



The virtuous circle of knowledge and innovation



The Virtuous Circle of Knowledge and Innovation

Host: **Paola Catapano**

Speakers: **Alain Aspect, Tabea Arndt,
Amalia Ballarino, Reinhold Bertlmann,
Daniela Bortoletto, Nicolas Gisin, Michele Grossi,
Jan Jakubek, Steffen Kappler, Alessandra Lombardi**




Medical X-ray Imaging

Steffen Kappler

Technology & Innovation, Siemens Healthineers





7th Workshop on Medical Applications of Spectroscopic X-ray Detectors

15–18 Apr 2024
CERN
Europe/Zurich timezone



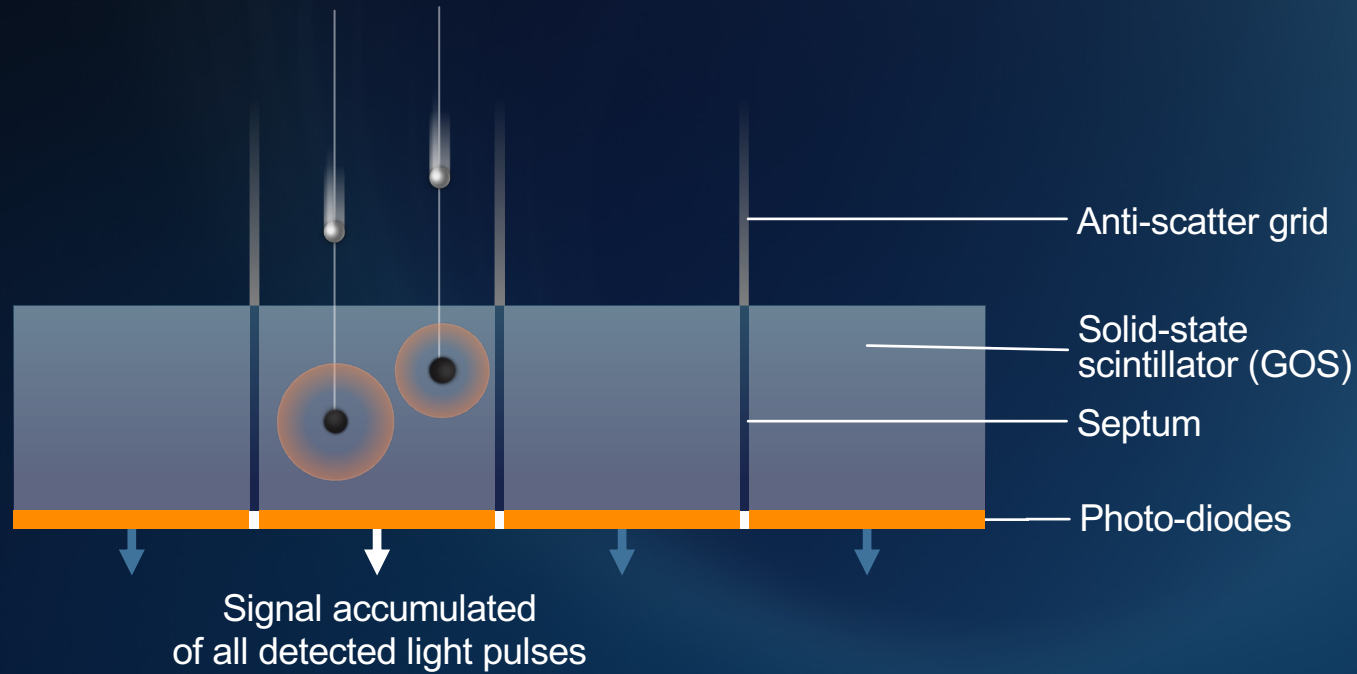


"I am convinced, that institutions like CERN play an important role for continuous innovations in medical imaging.

