Key Visions: A tribute to Joe L. Key

Founder of plant molecular biology and its community

ISPMB

Society

AMERICAN SOCIETY OF PLANT BIOLOGISTS

INVENIAMVS VITALIA ARCANA PLANTARVM

1924

USDA

Federal Funding

Industry

AGRIGENETICS

Academe

THE PLANT CENTER at the University of Georgia

A tribute by Gloria Coruzzi, New York University

Key Visions: A tribute to Joe L. Key

Founder of plant molecular biology and its community

Joe Key: A great scientist, community builder, and friend

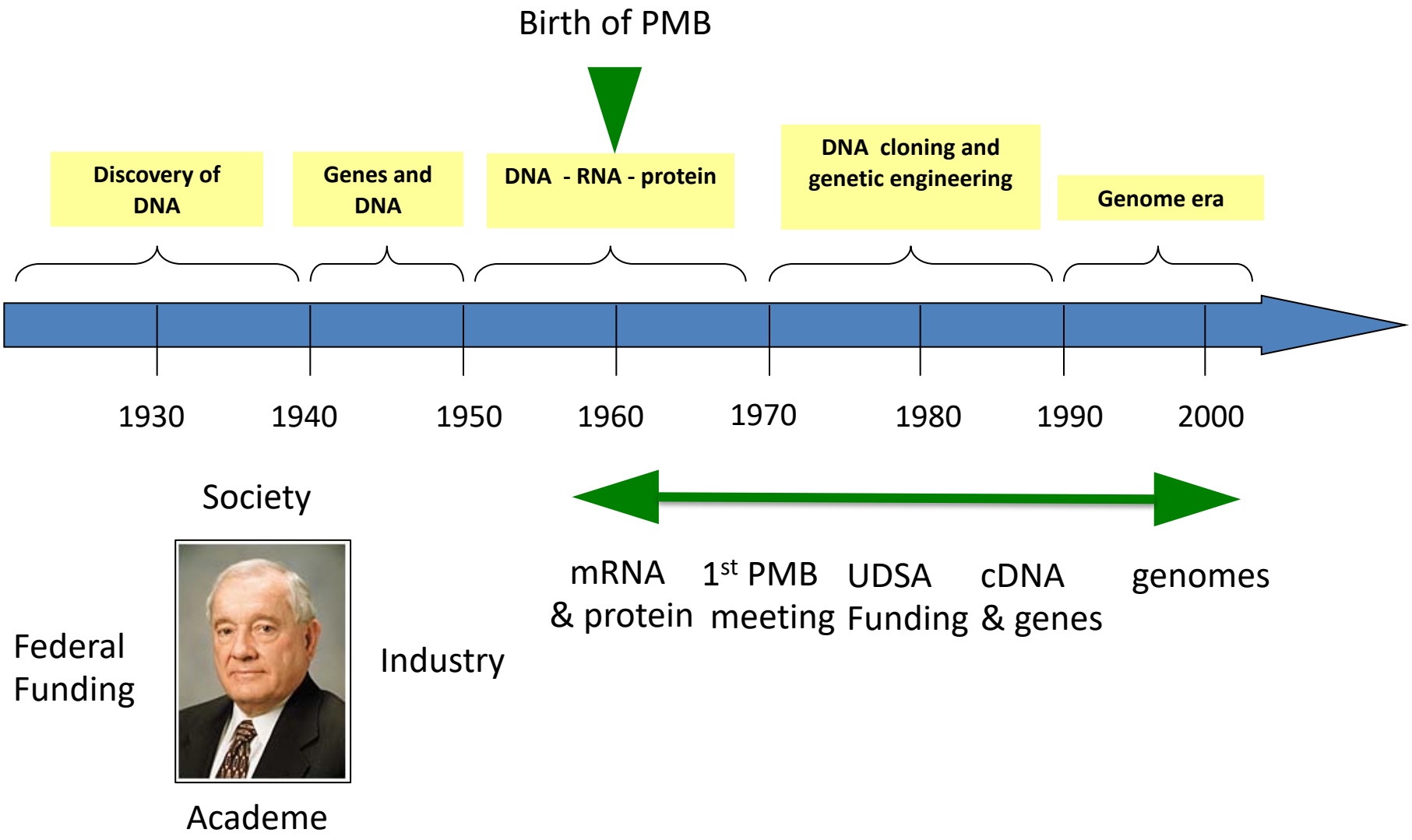
My Joe Key connection:

I first became introduced to the nascent plant molecular biology community at the 2nd Plant Molecular Biology Gordon conference, chaired by Joe Key in 1981. That was a seminal meeting in our field, and my connections to Joe Key and his colleagues grew over the years.

