

The History of Prostate Cancer Treatment



ILLUMACELL's vision for non-invasive and natural treatment of cancer

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Introduction

- **Dr. Jeff Hummel, Ph.D. - Medical Oncology**
- **28+ year career in cancer research and clinical cancer studies**
 - University of Guelph, University of Toronto, Ontario Cancer Institute, Princess Margaret Hospital, McMaster University
 - cancer genetics, virology, immunology, novel cancer therapeutic design
 - biotech start-ups
- **ILLUMACELL Inc.**



The Cancer Burden

Decades of cancer research and therapeutic advances yet most cancer patients still end up with terminal diagnoses

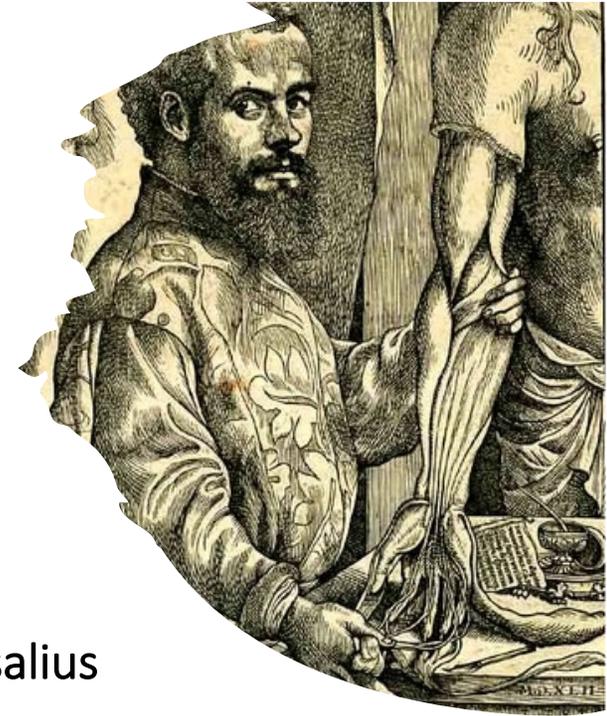
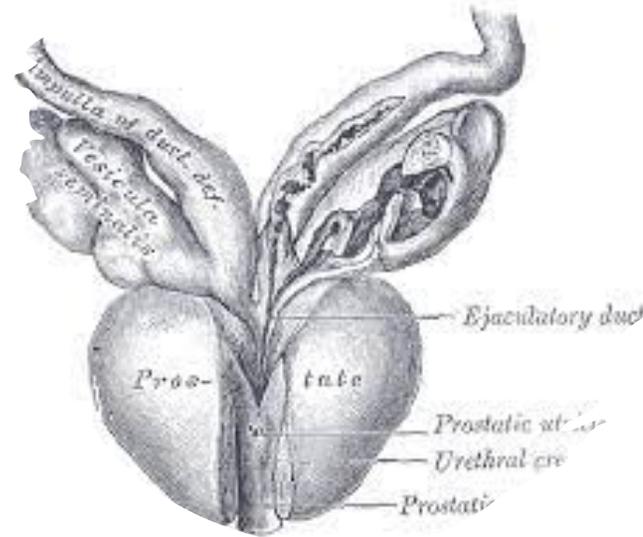
- 2018 = 17 million new cancer cases worldwide and 9.5 million cancer deaths
- 2040 = expected growth to >16 million deaths simply due to the aging population
- *New and safe treatment options are desperately needed to compliment and possibly even “break-free” from today’s toxic Tx standards*



History of Prostate Cancer Treatment

- **Road-blocks for innovative Tx for cancer**
 - decades of pre-clinical mouse models rarely translate into successful human studies
 - surgery, radiation, and chemotherapy = front-line Tx pillars
 - significantly cytotoxic, generally low success rates
 - *desperate need for non-invasive and natural, less toxic Tx options!*
- **Male and female cancers of the reproductive organs**
 - hereditary - genetic links between prostate and breast cancer!
 - socially and psychologically sensitive subject





