Hot Topic Discussion

Revisiting The Hallmarks of Cancer

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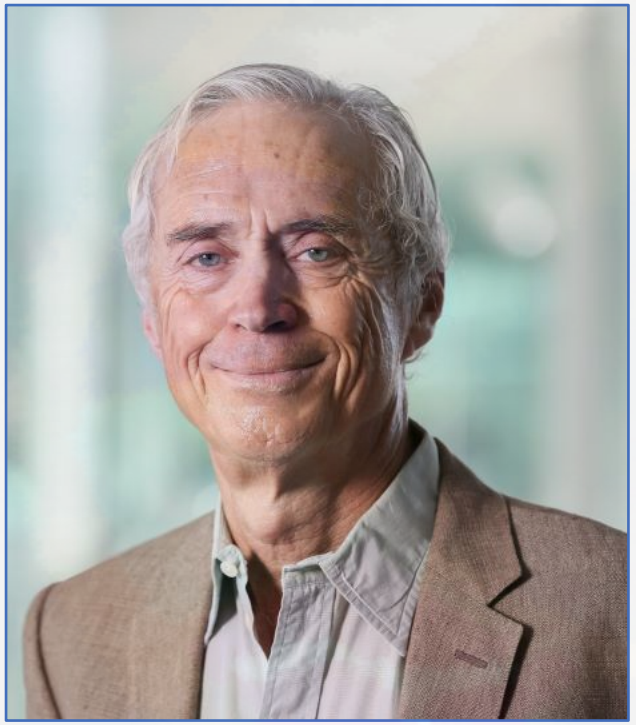
About the Review

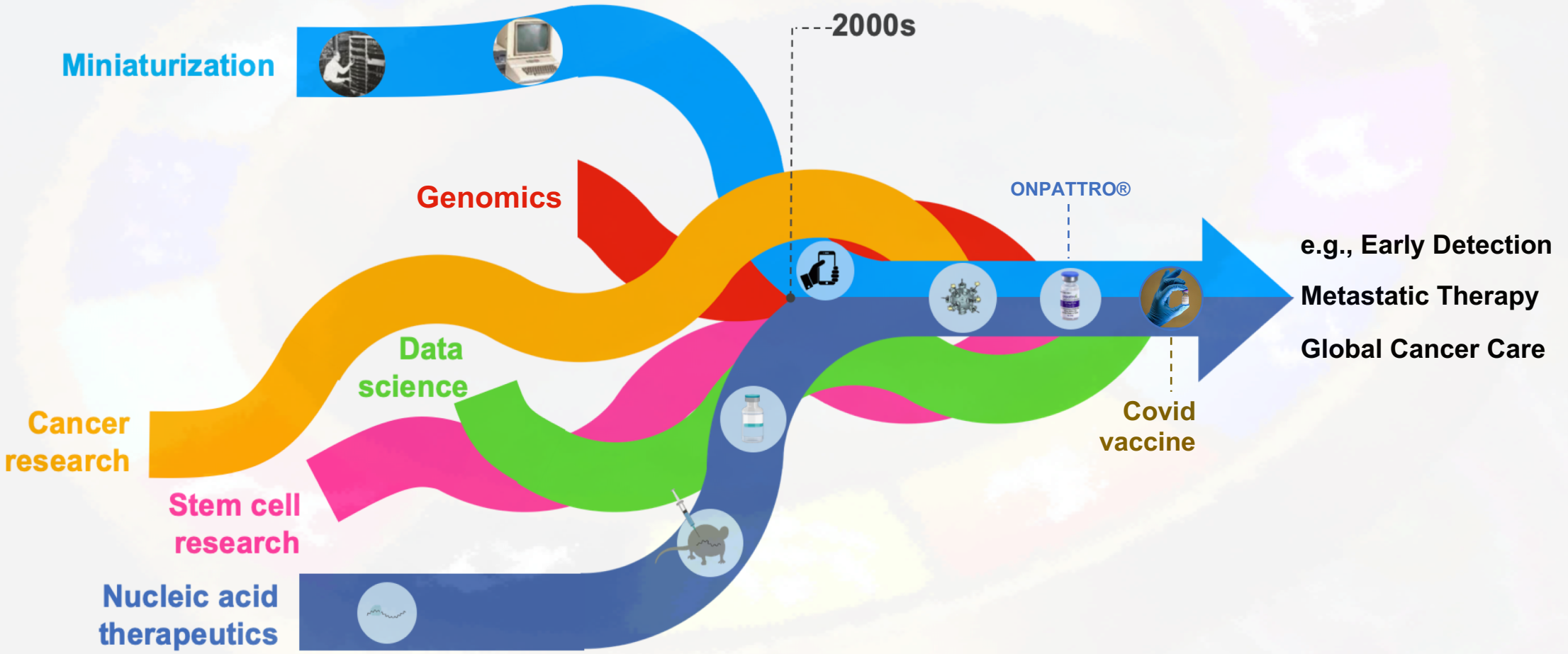


Prof. Douglas Hanahan
(EPFL)