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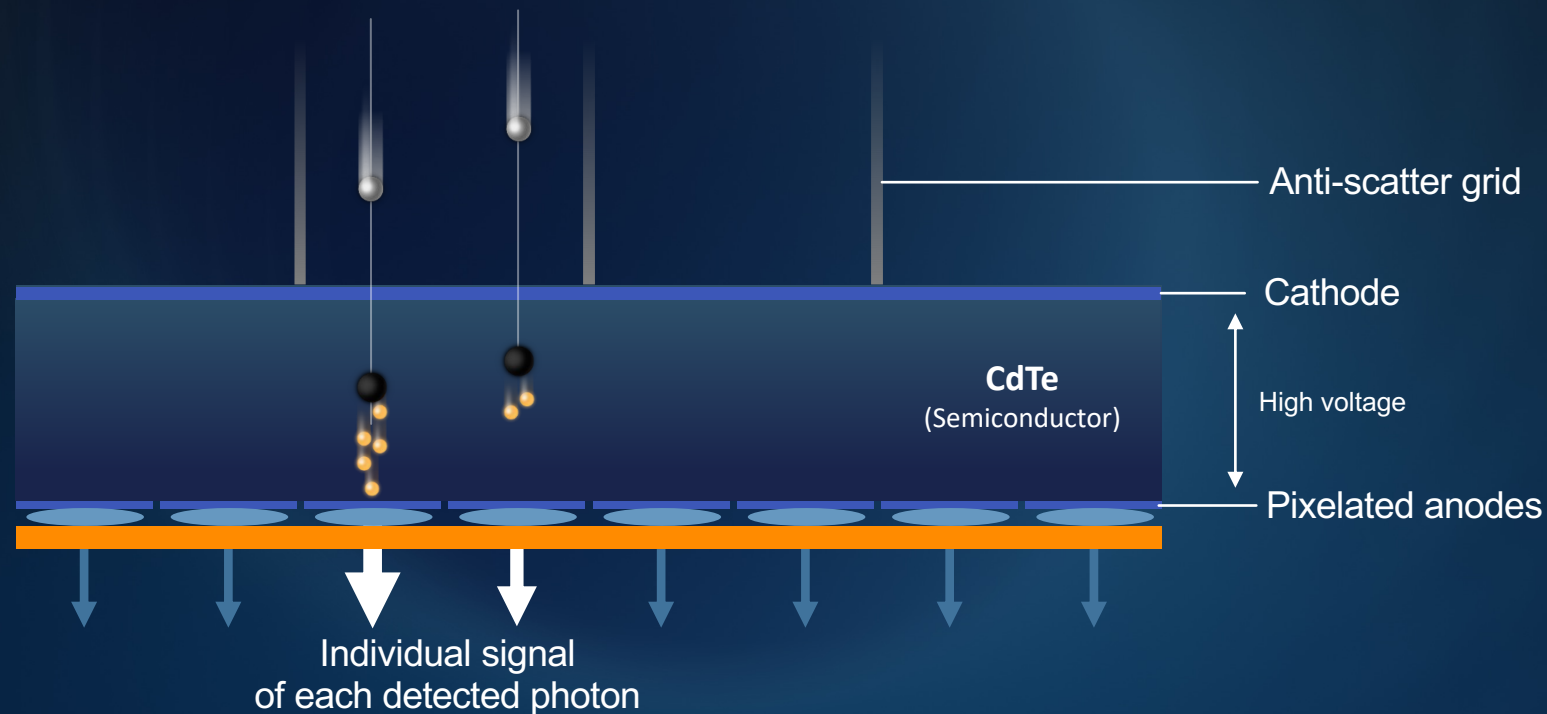
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Established Technology: Energy-integrating detectors



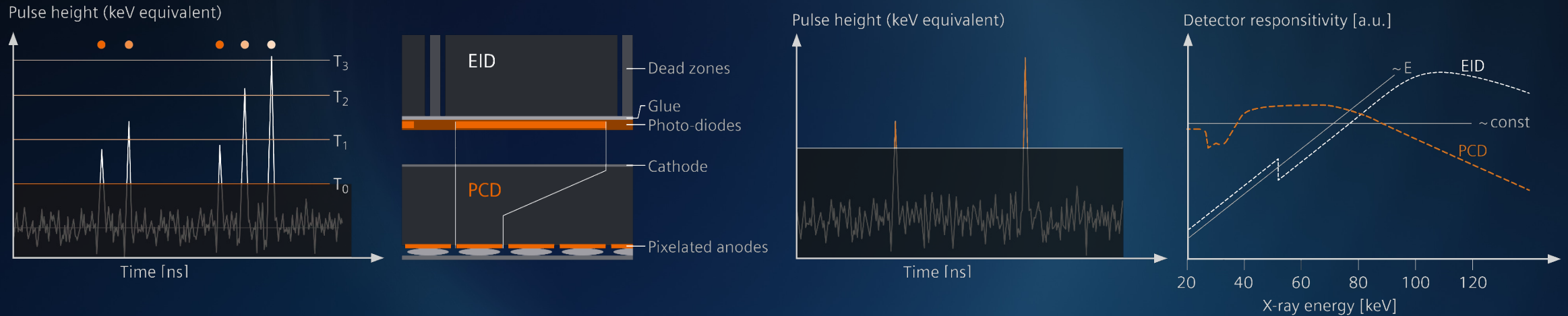
Two-step conversion: X-rays → light → electric current