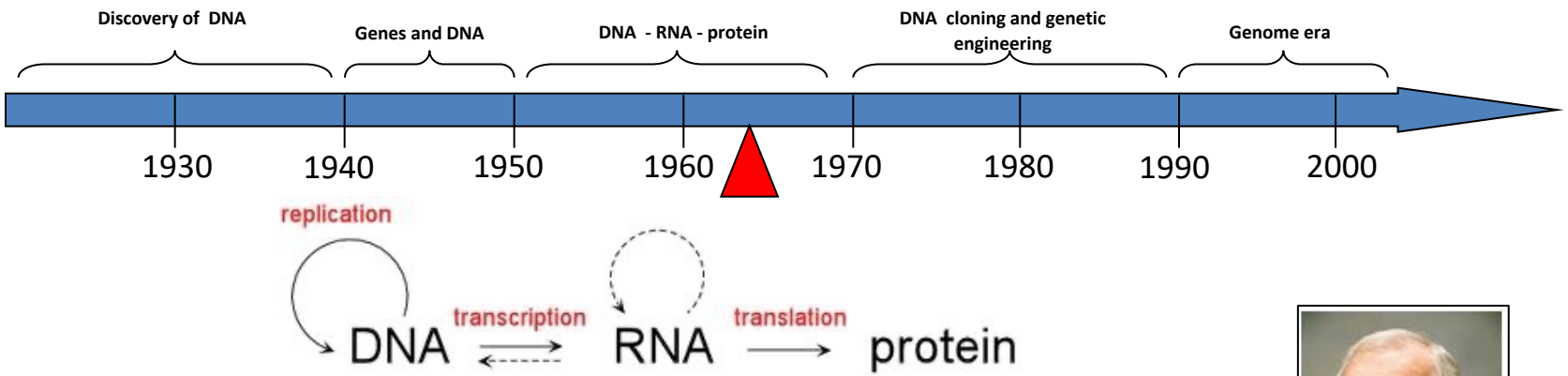
This tribute to Joe Key is for his vision and leadership at the frontier of plant molecular biology, both scientifically and for community building. He created the plant molecular field that we all so richly cherish. We are truly grateful for his vision and mourn his passing on Aug. 19, 2024.

A tribute by Gloria Coruzzi, New York University

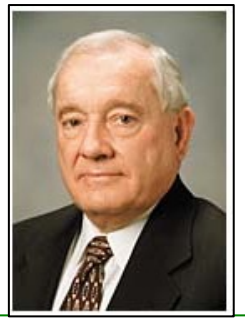
Key Visions:
The birth of plant molecular biology and its community



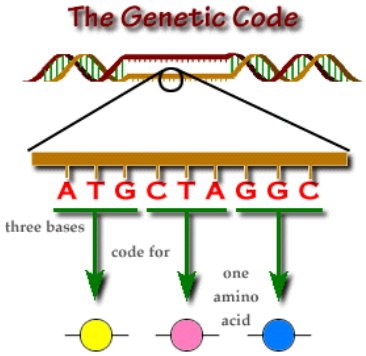
From DNA to mRNA to Proteins



- **1957** – the "Central Dogma" (Crick)
- **1958** – the mechanism of DNA replication (Meselson)
- **1961** – the hypothesis of the messenger RNA (Brenner, Jacob, Meselson)
- **1961 to 1965** – the genetic code was deciphered (Nirenberg, Khorana and Holley) Nobel Prize 1968



mRNA and plant growth (Key and Ingles 1964)