Prof. Robert A. Weinberg
(Whitehead Institute)

https://www.epfl.ch/labs/hanahan-lab/
https://cancerdiscovery.aacrjournals.org/content/12/1
https://wi.mit.edu/people/member/weinberg

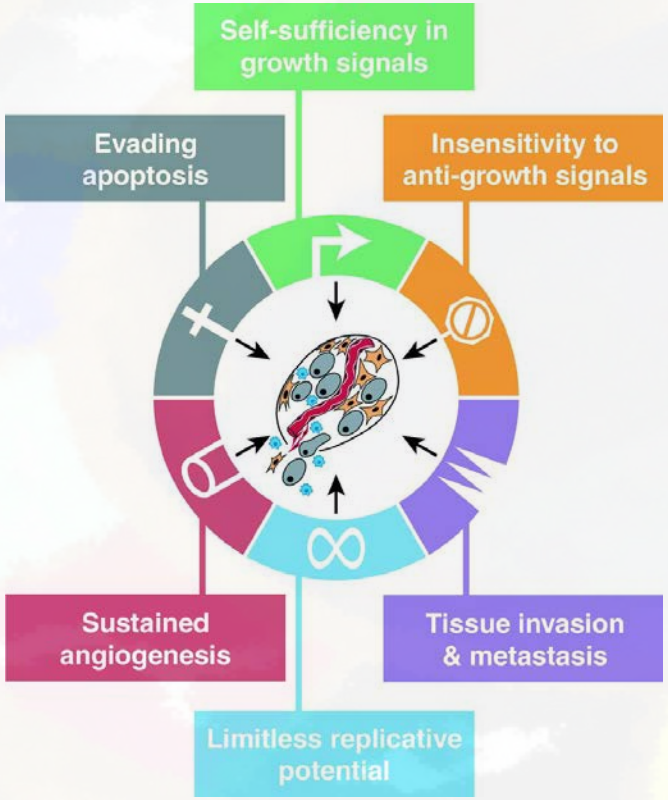
How converging sciences uncover new frontiers in precision medicine



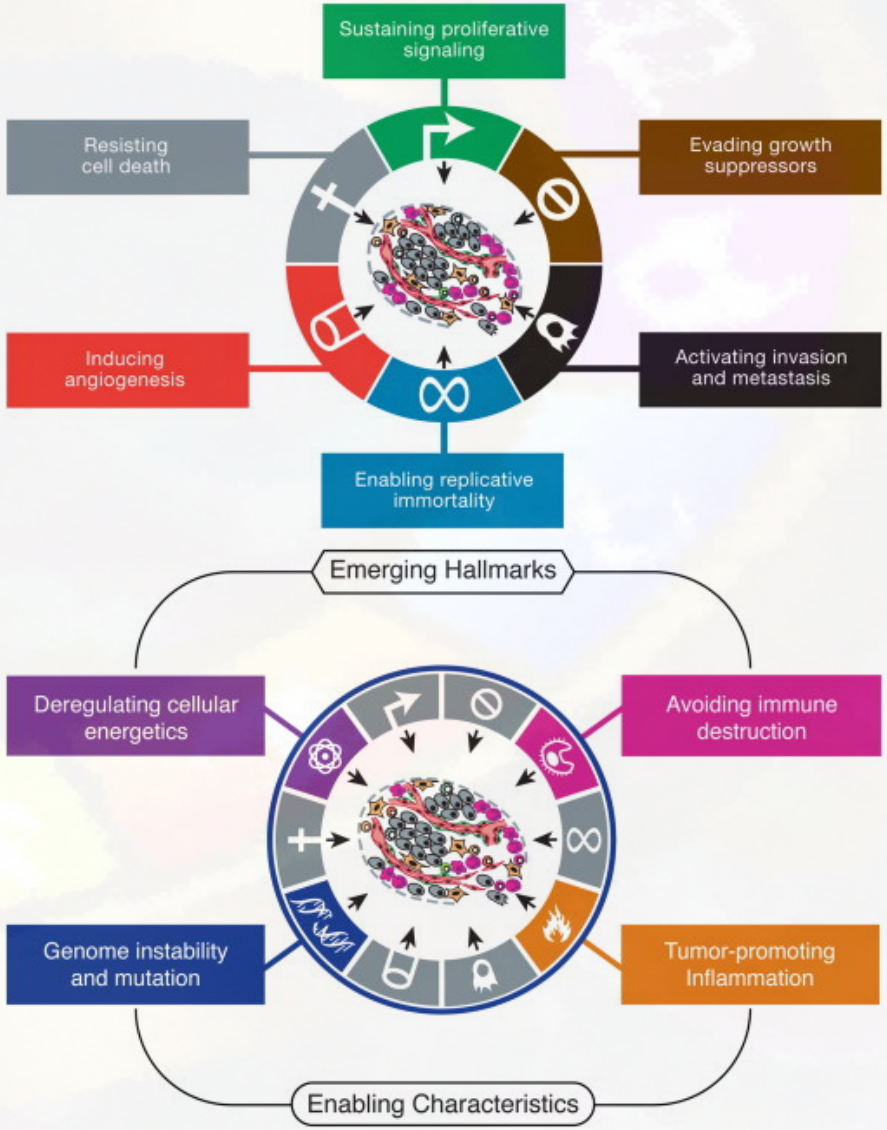
Adapted from Dr. Sangeeta Bhatia's presentation at the National Academy of Medicine (2020)