Disruptive Technology: Photon-counting detectors



Single-step direct conversion: X-rays → electric current

Benefits of photon-counting detectors



Intrinsic spectral sensitivity



Smaller detector pixels



Elimination of electronic noise

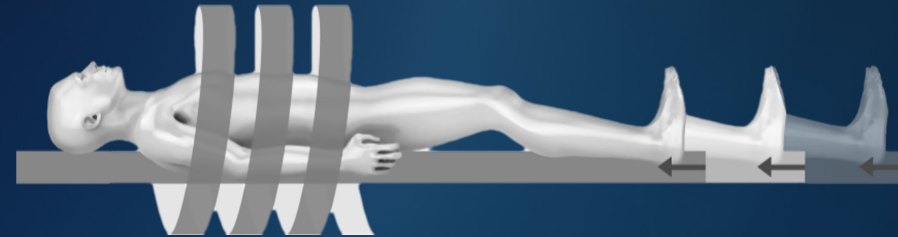


Equal energy contribution

Computed Tomography plays a central role in medical diagnostics

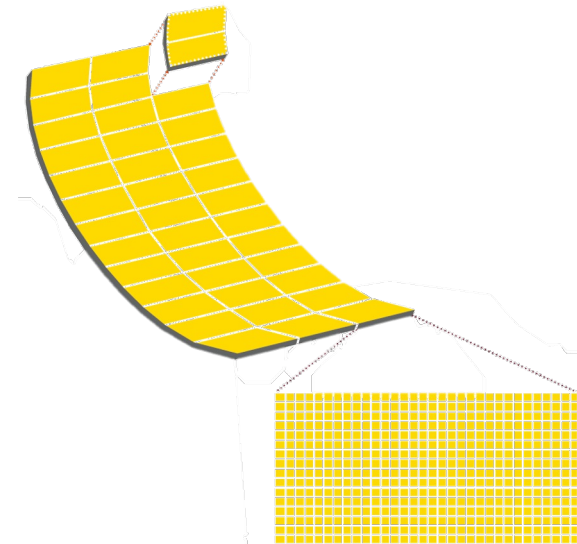
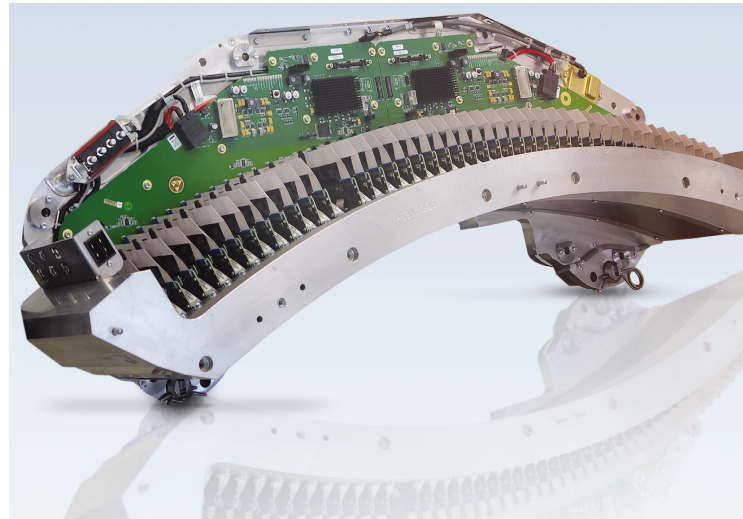
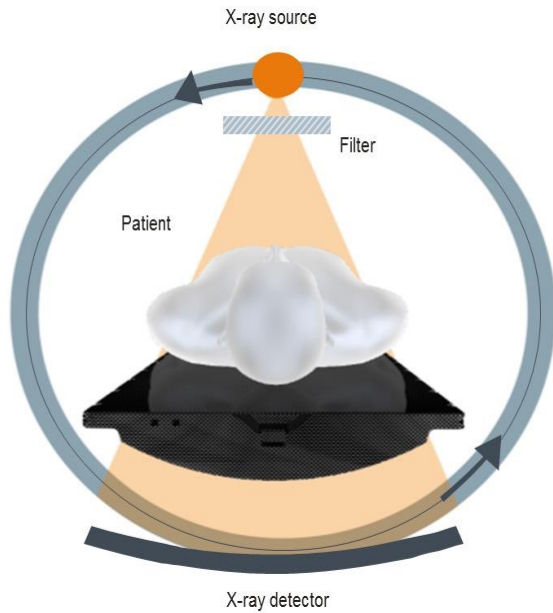


Primary Diagnostic Touchpoint
Supports Interventions
Follow-up after Treatment



- Morphological imaging within seconds
- Functional information by spectral X-ray techniques

X-ray tube and detector are core components of CT scanners



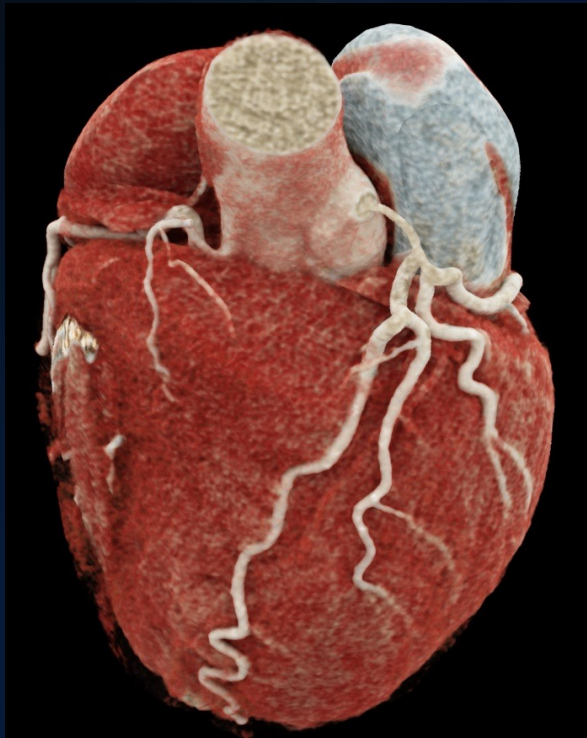
1st photon-counting CT by SIEMENS Healthineers