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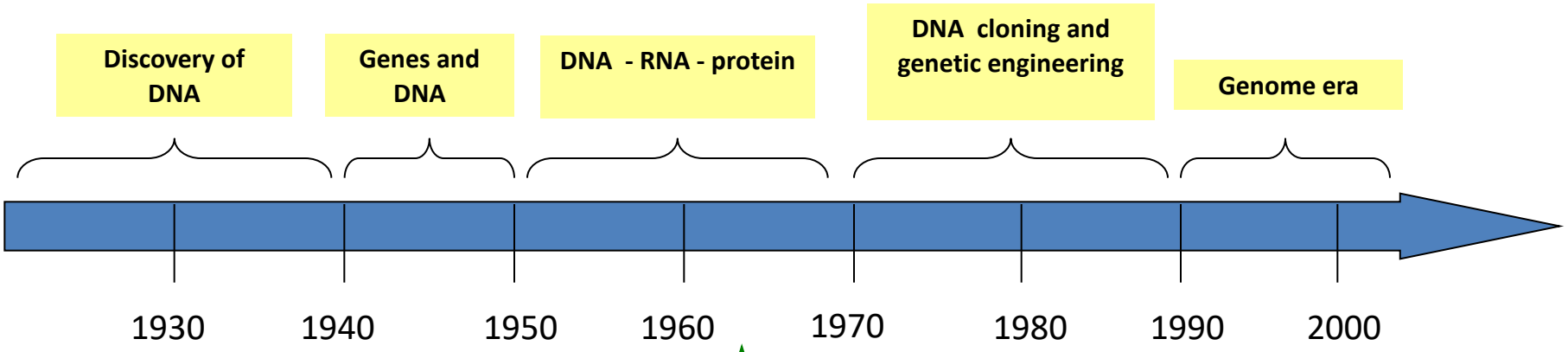

*REQUIREMENT FOR THE SYNTHESIS OF DNA-LIKE RNA FOR GROWTH OF EXCISED PLANT TISSUE**

By Joe L. Key and John Ingle

DEPARTMENT OF BOTANY AND PLANT PATHOLOGY, PURDUE UNIVERSITY

Communicated by Kenneth V. Thimann, October 21, 1964

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We have examined the nature of the RNA synthesis that was required for growth. RNA, synthesized in control and inhibitor-treated tissue, has been fractionated by differential extraction, sucrose density gradient centrifugation, and methylated-albumin, kieselguhr column chromatography.[7] By these techniques we have identified a fraction of RNA, the synthesis of which appears to be essential for growth of the tissue. The properties of this RNA fraction, its composition, heterogeneity of size, rate of labeling and turnover, are in many respects similar to those of the messenger-RNA described in bacterial systems.[8] The requirement for the synthesis of this RNA for the process of cell elongation is discussed.

Key Visions:
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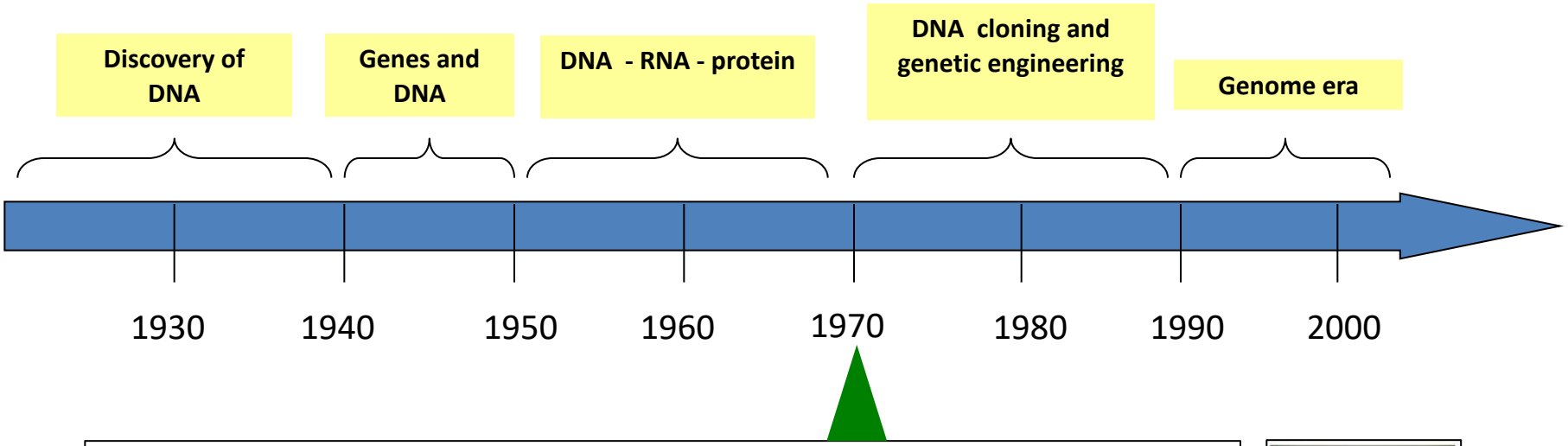
First International Plant Molecular Meeting