What are the Hallmarks of Cancer?

2000



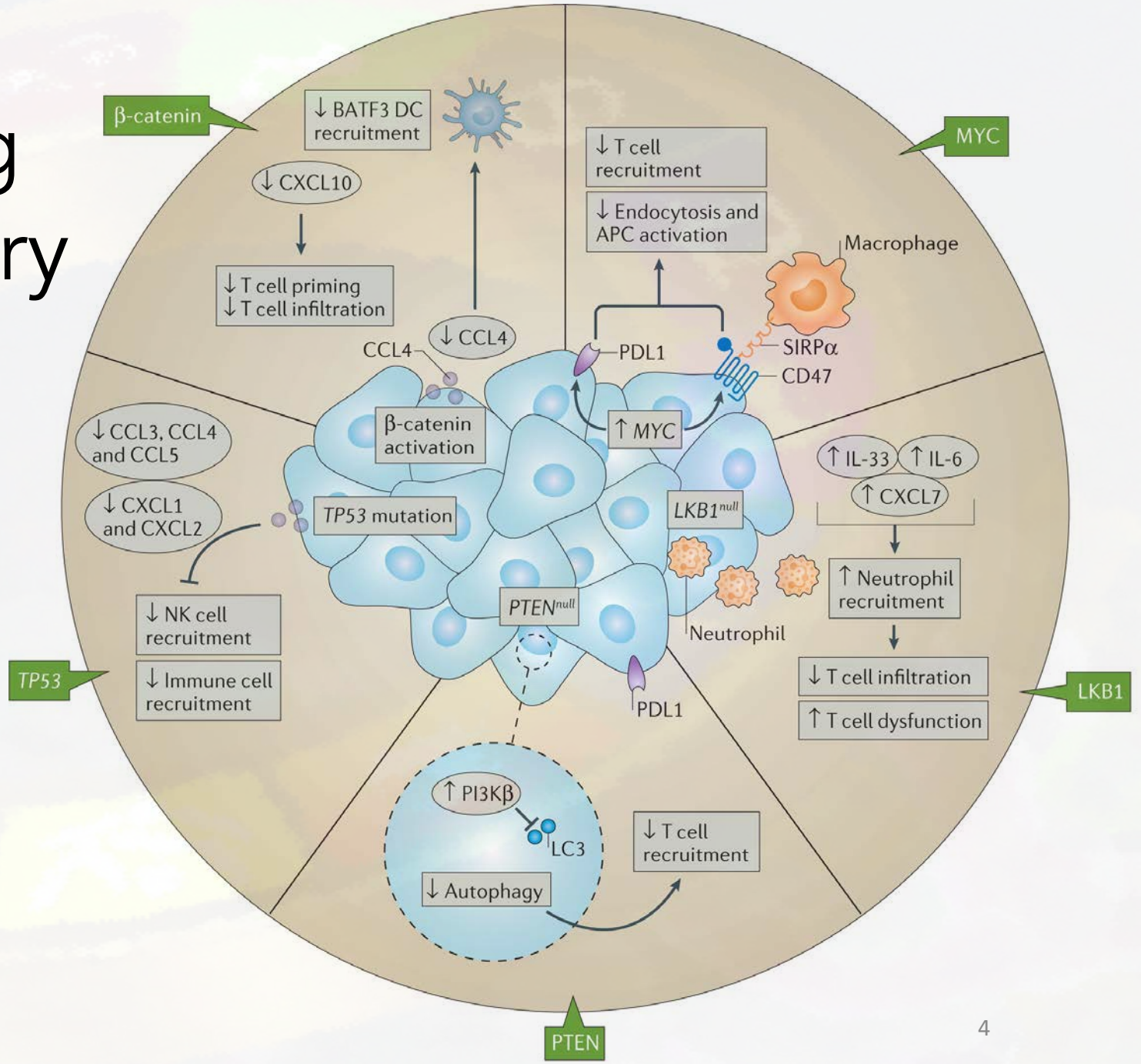
2011



Hanahan, D. & Weinberg, R.A. *Cell* (2000, 2011)