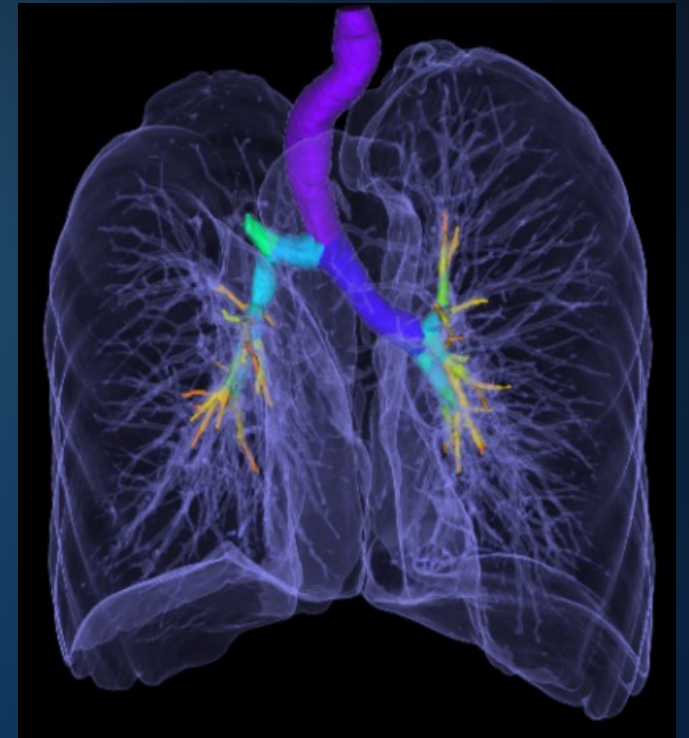
NAEOTOM Alpha®



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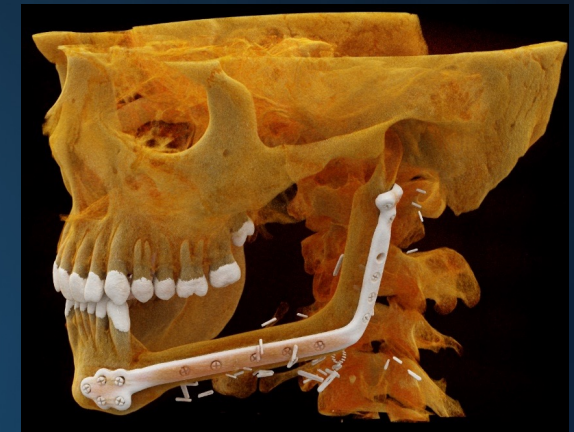
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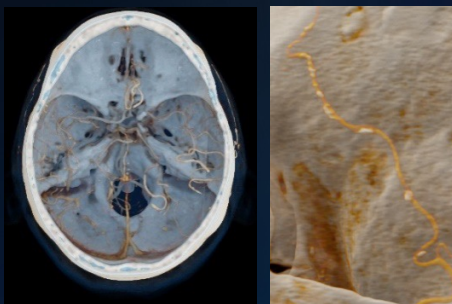


NAEOTOM Alpha[®] – New Era of CT Imaging

Started in academia with scientific collaborations, and entered clinical routine

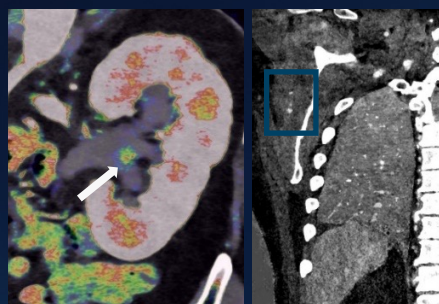
Neurology

Make the unseen visible
and impact patient management



Oncology

Aim for new standards
in cancer treatment



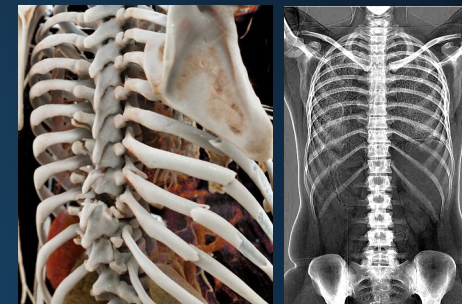
Musculoskeletal

More details with ultra-high resolution



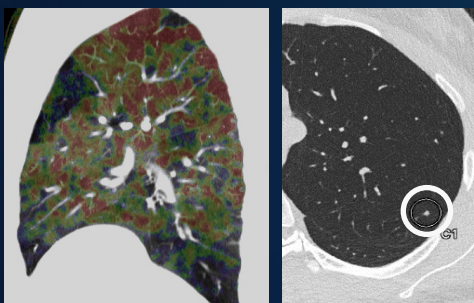
Emergency

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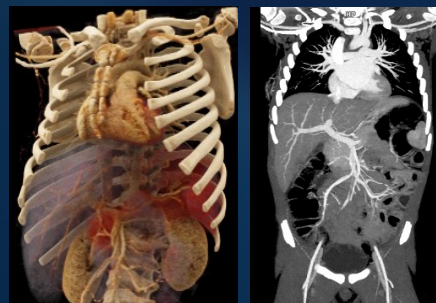
Pulmonology