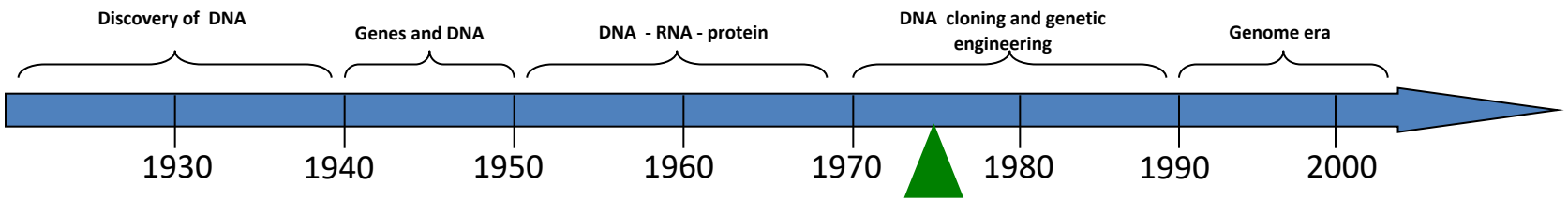


International Conference on RNA and Protein Synthesis in Plants
(Tihany, Hungary, 1971)

The growth of plant molecular biology historically is reflected in a chronicle of the international meetings devoted to it. The first of these was in Tihany, Hungary in 1971. About 40 people attended. In retrospect this meeting was a bell-wether event in that the individuals who met there for the first time have in time become the recognized international advocates of the field.

(L. Dure. BioEssays)

The Golden Age of (Plant) Molecular Biology



- **1969:** First gene in bacterial DNA isolated
- **1970:** First synthetic (artificial) gene

- **1973**: First successful DNA cloning experiment

- **1977**: DNA is sequenced

- **1978**: The first human gene is cloned – insulin

- **1981**: **First plant gene cloned - phaseolin**

- **1985**: PCR (Polymerase Chain Reaction) is invented

From Cot Curves to Genomics. How Gene Cloning Established New Concepts in Plant Biology

Robert B. Goldberg*

Department of Molecular, Cell, and Developmental Biology, University of California, Los Angeles, California 90095–1606

PLANT GENES CAN BE CLONED!

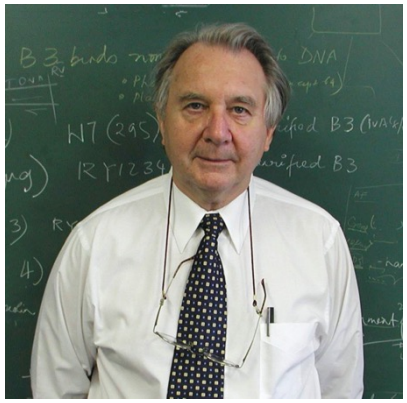
Rumors began to circulate in the late 1970s that plant DNA could not be cloned. One well-known plant molecular biologist (who will remain anonymous) went from meeting to meeting like Paul Revere declaring that plant DNA was "different" from animal or bacterial DNA and that it could not be cloned! John Bedbrook and colleagues in Dick Flavell's lab in Cambridge, England soon showed that this was not the case and demonstrated directly that plant DNA could be cloned and replicated in bacteria just like the DNA from other organisms (3). They

1981

Phaseolin

First transgenic gene

(Tim Hall 1937-2016)



The age of plant genetic engineering has begun….

The New York Times

Science

Protein Gene Is Transplanted From Bean to Sunflower

UPI
Published: June 30, 1981

WASHINGTON, June 29— Scientists have developed a genetic engineering process for moving genes from one plant species to another, opening the way for major improvements in plants, Agriculture Secretary John R. Block said today.

"It is the first step," Mr. Block said, "toward the day when scientists will be able to increase the nutritive value of plants, to make plants resistant to disease and environmental stresses and to make them capable of fixing nitrogen from the air."