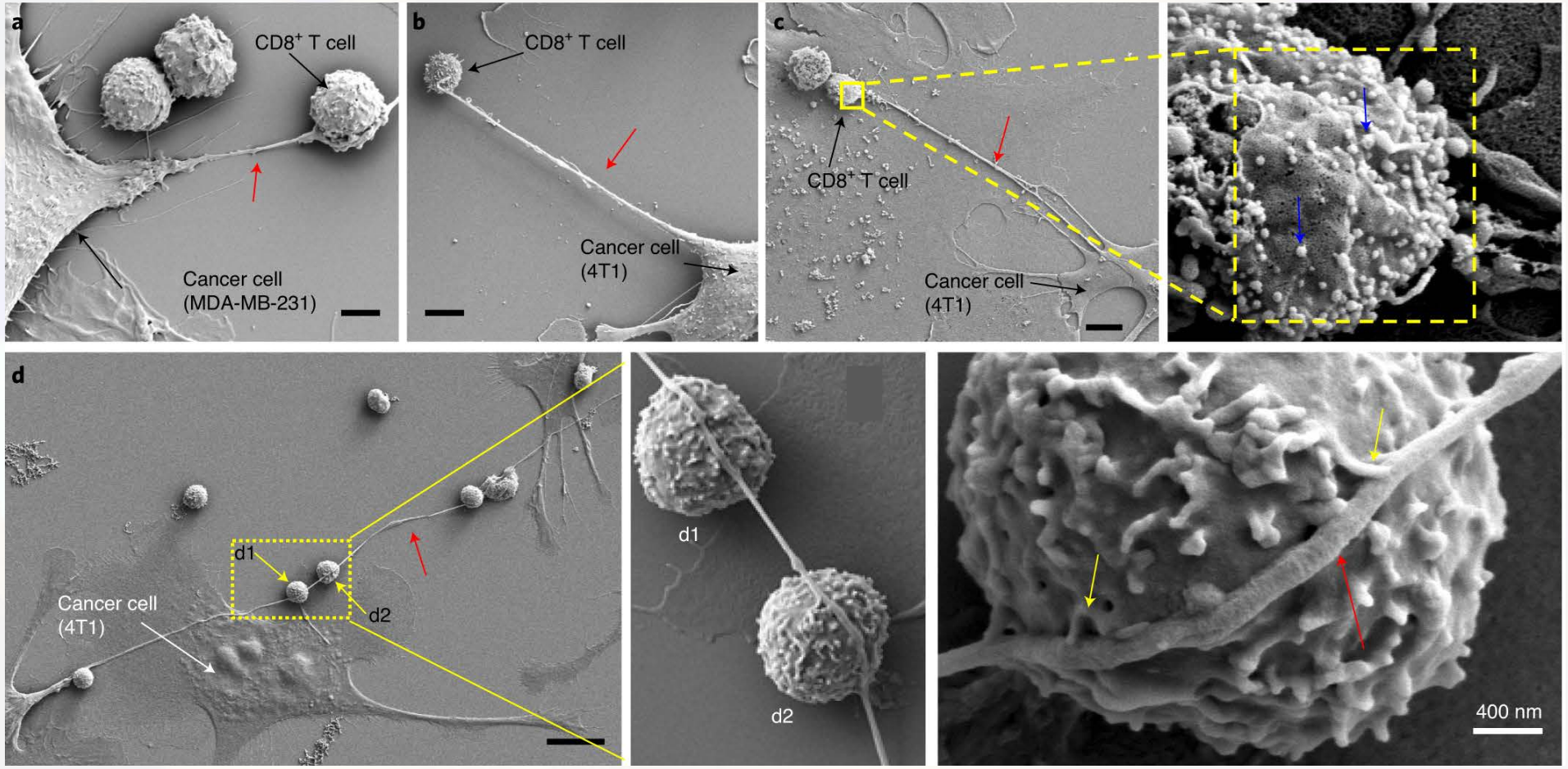
Example: Impact of oncogenic signaling on immune inhibitory pathways and cell populations

Dr. Stefani Spranger is the Howard S. (1953) and Linda B. Stern Career Development Professor at the Koch Institute, Assistant Professor of Biology, and member of the Ludwig Center at MIT