Niccolo Massa and Andreas Vesalius

- 17th century anatomists
- First description of the prostate gland
- Father of modern anatomy
- 1543 - Dr. J. Adams in London
- credited for first prostate cancer description

Surgery

- **19th century**

- Tx was ALL surgical
- to relieve urinary blockage or prostate issues
- prostate cancer considered a very rare disorder
- a death sentence

- **20th century**

- more specialized surgeries performed to preserve penile function
- 1904 – Dr. Hugh Young – Johns Hopkins – complete prostatectomy
- 1983 – Dr. Patrick Walsch – radical retropubic prostatectomy
 - revolutionized prostate Sx
 - saved the penis without comprising cancer outcomes!
 - became the standard with diagnostic ultrasound guided techniques



Hormone Therapy (Androgen Ablation)

- **Sx until 1941 when chemical interventions were introduced**
 - 1966 – Dr. Charles Higgins - Estrogen opposing testosterone (chemical castration)
 - 1977 - Gonadotropin-releasing hormone antagonists (hypothalamus)
 - Noble prizes

Androgen Ablation

- castration or estrogen
- reduced tumor growth ~75% but...
- cardiac toxicity and most patients regressed

Androgen receptor blockers (hypothalamus)

- Loss of libido, hot flashes, impotence but no cardiac events

- **1989 – Logically combine them ?**
 - poor results, palliative, never curative
 - new “non-steroidal” hormone therapy options are better



Radiation Therapy

- **Brachytherapy (radium)**

- radiolabeled implants
- local/regional effects
- declined in the 1950s until 1983
 - Dr. H.Holm small ultrasound-guided radioactive seeds
- good for localized disease

- **External beam therapy**

- 1940s – cobalt, intense, toxic, **adjunct Tx**
- lost interest with discovery of hormone and ablative Sx techniques in the 1940s
- regained interest in the 1960s with better cobalt sources (deeper)
- computer guided topography allowed
 - 3D plans that saved more surrounding normal tissues



Prostate Specific Antigen

- **PSA – 1980's**
- **antigens isolated from semen,**
- **hopes to improve fertility**

- **1979 – Dr. Ming Wang**
 - purified first prostate antigen
 - originally studied as a forensic marker for rape victims

- **1980 – Dr. Padsidero**
 - credited with first quantitative measurement in the blood

- **1980 – Dr. Stamey**
 - first clinical applications of PSA as a marker for prostate cancer
 - Still used today though not cancer specific
 - Can't determine aggressiveness of cancer
 - Can help with detection of relapse
 - PSA velocity can be indicative of cancer and early detection



PSA and the Kallikreins

- **PSA = KLK3!**
- **originally thought just 3 kallikreins in humans**
- **complicated and whole-body family of proteins**
- Still used today - cancer specific?
- can not determine aggressiveness of cancer
- can help with detection of relapse!
- PSA “velocity” can be indicative of cancer and early detection