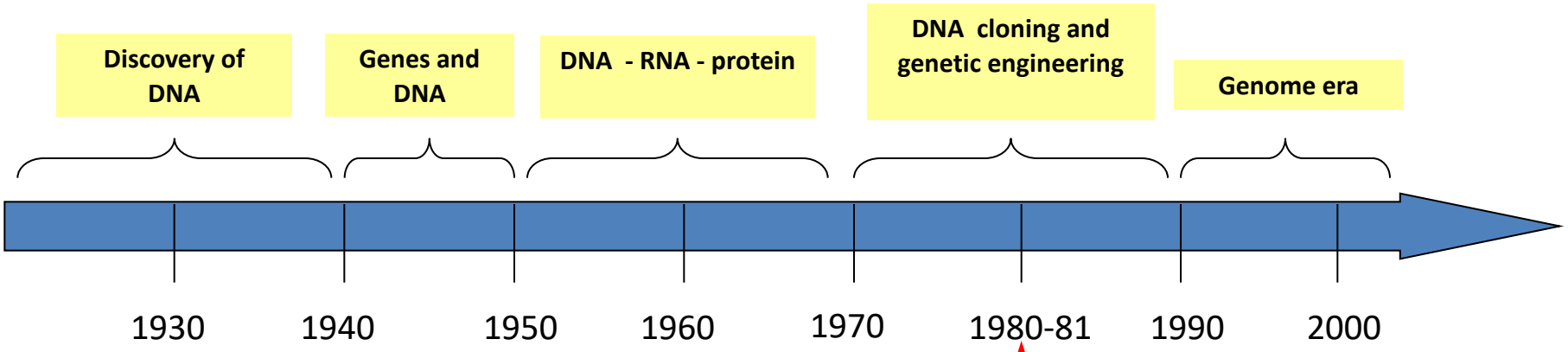
Researchers led by John D. Kemp of the Agriculture Department and Timothy Hall of the University of Wisconsin at Madison transferred a gene from a French bean seed into a sunflower cell; they called the resulting tissue "sunbean."

The gene, which directs production of a protein called phaseolin, is stable in its new location. According to Dr. Prabhakara Choudary, another member of the Wisconsin team, the gene is producing the messenger ribonucleic acid that directs the assembly of the protein, but the protein itself has not yet been found.

The gene was spliced into Agrobacterium tumefaciens, a bacterium that transmits crown gall disease in some plants. The bacterium's normal infection mechanism was used to transfer the bean protein gene to the sunflower plant cells.

The next step, which has succeeded in some plants but not in sunflowers, will be to regenerate an entire plant from the "sunbean" cells.

Key Visions:
The birth of plant molecular biology and its community



GRC Gordon Research Conference *frontiers of*

First **Plant Molecular Biology Gordon Conference**

1980 - Co-Chair

1981 - Chair

From Cot Curves to Genomics. How Gene Cloning Established New Concepts in Plant Biology

Robert B. Goldberg*

Department of Molecular, Cell, and Developmental Biology, University of California, Los Angeles, California 90095–1606

In the 1970s and 1980s (as well as today) plant scientists were playing "catch-up" with their animal counterparts and were competing for a meager pot of money. It was during this time that Joe Key played a huge role in establishing the U.S. Department of Agriculture Competitive Research Grants Program after many years of fighting the U.S. Department of Agriculture bureaucracy and Congress. This Program has made a major impact over the past 25 years in keeping plant sciences in the forefront of pioneering research.