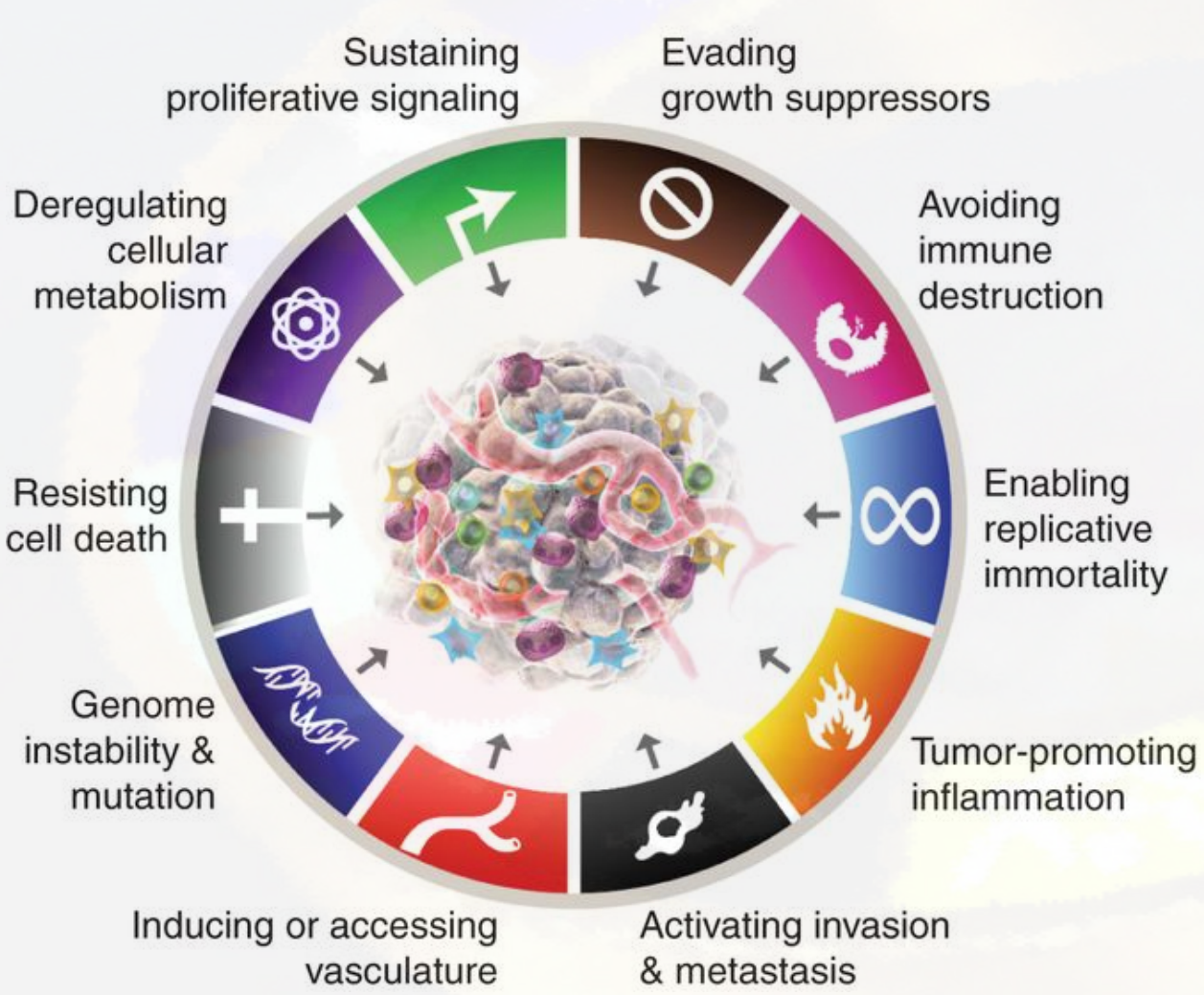
Spranger, S. & Gajewski, T. *Nat Rev Cancer* (2018)