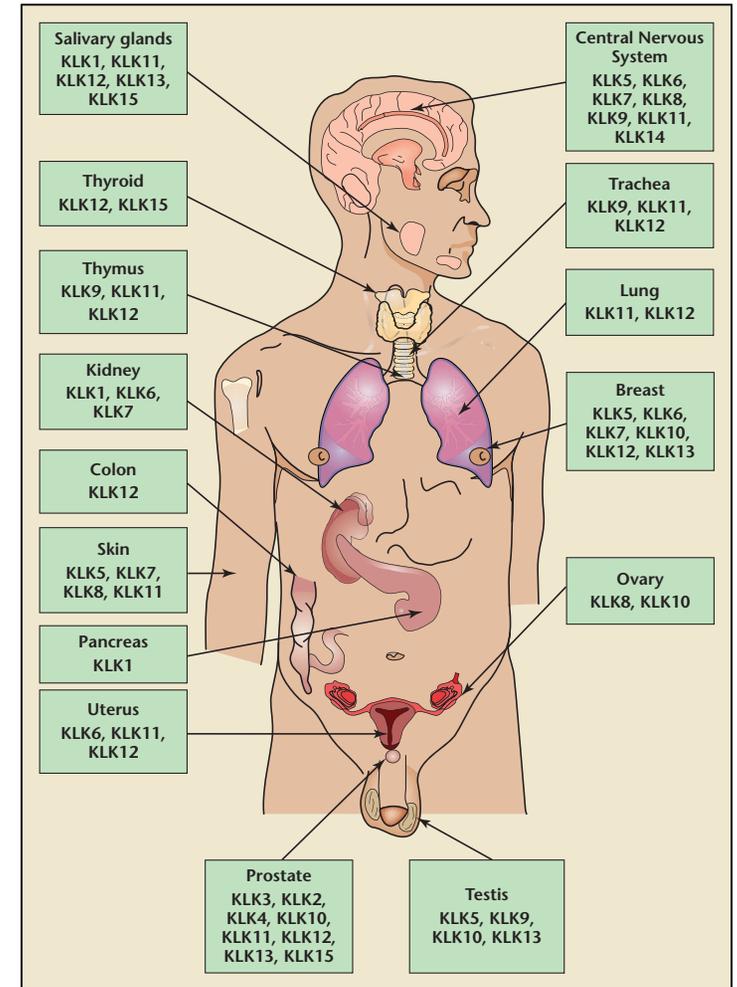


Figure 1. Schematic representation of major expressions of human kallikreins in various tissues. Adapted from Yousef and Diamandis.⁴⁹

Chemotherapy

- **Many patients respond to androgen ablation therapy**
 - with time develop recurrence, androgen ablation resistance
- **Small studies in 1950s and 60s but wasn't until 1972**
 - Dr. Gerald Murphy, National Prostate Cancer Project
 - Godfather of the PSA test!
 - early chemotherapy single agent studies were with alkylating agents
 - ~10% response rates reached stable disease
- **Newer chemo agents are better and still used today**
 - combination treatments yield better response rates
 - tracking of PSA levels as biomarker of disease (drops of 50%)