Plant Physiol. Vol. 125, 2001

Key Visions:
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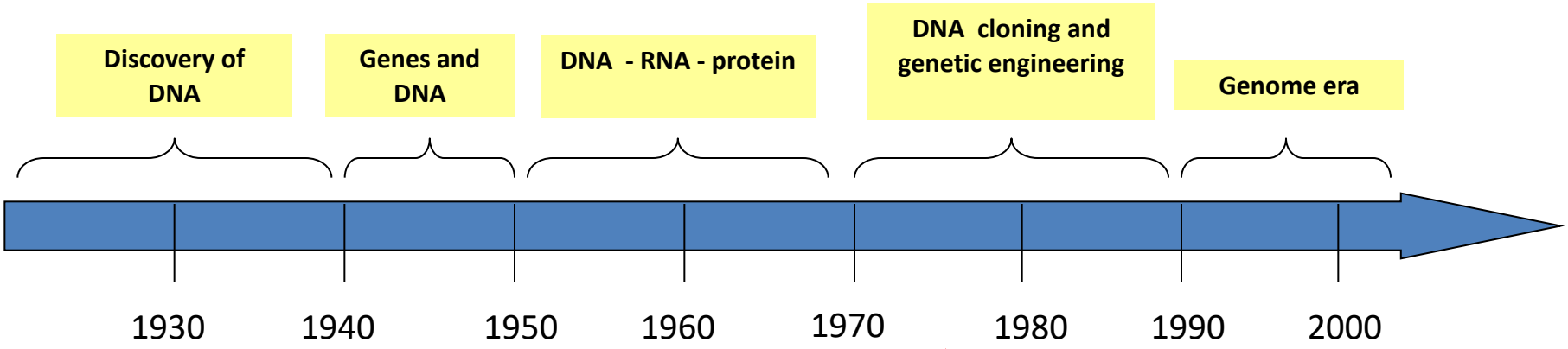

USDA

Director, Competitive Grants Program
USDA
1978-79

The national research agenda must remain flexible if it is to continue to address the nation's social, economic, humanitarian and scientific needs efficiently and effectively. We, as researchers, must remain flexible as well.

It is imperative that we find the time and mechanisms to persuade society in general, and decision-makers in particular, on the importance of research to our personal and national health and well-being.

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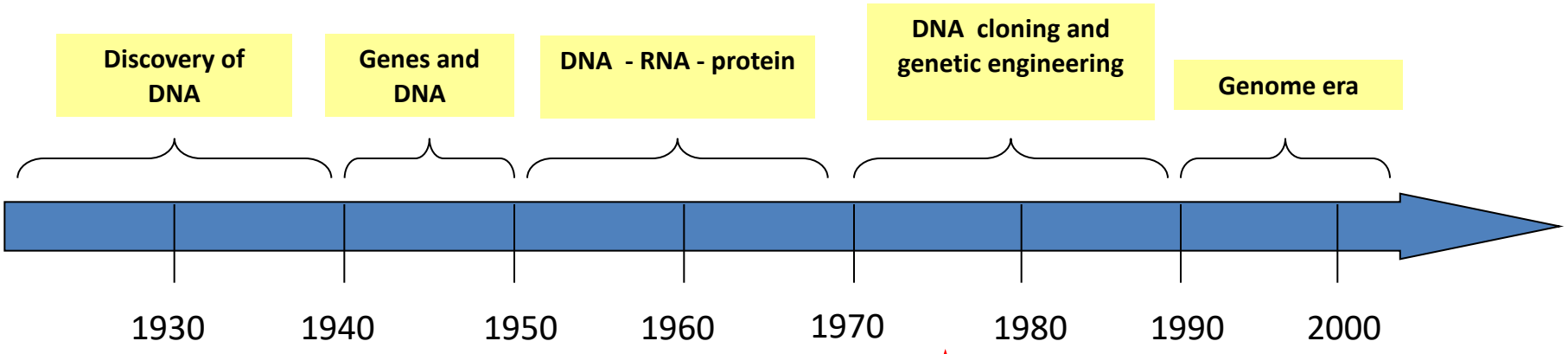

President,
American Society of Plant Physiologists
(1976-77)

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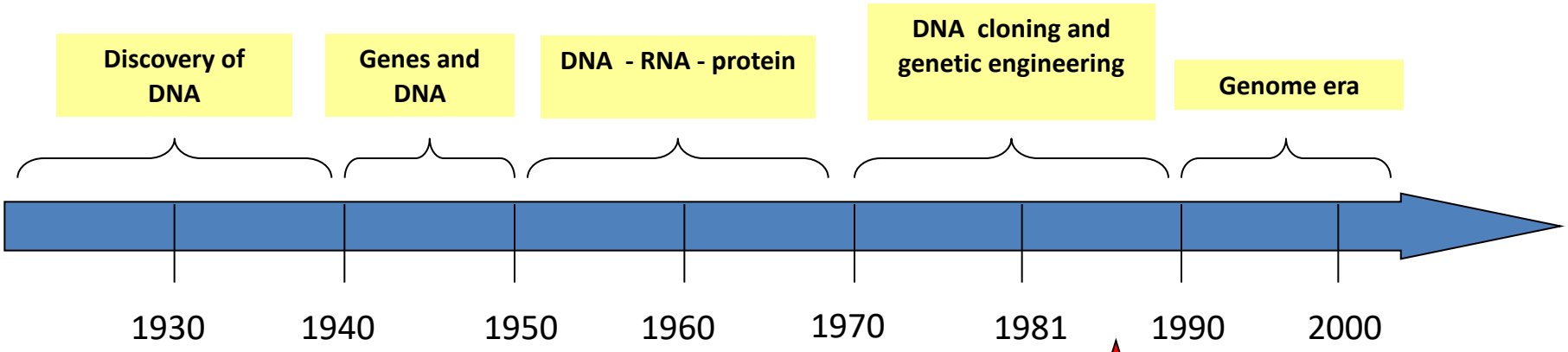