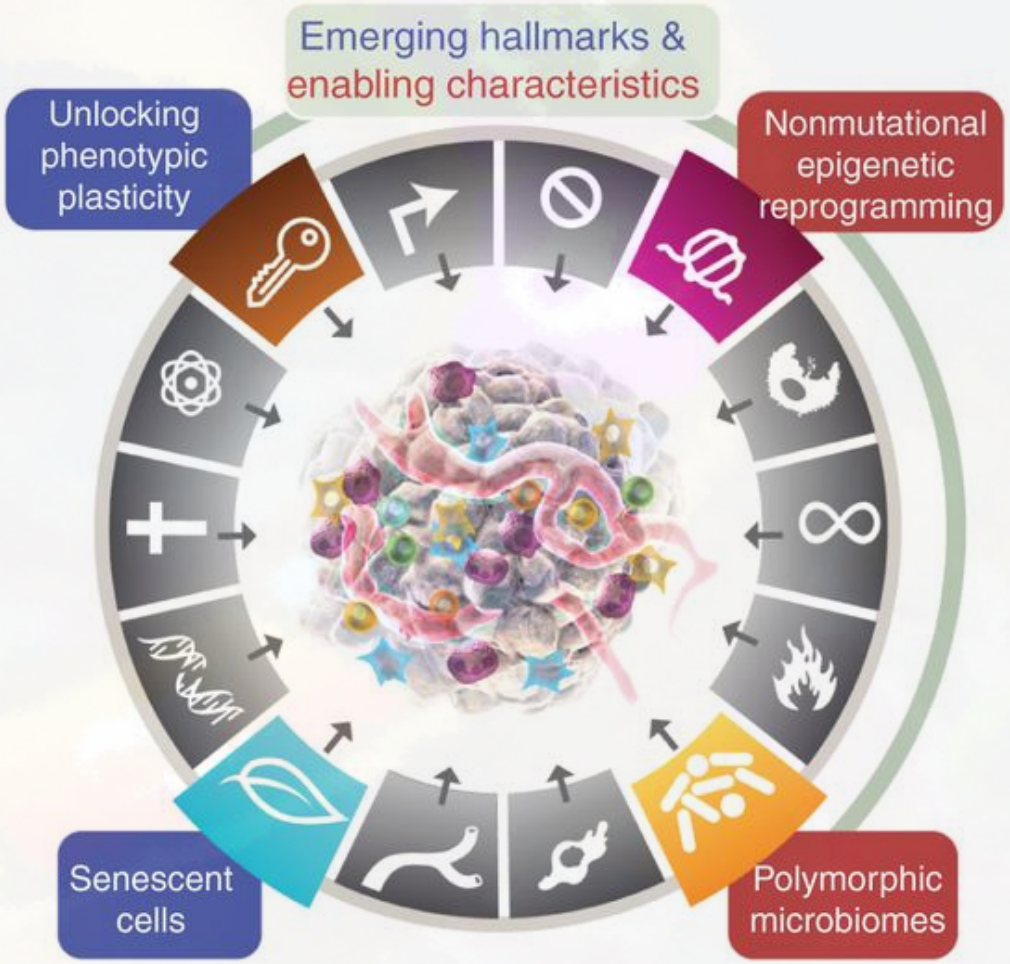
…and how nanoscience can help us discover new mechanisms of immune-evasion



Saha, T., Dash, C., Jayabalan, R. *et al. Nat. Nanotechnol.* (2022)

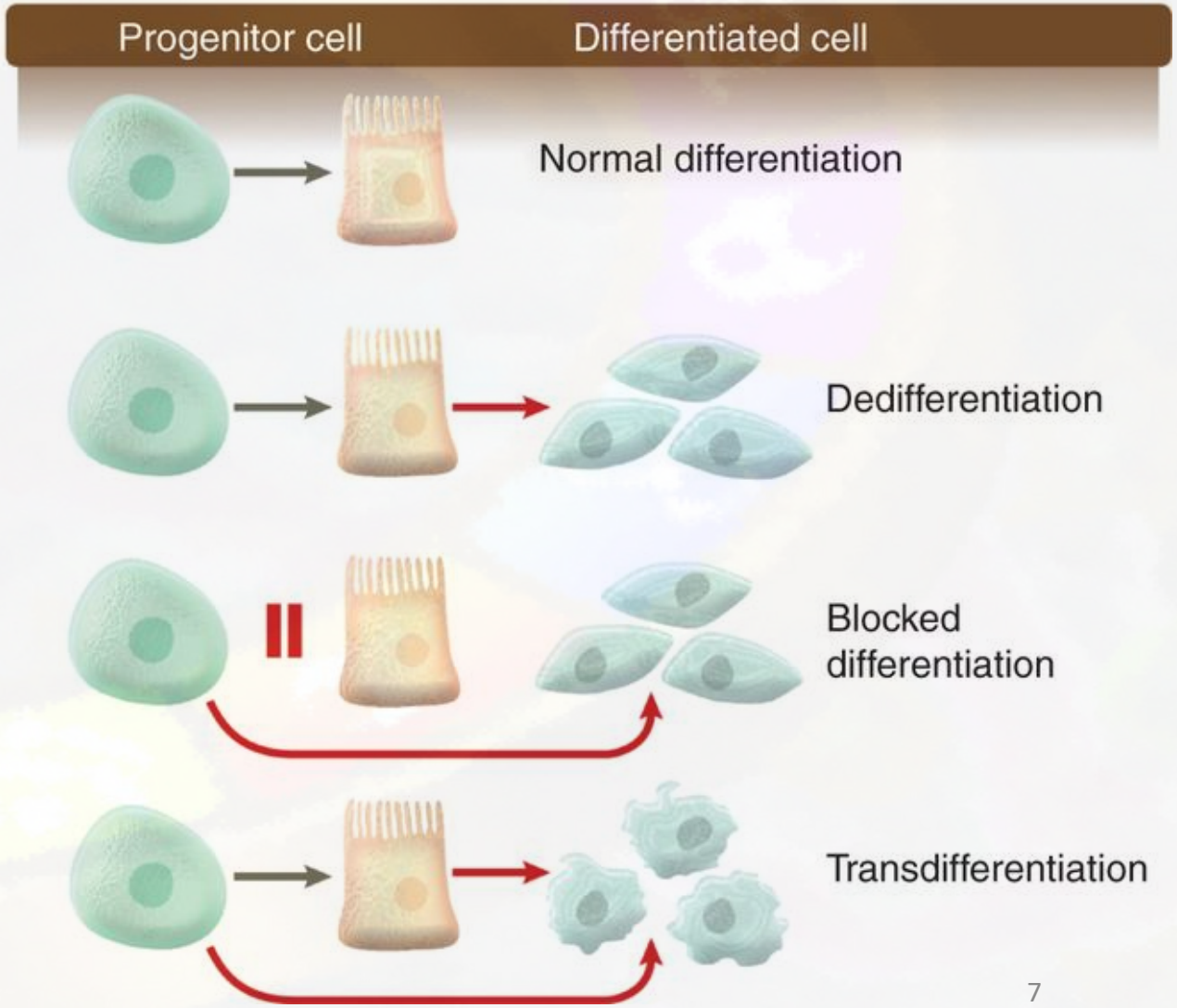
Revisiting the core principles (2022)