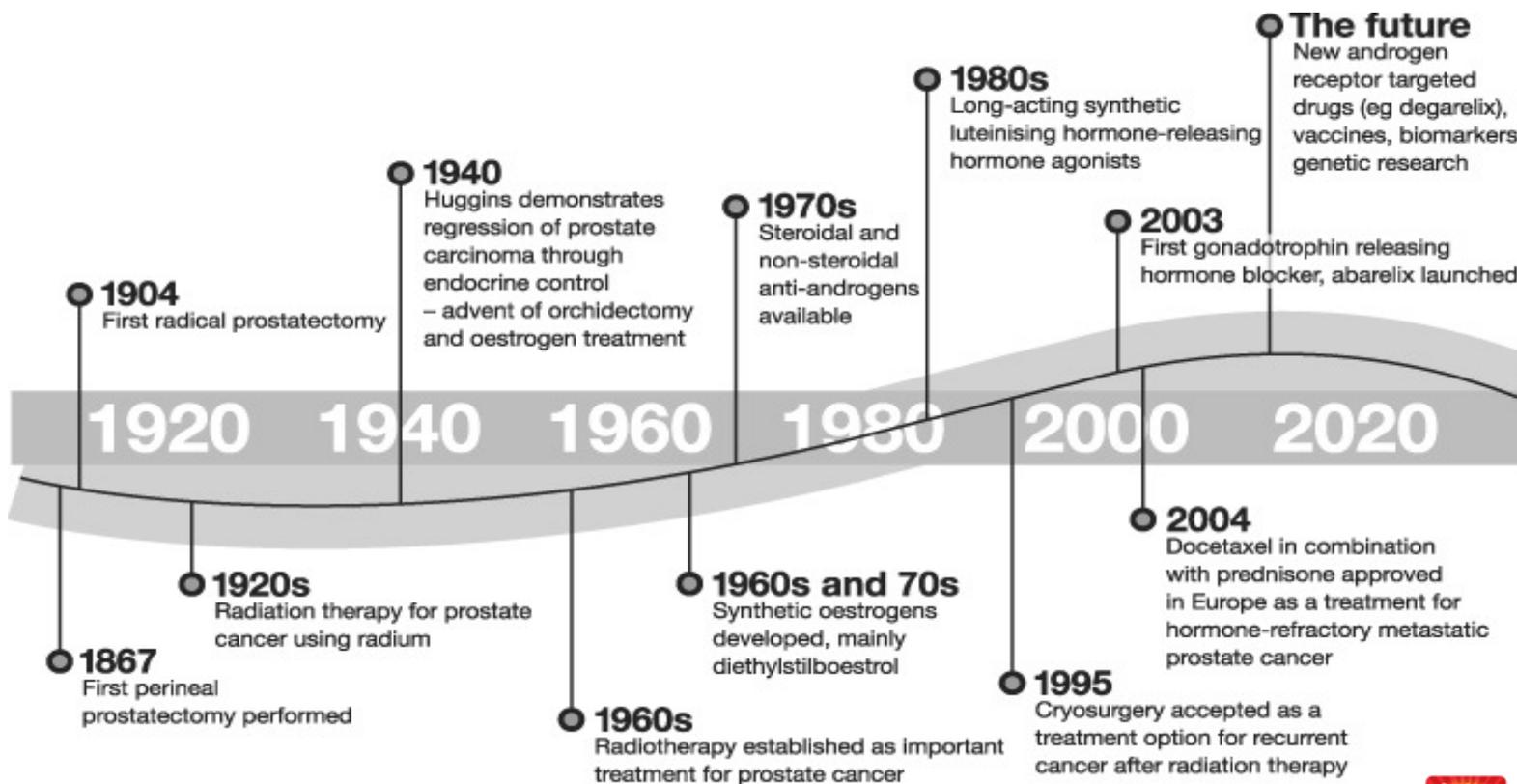


Combination Therapy

- Currently, combinations of Sx, ablation hormone therapy and radiation are the SOC
- Combination of Walsh Sx and Radiation
- Coupling early detection methods (PSA and Ultrasound) with Walsch's Sx techniques and/or radiation
 - 1974-1993 the number of patients being treated tripled
 - 1990-1995 the prostate cancer death rate in men younger than 75 fell for the first time in decades!
- Not a death sentence anymore! Over a century of medical advancements!



History of Prostate Cancer Tx Timeline



New Treatments being Studied¹

- **Prostate Cancer**

- Still second most common in men (1st ?)
- Current therapies effective but severe side-effects affecting QoL
- Still need new treatments for localized low risk disease to preserve male organ function

- **Cryotherapy**

- *in situ* freezing of prostate

- **Brachytherapy**

- Radiation “bombs” placed near the tumor
- declined in the 1950s - poor radium sources
- 1983 came back – Dr. H.Holm small ultrasound-guided radioactive seeds



New Treatments being Studied²

- **High Intensity Focused Ultrasound**

- Maple Leaf HIFU - Toronto
- **AblathermTM** – heat from intense, ultrasound waves destroy prostate

- **Photodynamic Therapy (PDT)**

- photosensitive drug + light + oxygen = cell death!
- last few decades studies in early-stage prostate cancer
 - use of stronger proprietary drugs
 - use of weak light devices
 - use of fiber optics and endoscopy to access > 1 cm tissues