ISPMB

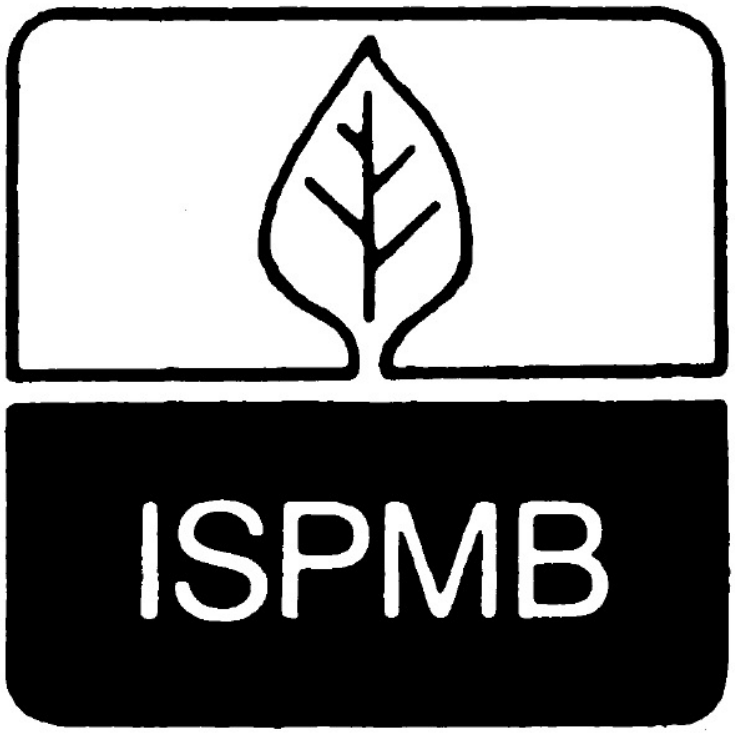
1St International Congress of Plant Molecular Biology

Oct. 27 - Nov. 3, 1985, Savannah, GA.

About This Issue

This is the first of a series of special issues to be devoted to one area of biology. The subject of this issue, plant biology, is currently expanding at a very rapid rate in response to the many opportunities created by molecular cloning and the regeneration of whole plants from cultured cells. Industry has seized the opportunities for agriculture and is playing a significant part in stimulating the science and its practitioners. The new interest in plant molecular and cell biology has led to the formation of a new society; the International Society for Plant Molecular Biology, which is responsible for the first-ever International Congress of Plant Molecular Biology, being held this October at Savannah, Georgia. This issue has been produced to coincide with the Congress. The Editorial describes the birth of the International Society and its aims, while one of the Places articles features the University of Georgia which is celebrating its bicentennial this year. The remainder of the issue highlights just a few of the areas of current interest in plant biology past, present and future.

RICHARD B. FLAVELL,
Plant Breeding Institute, Cambridge, England;
(Guest editor of this issue)



Editorial

Plant Molecular Biology Comes of Age

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The First International Congress of Plant Molecular Biology
Oct. 27 - Nov. 3, 1985, Savannah, GA.