- Functional evaluation of lung diseases
at high level of detail



Pediatrics

Dose efficiency and spectral
information for small patients



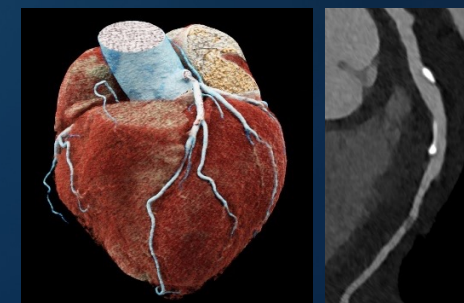
Vascular

- High contrast at low dose



Cardiology

Inform treatment planning
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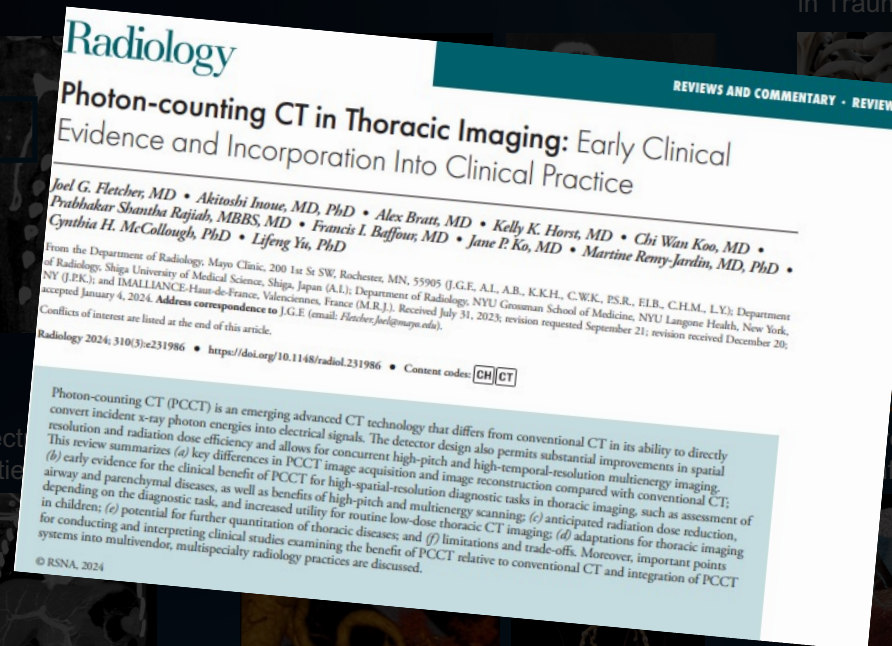
FOCUS TOPICS

- Ultra high resolution
- Intrinsic spectral separation
- Ultra-low dose (radiation & contrast)

standards
tment

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Radiology
REVIEWS AND COMMENTARY • REVIEW

Photon-counting CT in Thoracic Imaging: Early Clinical Evidence and Incorporation Into Clinical Practice

Joel G. Fletcher, MD • Akitoshi Inoue, MD, PhD • Alex Bratt, MD • Kelly K. Horst, MD • Chi Wan Koo, MD • Prabhakar Shantha Rajiah, MBBS, MD • Francis I. Baffour, MD • June P. Ko, MD • Martine Remy-Jardin, MD, PhD • Cynthia H. McCollough, PhD • Lifeng Yu, PhD

From the Department of Radiology, Mayo Clinic, 200 1st St SW, Rochester, MN, 55905 (J.G.F., A.I., A.B., K.K.H., C.W.K., P.S.R., E.B., C.H.M., L.Y.); Department of Radiology, Shiga University of Medical Science, Shiga, Japan (A.I.); Department of Radiology, NYU Grossman School of Medicine, NYU Langone Health, New York, NY (J.P.K.); and IMALLIANCE-Haut-de-France, Valenciennes, France (M.R.J.). Received July 31, 2023; revision requested September 21; revision received December 20, 2023; accepted January 4, 2024. Address correspondence to J.G.F. (email: Fletcher.Joel@mayo.edu).

Conflicts of interest are listed at the end of this article.

Radiology 2024; 310(3):e231986 • <https://doi.org/10.1148/radiol.231986> • Content codes: **CH** **CT**

Photon-counting CT (PCCT) is an emerging advanced CT technology that differs from conventional CT in its ability to directly convert incident x-ray photon energies into electrical signals. The detector design also permits substantial improvements in spatial resolution and radiation dose efficiency and allows for concurrent high-pitch and high-temporal-resolution multienergy imaging. This review summarizes (a) key differences in PCCT image acquisition and image reconstruction compared with conventional CT; (b) early evidence for the clinical benefit of PCCT for high-spatial-resolution diagnostic tasks in thoracic imaging, such as assessment of airway and parenchymal diseases, as well as benefits of high-pitch and multienergy scanning; (c) anticipated radiation dose reduction, depending on the diagnostic task, and increased utility for routine low-dose thoracic CT imaging; (d) adaptations for thoracic imaging in children; (e) potential for further quantitation of thoracic diseases; and (f) limitations and trade-offs. Moreover, important points for conducting and interpreting clinical studies examining the benefit of PCCT relative to conventional CT and integration of PCCT systems into multidisciplinary, multispecialty radiology practices are discussed.