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Our Solution

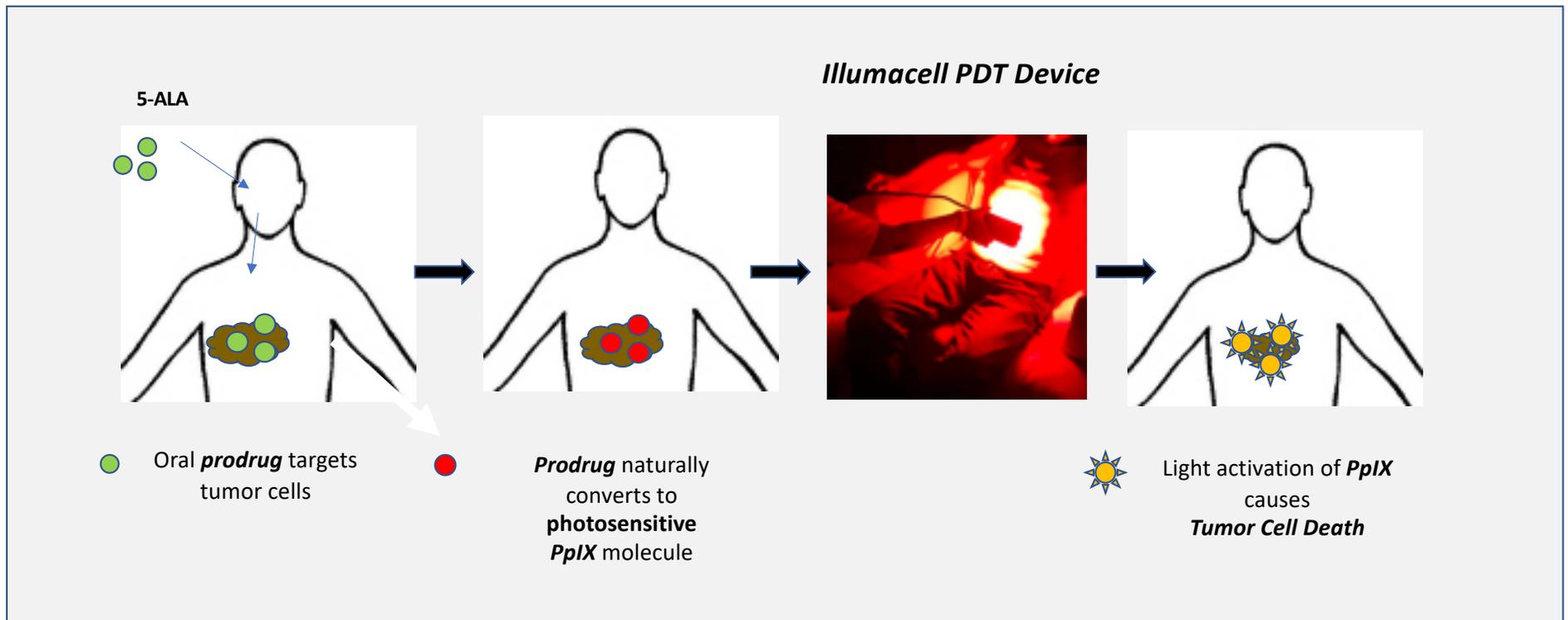
- Non-invasive and natural Photodynamic Therapy (PDT)
- Most solid tumors, at any stage not just early stage
- Breakthrough technology allowing deep penetration of light phototherapy into tissue
- Potential to become standard equipment in all hospitals and cancer centers, worldwide