Hanahan, D. et al. *Cancer Discovery* (2022)

Emerging hallmark #1: Unlocking phenotypic plasticity



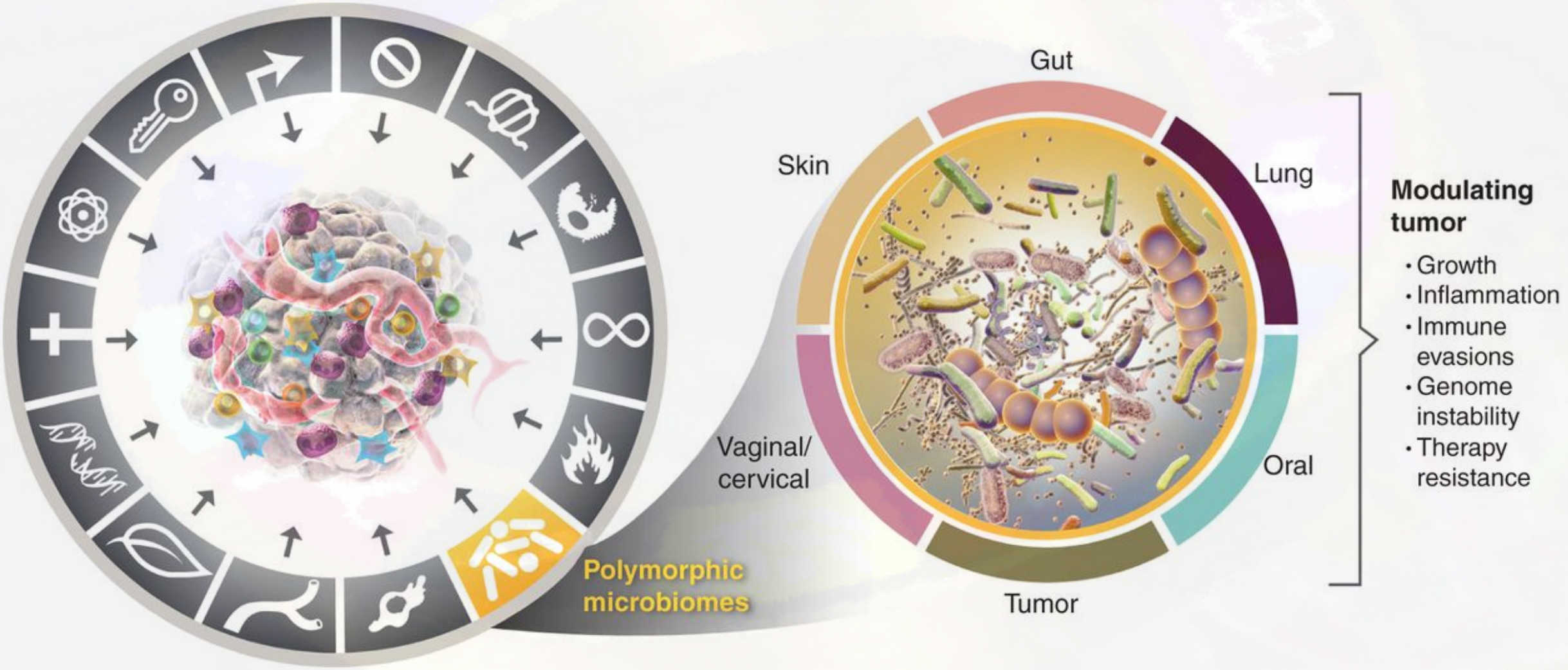
Hanahan, D. et al. *Cancer Discovery* (2022)

Emerging hallmark #2: Non-mutational Epigenetic Reprogramming

- Microenvironmental mechanisms of epigenetic reprogramming.
- Epigenetic regulatory heterogeneity.
- Epigenetic regulation of the stromal cell types Populating the tumor microenvironment.