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ology
treatment planning
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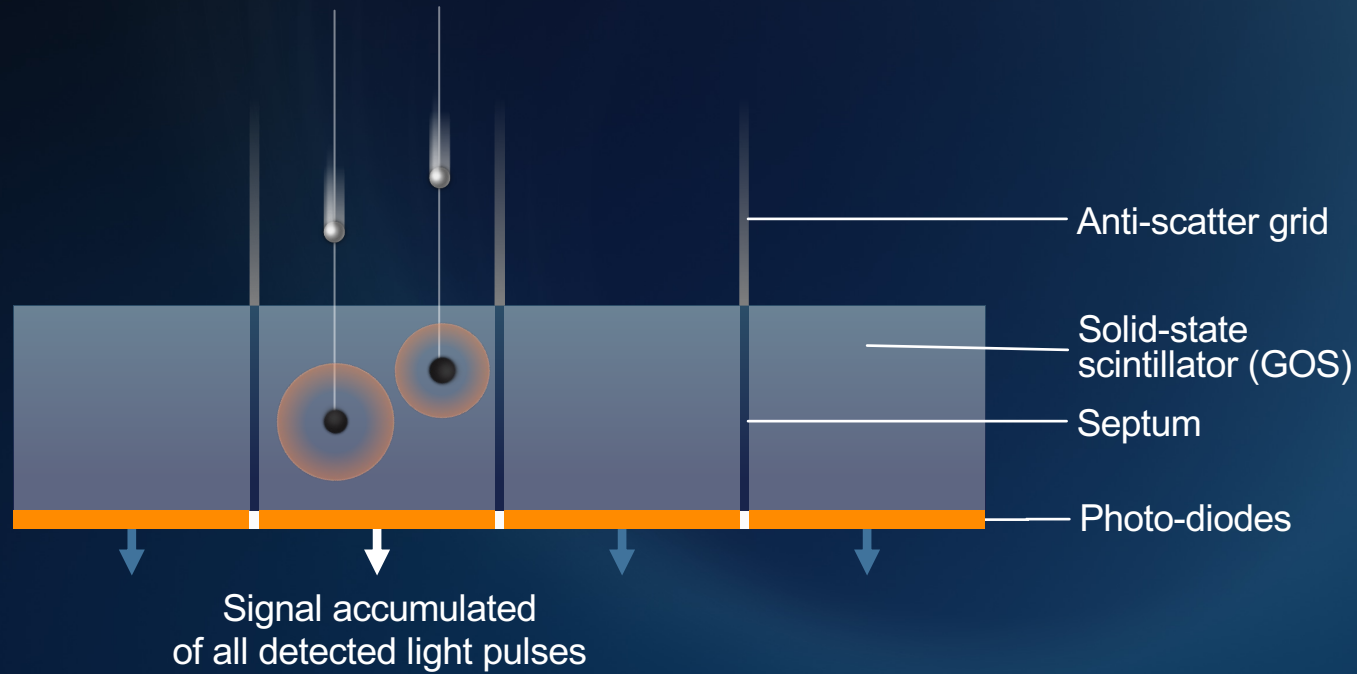


