of Health and Human Services**
- **Department of Education**
- **Department of Agriculture**

NATIONAL DEUTENOMICS INSTITUTE - USA

https://discourse.nomineesforthepeople.com/t/laszlo-g-boros/73708/14

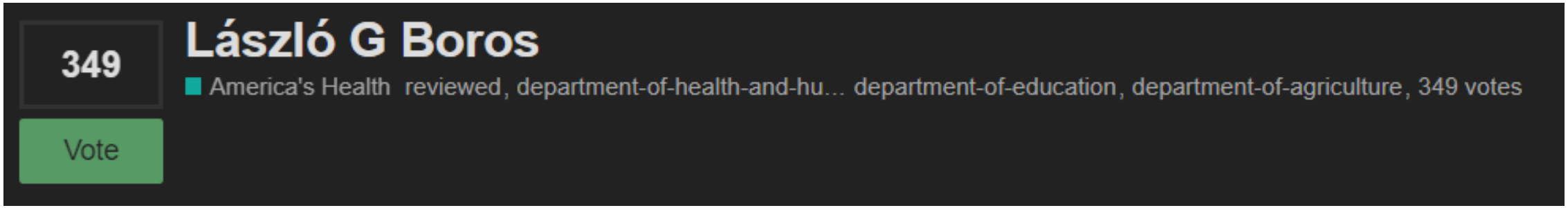


Agency or agencies for which nominator feels nominee is best suited:

- **Department of Health and Human Services**
- **Department of Education**
- **Department of Agriculture**

NATIONAL DEUTENOMICS INSTITUTE - USA

https://discourse.nomineesforthepeople.com/t/laszlo-g-boros/73708/14



I have been proposing a new National Deutenomics Institute (NDI - est. 2025) for a few years now and hopefully this is becoming an urgent reality with the new administration under Bobby's radar!

DEUTENOMICS CHALLENGES FOR THE NDI

- how and why deuterium accumulates in certain tissues and life forms
- food processing, deuterium and health
- diagnostic markers for deutenome studies (MRI)
- population deutenomics and regulation via food

DEUTENOMICS CHALLENGES FOR THE NDI

- analytical core (Dr. Zubarev)
- medical deutenomics core (Dr. Boros)
- environmental solutions for deutenomics (Dr. Seneff)
- nutritional solutions for deutenomics (open)

TRANSLATIONAL DISCUSSIONS

- deutenomics discussions of existing scientific and clinical data
- article reviews and editorial comments
- examples: https://www.laszlogboros.com

TRANSLATIONAL DISCUSSIONS

László G. Boros, M.D.

Retired Professor of Pediatrics

University of California Los Angeles School of Medicine, Harbor-UCLA Medical Center

Specialties

Medical Biochemistry, Deutenomics, Stable Isotope Chemistry, Biological Adaptation, Metabolic Regulation

https://www.laszlogboros.com

Resume & Certifications

On the cover of Metabolomics (18-1,

LG Boros

DEUTENOMICS

science behind endurance, performance and health via the regulation of deuterium in Nature

Log In

contact@laszlogboros.com

Home About Consultations Podcasts Lectures More

"Use of the powerful tools provided by SIDMAP .... provides the promise to address, perhaps in vivo, similar unanswered questions involving the molecular basis for disease."

Ralph Green, M.D., Ph.D., F.R.C. PATH
University of California Davis

https://www.laszlogboros.com

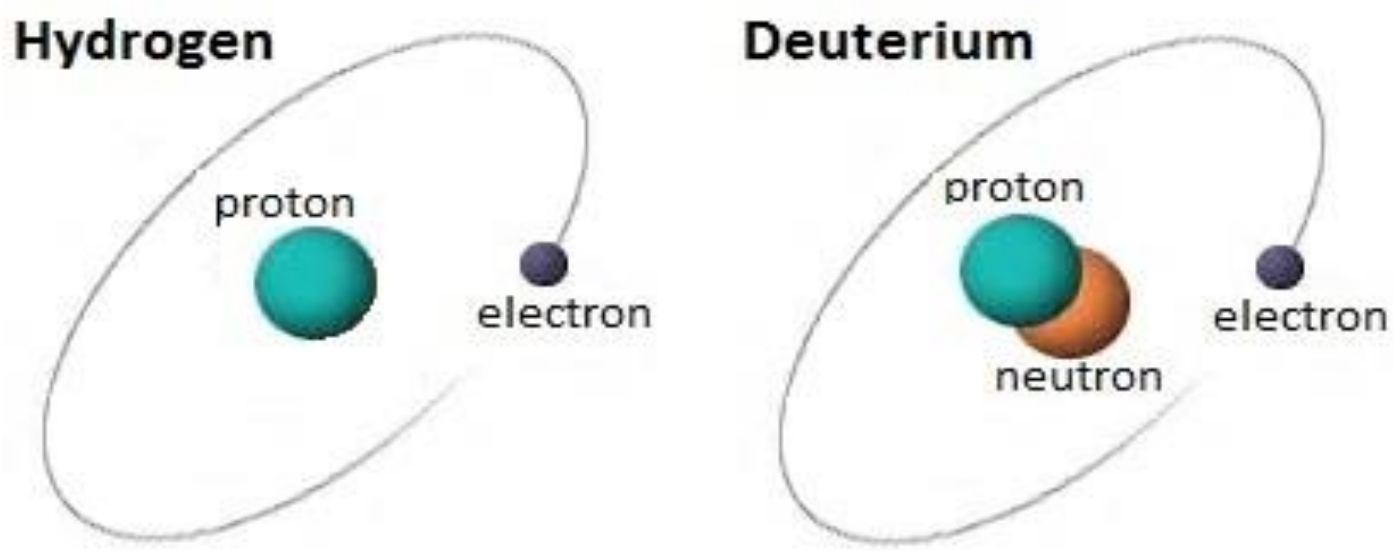
Scientific Literature

ResearchGate

Editor/Affiliations

Full citation

NATIONAL DEUTENOMICS INSTITUTE - USA



THANK YOU!