Hanahan, D. et al. *Cancer Discovery* (2022)

Emerging hallmark #3: Polymorphic microbiomes



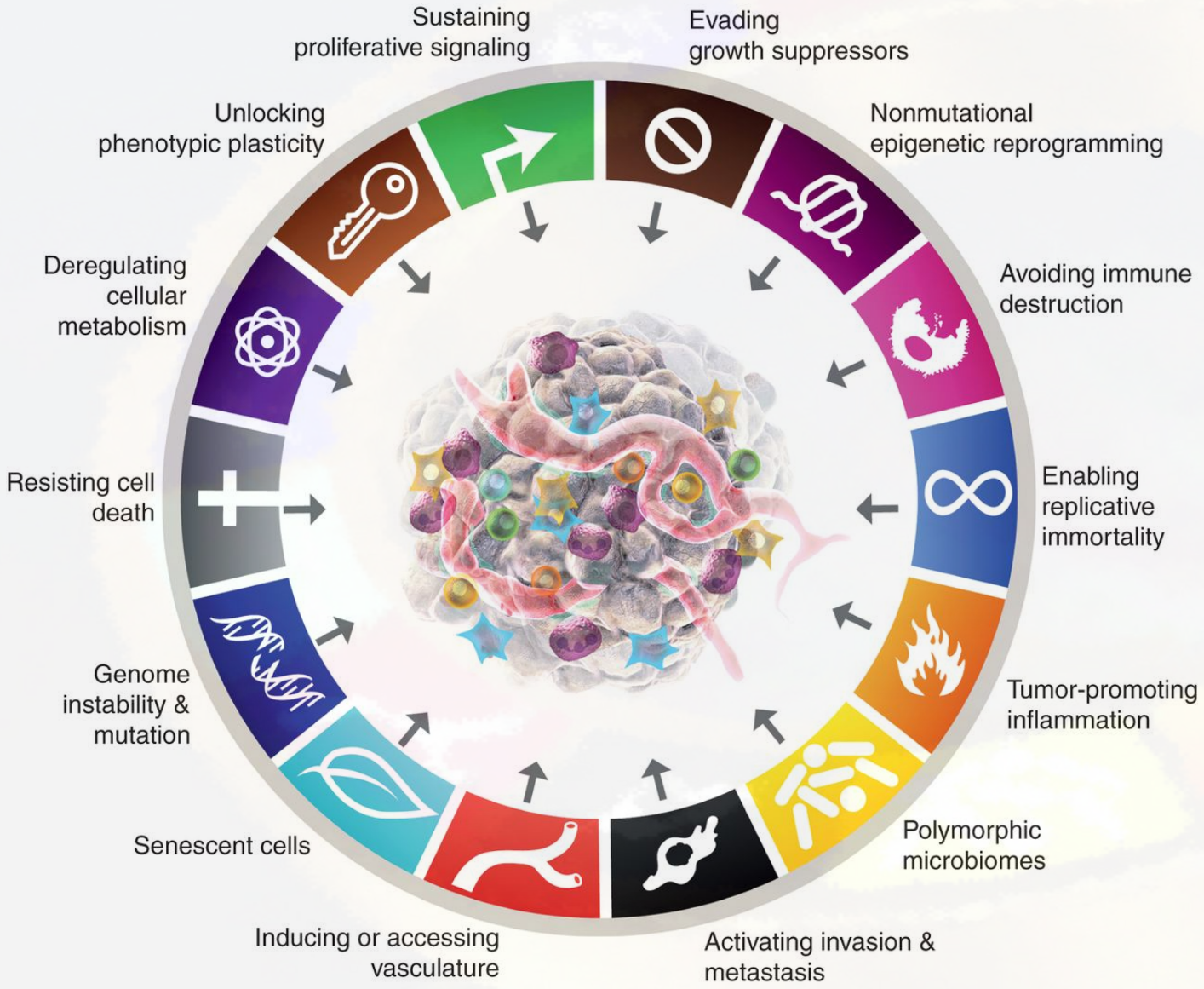
Hanahan, D. et al. *Cancer Discovery* (2022)

Emerging hallmark #4: Senescent cells

- Implicating senescent cell derivatives of stromal cell types and subtypes, and their variable SASPs
- Senescent cells modulate hallmark capabilities and consequent tumor phenotypes.

Hanahan, D. et al. *Cancer Discovery* (2022)

Closing thoughts



- Four new facets discussed, including how their regulation with other hallmark(s) is interconnected in some and perhaps many cancers.
- Senescent cells warrant being factored into the quest for deep knowledge of cancer mechanisms.

Hanahan, D. et al. *Cancer Discovery* (2022)

Discussion

- Any other examples of how **engineering** can help us shed new light on underlying biological mechanisms in support of the hallmarks of cancer?
- Examples of how aspects of hallmark regulation are **interconnected** in some cancers?