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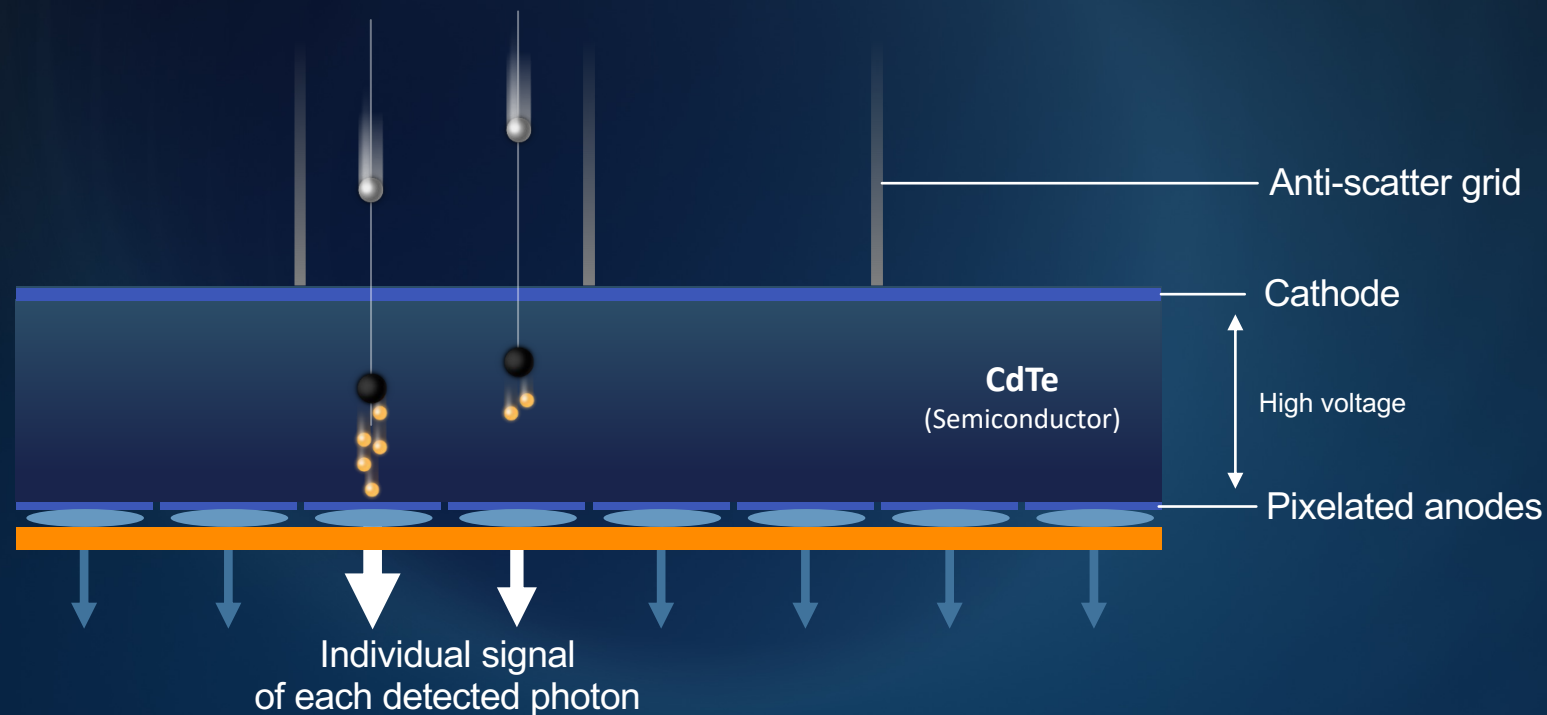
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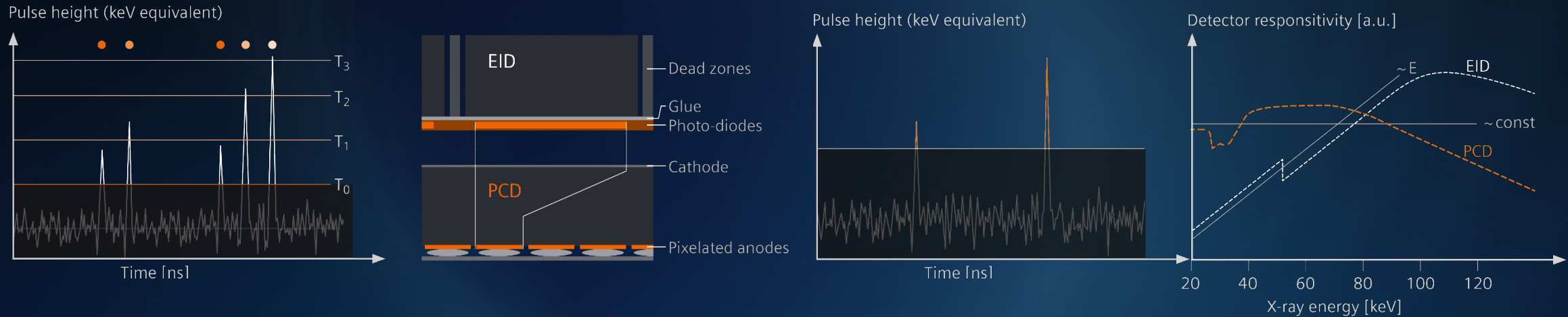
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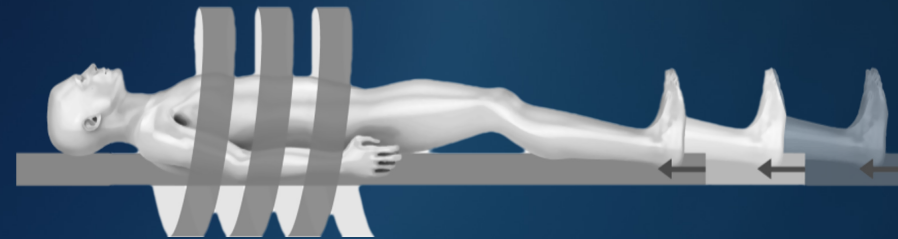
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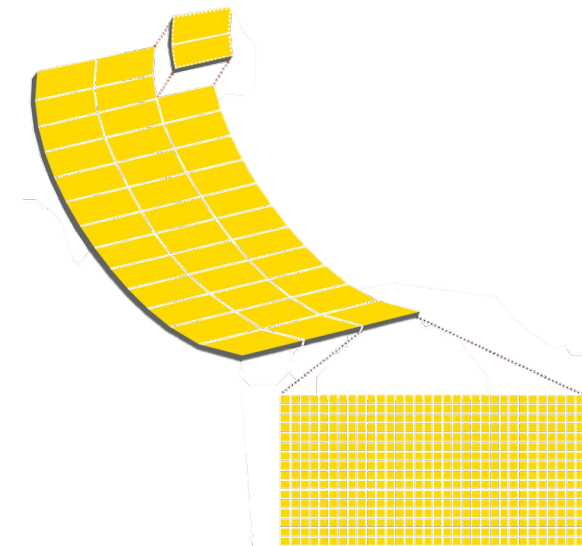
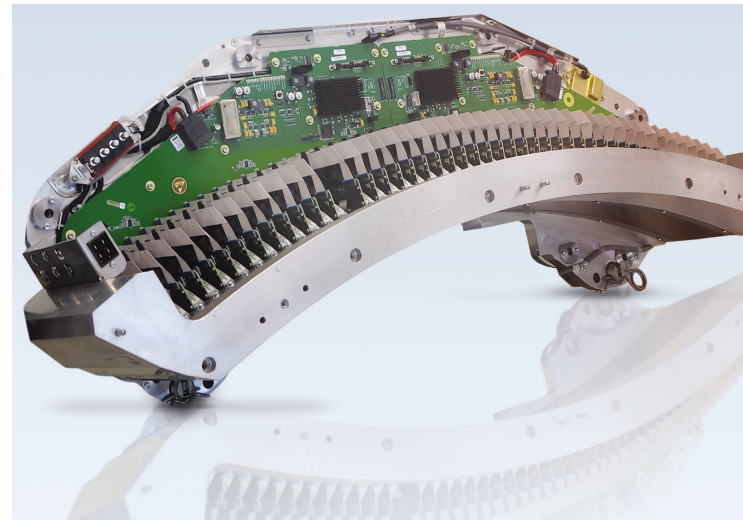
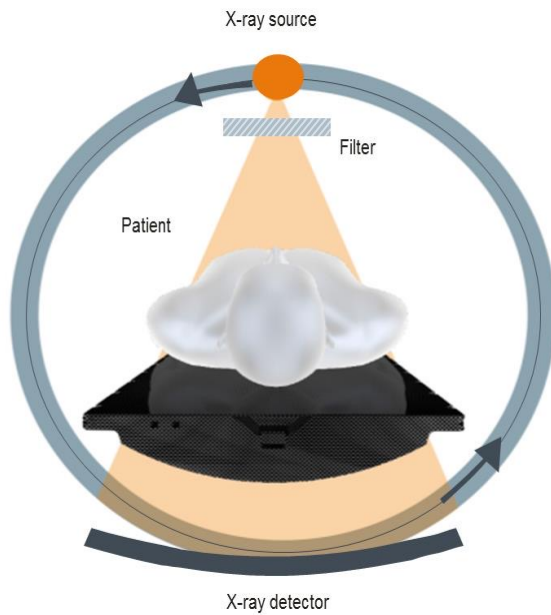


