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Dedication to Professor Julian Davies

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It is an honor to dedicate this special Issue of the *Journal of Industrial Microbiology and Biotechnology* to Prof. Julian Davies. Julian is a remarkable scientist who has made many influential contributions to the development of molecular biology and biotechnology. He is a self-proclaimed ''rolling stone'' [4], predating Bob Dylan, Mick Jagger and Keith Richards in the start of his journey. He became interested in chemistry and natural products at an early age, and committed the structure of penicillin to memory in grammar school. He studied chemistry at Nottingham University as an undergraduate and went on to earn a PhD which involved the total synthesis of the fungal metabolite flavolin and structural analysis of sterigmatocystin. He carried out the total synthesis of a β-amyrin during his postdoctoral studies at Columbia University. After doing additional postdoctoral work at the University of Wisconsin, Madison, he took a position in the Department of Chemistry at the Manchester College of Science and Technology in 1959 where he became interested in the biosynthesis and biology of natural products.

Being trained in organic chemistry, Julian wanted to learn more about microbiology and microorganisms. He went to Bernie Davis' laboratory at Harvard Medical School in 1962, a move that would put Julian on a path towards involvement in recombinant DNA technology and biotechnology. During his days at Harvard, Julian was associated with Wally Gilbert, Luigi Gorini and Jim Watson, working initially on the mechanism of action of aminoglycoside antibiotics. He discovered that streptomycin inhibits protein synthesis by binding to the 30S ribosomal subunit [9]. He also discovered that streptomycin and other aminoglycoside antibiotics cause mistranslation of messenger RNA [6], and that spectinomycin acts at the 30S ribosomal subunit [5]. In 1965, he collaborated with Gobind Khorana at the University of Wisconsin to propose a set of rules on misreading mRNA in the presence of aminoglycoside antibiotics [8]. Later in 1965, he joined Francois Jacob at the Pasteur Institute. He associated with a number of leaders in the budding field of molecular biology, mapping the *lacI* and *lacO* genes by P1 transduction and conjugation [7]. He was the first to use X-gal as a means of screening for $lacI^+$ recombinants. He spent the summer of 1966 in Sydney Brenner's laboratory at the Medical Research Council in Cambridge, UK, studying the suppression of T4rII frameshift mutants by streptomycin in certain streptomycin-resistant (SmR) mutants.

In 1966 he started work on a bacterial strain containing an R-factor (R100) which encoded SmR. He noted that the mechanism of SmR was not associated with changes in ribosome sensitivity to Sm, so it must be different from that observed in spontaneous mutants. This set him on a course of studies that he continued after joining the faculty of the University of Wisconsin in 1966. At Wisconsin, he determined that R100 encoded an aminoglycoside-inactivating enzyme [14], and this was followed up by many additional studies on aminoglycoside-inactivating enzymes and other antibiotic resistance mechanisms carried out by many postdoctoral and visiting scientists including Patrice Courvalin, Eric Cundliffe, Mori Yagasawa, Mike Cannon, Antonio Jimenez, Takeshi Yamada, Raoul Benviniste, Wolfgang Piepersburg, Ken Komatsu and Jan Westpheling. Julian's laboratory at Wisconsin was very active in the isolation and characterization of plasmids from clinical and environmental origins, and they also discovered several restriction endonucleases, including *Pst*I [12].

In 1974, Julian visited the University of Geneva, and discovered Tn*5* and Tn*6* with Doug Berg [2]. Tn*5* encoded resistance to the aminoglycoside G418 (geneticin) which functions in bacteria and yeast [10], and is now widely used for selections in plants and mammalian cells. In the early 1980s, his discussions with Nagaraja Rao at Eli Lilly and Company led to the development of

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hygromycin resistance as an additional marker useful for prokaryotic (including actinomycetes) and eucaryotic cells, and apramycin as an excellent marker for actinomycetes and *Escherichia coli* [1, 3], and his tenure as Director of Biogen's Geneva laboratories led to the discovery of the bialaphos resistance gene [13] that has been used to genetically engineer plants. His group at Biogen made many other contributions to the expression of mammalian genes in microbial hosts.

Julian moved to the Pasteur Institute in 1985 to head the Biotechnology Department. During his tenure at the Pasteur Institute, his colleagues developed conjugation from *E. coli* to streptomycetes [11], a methodology that has been used successfully in many actinomycetes, including "the organism from hell", *Saccharopolyspora spinosa* [1].

Julian continued his journey as a "rolling stone" in 1991 to become the Chairman of Microbiology at the University of British Columbia in Vancouver, BC. In the mid 1990s, he founded TerraGen, which acquired Xenova Natural Products and ChromaXome in the late 1990s, and was subsequently acquired by Cubist Pharmaceuticals in 2000. Julian's vision that there are more secondary metabolite pathways to be found in soil microorganisms continues to inspire academic and industrial programs today. Julian's contributions to the technical elements now used routinely in biotechnology, and to the understanding of antibiotic resistance mechanisms, have made a lasting impact on how we view and do science today.

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