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BEATING CANCER WITH LIGHT



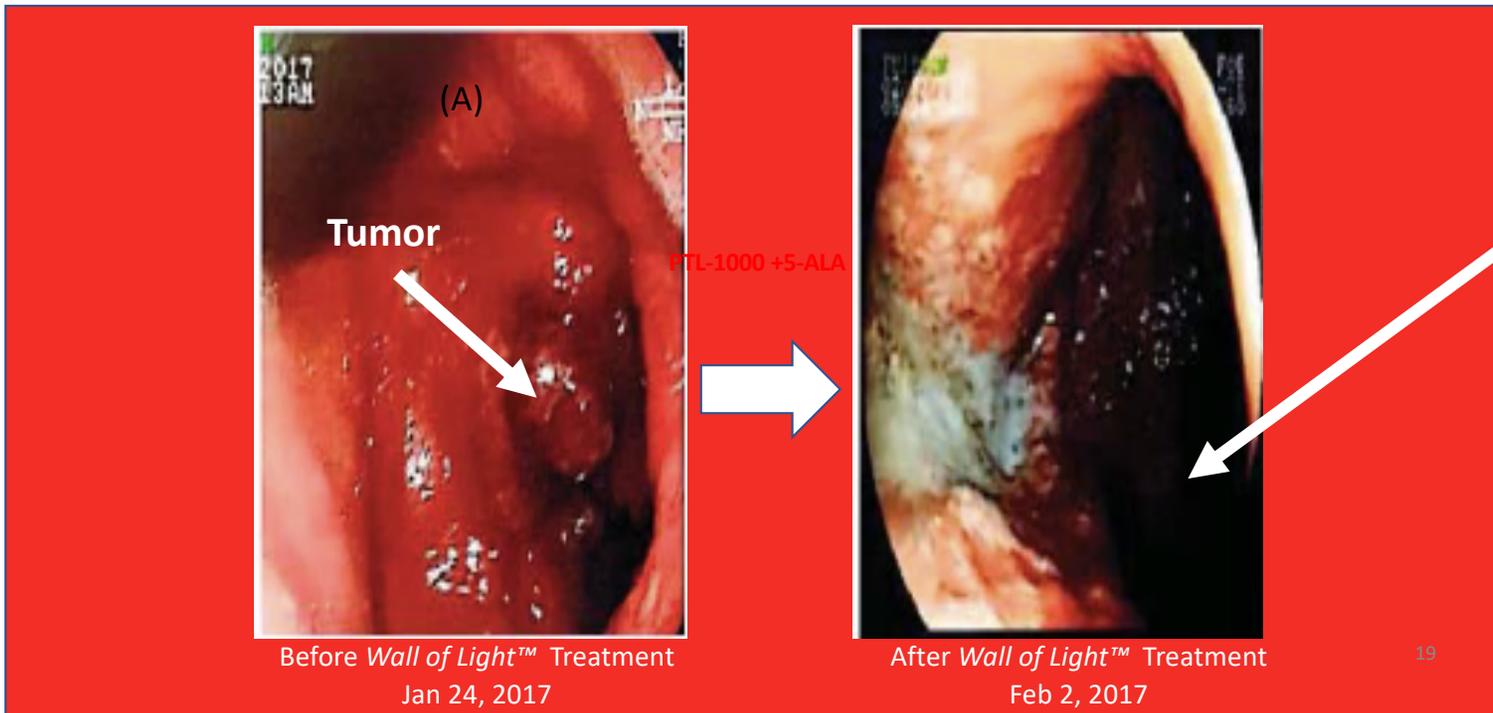
Typical Clinical Protocol





Stomach Cancer example

Patient with stomach cancer treated at the Hope4Cancer Institute in Mexico



Tumor is black and necrotic after treatment
Direct evidence that we can reach tumors deep inside the body!

Advantages of Illumacell PDT

- **natural 5-ALA prodrug + non-invasive, high intensity light**
- **strong light, weak photosensitizer**
 - no Sx or endoscopy required
 - deep tissue and deep tumor therapy
 - quick clinical recovery time
- **exciting neo-adjuvant, combination, and adjuvant potential**
- **potential to create a significant paradigm shift in first-line cancer care**
 - Prostate Cancer Tx
 - could be used as a first-line Tx for non-androgen ablativ approaches
 - combine with radiation or even replace it!
 - could be effective androgen resistant prostate cancer Tx



Senior Management Team



Michael Ben
President

CPA, CA, CF.
PwC trained. Has taken
two companies public
(IPO & RTO)



Dr. Jeff Hummel
Clinical and
Regulatory Affairs

PhD in Medical
Oncology with >25 years
experience in clinical
cancer research



Dr. Robert Zawydiwski
Scientific Affairs

PhD in Pharmaceutical
Science with >30 years
experience in the
medical device industry



Tom Kerber
Founder and CTO

>30 years experience in
developing innovative
light technologies



References and Resources

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