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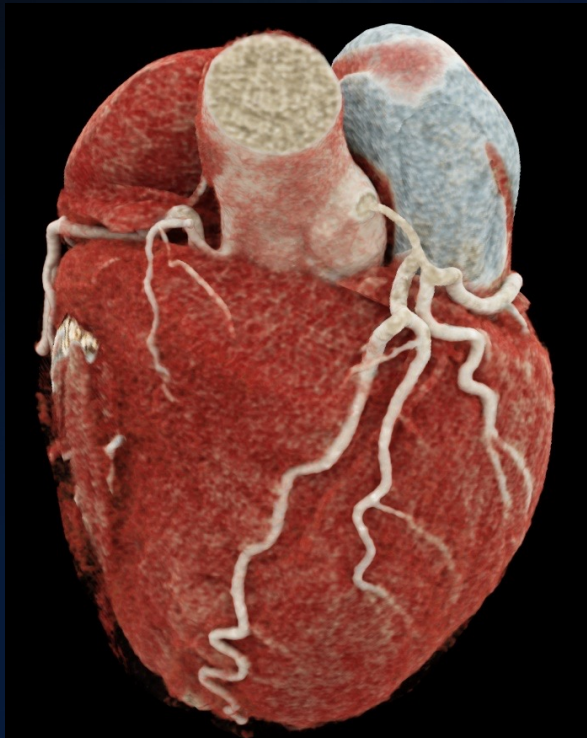
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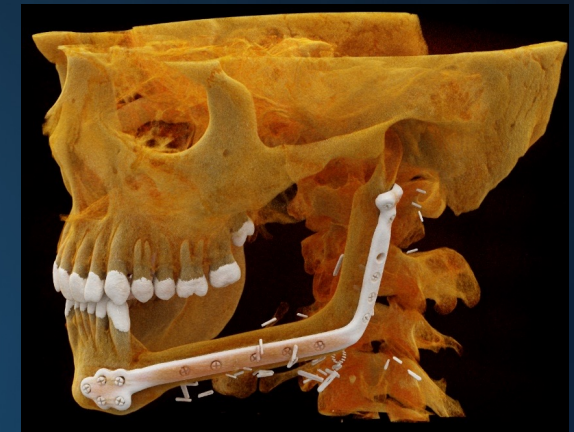
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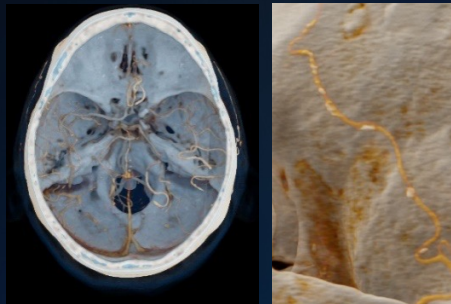


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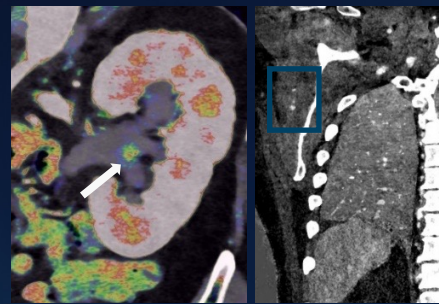
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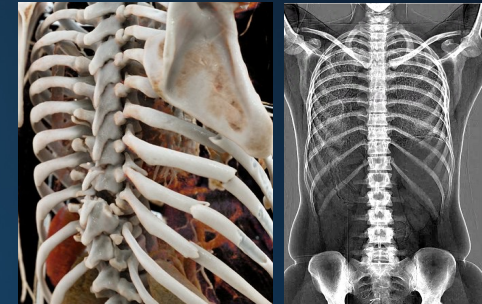
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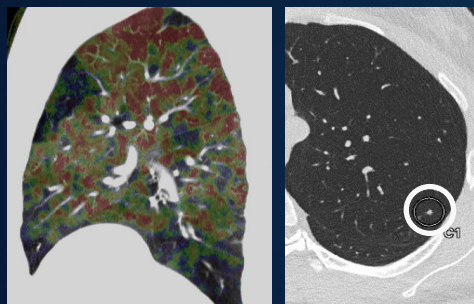
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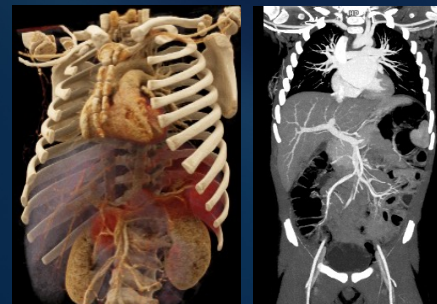
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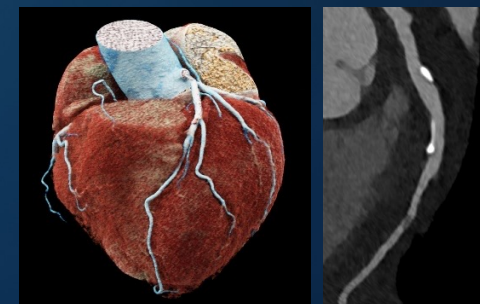
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