Joe in Tiger Costume

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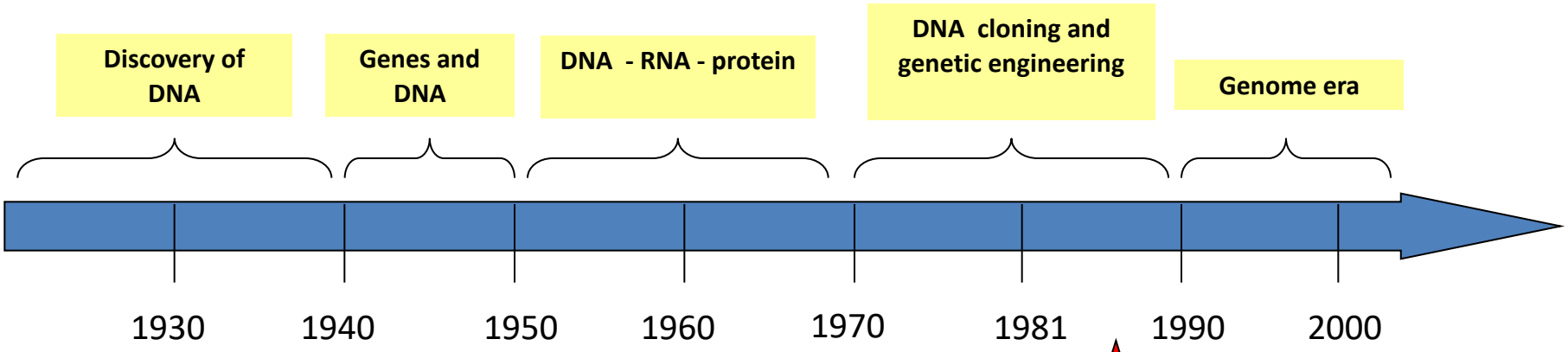

Executive Vice President for Research,
AgriGenetics
(1983-1985)

AGRIGENETICS

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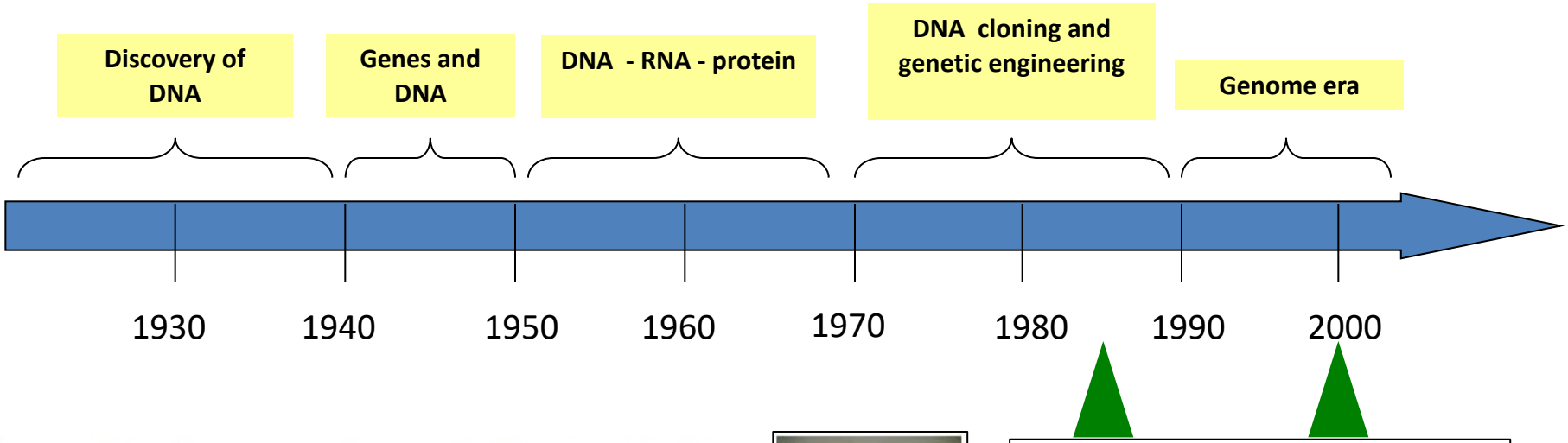

We have certainly made great progress in research and creative scholarship across campus these past 14 years. Research funding through grants and contracts has grown from about $40 million to more than $100 million a year, with total research expenditures exceeding $230 million. We have invested nearly $100 million for new science buildings, including the Life Sciences Building, the Complex Carbohydrate Research Center (CCRC), a recently completed animal science complex and a soon-to-be-completed Center for Applied Genetic Technologies (CAGT) — research and incubator facilities for start-up companies.

Vice President for Research
University of Georgia
(1986-2000)

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Founder of plant molecular biology and its community

The Plant Biology Community THANKS YOU, Joe!

ISPMB

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