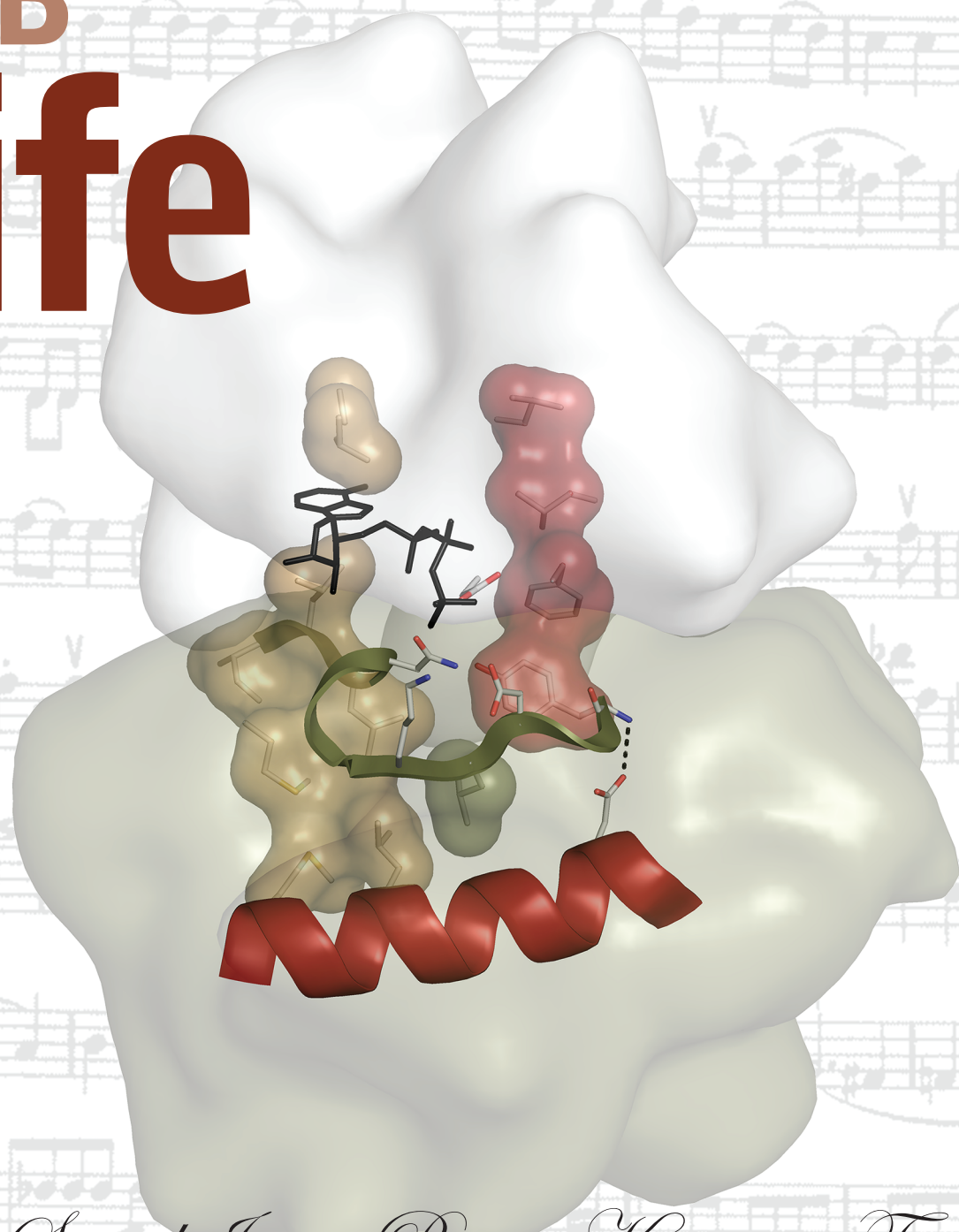


IUBMB Life



Special Issue: Protein Kinases in Tune
Guest Editor: Alexandra Newton

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This issue of IUBMB Life, suggested by kinase aficionado Michael P. Walsh, plays homage to one of the largest gene families in humans, the protein kinases. The >500 members in this family are the instruments nature uses to relay information throughout the cell and, with the discovery of secreted kinases, outside the cell. Every instrument not only has a precise and finely controlled role in the symphony that controls cell function, but is itself finely tuned for perfect pitch. When these instruments are not in tune, the ensuing cacophony is causal in disease.

We begin this issue with a review by Taylor and colleagues who cover the history of protein kinases, from their discovery to the elucidation of the first structure of a kinase, that of protein kinase A (PKA); this remains the gold standard to which all other kinases are compared and has provided enormous insight into how these enzymes work. Ahuja and colleagues then take the

theme of PKA to discuss how it is tuned like a violin (see also cover showing violin notes for Mozart's Symphony number 40). Kikkawa then describes the history and rationale leading to the discovery of protein kinase C, a biochemical tour de force in which he participated as a graduate student with Yasutomi Nishizuka at Kobe University, Japan in the 1970s. The issue then moves to receptor tyrosine kinases, with a review by Jura and colleagues on their structures and how these inform on their mechanism of action. Shah and Kim then provide a review on using chemical biology to identify the substrates of kinases. This is followed by a review by An and Brognard on an emerging function of kinases as tumor suppressors. Last, Tagliabracci and colleagues describe the newly discovered class of mammalian secreted protein kinases and puts them in context of secreted kinases in bacteria and parasites.

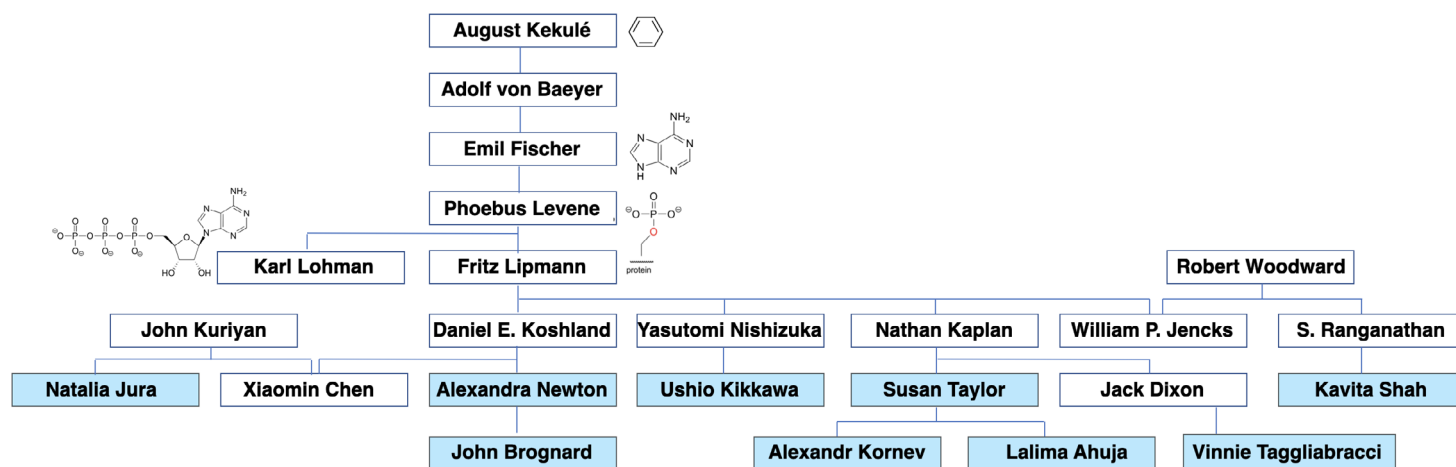


FIG 1

Kinase researchers in this issue stem from the chemistry branch of protein phosphorylation, which includes the researchers who discovered ATP and protein phosphorylation. The physiology branch, described in the opening review of this issue by Taylor and colleagues, discovered the enzymes responsible for the covalent modification of proteins by phosphate.

Abbreviations: PKA, protein kinase A

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In addition to highlighting the protein kinase family tree, this issue also illustrates the chemistry branch of the remarkable family tree that has given rise to the current generation of scientists working on protein kinases (Fig. 1); the physiology branch which led to the discovery of protein kinases is described in the opening review by Taylor and colleagues and in that of Kikkawa (who links also to Tony Hunter, who discovered phospho-tyrosine (1)). All of our authors are in some way related to Phoebus Aaron Theodore Levene who, with his student Fritz Lipmann, identified phosphoserine in the egg white protein vitullin, thus discovering protein phosphorylation (2). Five of our corresponding authors are direct descendants of Lipmann, who is their academic great or great great grandfather, and two of our authors are second cousins by relation of their mentors having trained descendants of Levene. But this family tree goes back to August Kekulé, whose vision of a snake biting its tail as he dozed by the fire led him to realize the heterocyclic structure of benzene, a conceptual breakthrough that allowed the subsequent determination of complex heterocyclic structures such as those found in ATP. He, in turn, trained Adolf von Baeyer, who developed a method for numbering such heterocyclic compounds, who in turn trained Emil Fischer. In addition to Fischer projections for 3D representation of chiral

molecules and his work on purines and sugars, he also opened the field of protein chemistry by discovering several amino acids, showing that the amino acid constituents of proteins are joined by peptide bonds, and synthesizing oligopeptides (3). It is the unique properties of these amino acids that tune kinase function to their perfect pitch. And as if this is not enough kinase-related chemistry in the family tree, the discovery of ATP was made by a trainee of Levene, the German chemist Karl Lohman (4, 5). Thus, this is not only a story of kinases, but a story of mentorship. We hope that this issue inspires the next generation of kinase researchers.

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Thinking Outside of the Cell: Secreted Protein Kinases in Bacteria, Parasites, and Mammals (pages 749–759)

Brenden C. Park, Michael Reese and Vincent S. Tagliabracci

Article first published online: 2 April 2019 | DOI: 10.1002/iub.2040

COVER: Structure of protein kinase A showing motifs that define dynamic properties of the kinase and tune its activity, analogous to the properties that tune a violin. Kinase is overlaid on the violin notes for Mozart's Symphony #40. Designed by Alexandr Kornev.



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Upcoming IUBMB Meetings

IUBMB Focused Meeting “The 7th Mediterranean Neuroscience Conference”
Marrakech, Morocco
June 23–27, 2019

<https://neurosciencemedite.wixsite.com/mns-2019>

“Revisiting the Central Dogma of Molecular Biology at the Single-Molecule Level” – Biophysical Society Thematic Meeting

Lima, Peru
July 18–21, 2019

<https://www.biophysics.org/2019lima>

Young Scientist Program (YSP) 2019
Taylor’s University, Subang Jaya, Selangor, Malaysia
August 15–18, 2019

<https://www.faobmbkl2019.com/young-scientist-programme>

Inquiries: iubmb2019.ysp@gmail.com; Application deadline: January 31, 2019

27th FAOBMB & 44th MSBMB Conference “Biomolecules: Networks & Biosystems”
with Special Symposia on Mosquito-borne Illnesses

Kuala Lumpur, Malaysia
August 19–22, 2019

faobmbkl2019.com

IUBMB Focused Meeting “Inhibitors of Protein Kinases. Kinase Inhibitors in Target Biology and Disease”

September 14–18, 2019

Contact: Prof. Jaroslaw Poznanski jarek@ibb.waw.pl

<https://www.ipk2019.org>

IUBMB Focused Meeting “Tissue Homeostasis in Health and Disease – The 2019 Champalimaud Symposium”

Lisbon, Portugal
October 8–11, 2019

Contact: Dr. Henrique Veiga-Fernandes

preaward.osp@research.fchampalimaud.org

Upcoming Miscellaneous Events

Third International Symposium on Fungal Stress – ISFUS2019
Universidade Federal de Sao Paulo, Sao Jose dos Campos, SP, Brazil
May 20–23, 2019

website: <https://isfus2019.wordpress.com>

BAGECO 15 – 15th Symposium on Bacterial Genetics and Ecology
Lisbon, Portugal

May 26–30, 2019

website: <http://www.bageco.org>

Contact: belege@conventus.de

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