Happy 90th Birthday: Professor Dr. *Jack David Dunitz* FRS, the 'Professor's Professor'[1])

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'*The endeavour to understand is the first and only basis of virtue.*'

Baruch Spinoza

[1]) This manuscript was published with some trepidation, particularly since Professor *Dunitz* had not scrutinised the grammar beforehand. Any remaining mistakes are utterly intentional, and purely for the amusement of the recipient.

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On the 29th March 2013, Professor Dr. *Jack David Dunitz* FRS, emeritus professor of chemical crystallography at the ETH Zürich, marked his 90th birthday. For those of us who know *Jack Dunitz* personally, it came as no surprise that he chose to celebrate this occasion with little fuss or ceremony; he requested that there be no symposium, or journal editions dedicated to him. Instead, *Jack* wished to celebrate this milestone quietly at home with family and close friends.

Although the occasion was all too ephemeral, this particular nonagenarian's legacy and influence on the natural sciences is considerably more enduring. We, therefore, felt that it was quite '*out of the question*' to let such a juncture pass without paying a personal tribute to the scientist, mentor, and friend who has influenced us so very much. And so it was with great respect and admiration that we raised a glass to the most beautiful of minds.

'*Beauty in things exists in the mind which contemplates them.*'

David Hume

We suspect that this '*Runder Geburtstag*' almost certainly included moments of quiet reflection at what has been achieved, both privately and professionally. *Jack*, more than most, can look back over a sterling research career with justified pride and immense satisfaction. This remarkable journey began in Glasgow University some 70 years ago where he began his doctoral studies with the renowned crystallographer *J. Monteath Robertson* (*Fig. 1*), who had been newly installed as Gardiner Professor. Despite the tribulations of that particular period of history, and his military obligations as part of the Home Guard, a secondary defence forces against a possible invasion, *Jack* and his colleagues quickly taught each other the rudimentary aspects of crystallography. This extraordinary group included *John White*, *Ian Dawson*, and *Sandy Matheson*. Remarkably, all four became eminent academics in their own right.

This early experience in *Robertson*'s group crystallised *Jack*'s passion for molecular structure, and from his first publication entitled '*The Crystal and Molecular Structure of Certain Dicarboxylic Acids. Part I. Oxalic Acid Dihydrate*' (*J. Chem. Soc.* **1947**, 142–148), he embarked upon a remarkable journey that took him from Glasgow to Oxford, to Caltech, to Bethesda Maryland, and finally to the Royal Institution London. *Jack* refers to this early phase of his career as '*La Primavera*' (*Helv. Chim. Acta* **2013**, *96*, 545–563)[2]). He found himself at the very heart of structural chemistry, bringing him into contact with prominent scientists including *Sydney Brenner*, *Dorothy Hodgkin*, *Leslie Orgel*, *James Watson*, *Vernon Shomaker*, *Linus Pauling* and Sir *Lawrence Bragg* to name but a few. These early professional appointments led to the structural determination of complex organic systems such as calciferol (with *D. Hodgkin*), revealed the characteristic sandwich of ferrocene (with *L. Orgel*), and elucidated the molecular structure of cyclobutane (with *V. Shoemaker*). Inimitable though these contributions may seem, the autumn of *Jack*'s scientific career would

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[2]) *R. G.* intends to compose of follow-on of '*La Primavera*' in the forthcoming months. This will be published in *Helvetica Chimica Acta*.

Fig. 1. *Professor* J. Monteath Robertson*'s 80th birthday symposium at Glasgow University (1980);* Jack Dunitz *centre left and* J. Monteath Robertson *centre right*. This photograph was reproduced with the kind permission of the University of Glasgow Archive Services, Glasgow University Graduates Association Collection, GB0248 DC174/3/1/66 (*College Courant*, Vol. 66, p. 17, **1981**).

prove to be equally splendid, establishing X-ray crystallography as an indispensable tool for organic chemists and heralding a new era in structure analysis.

Most of us know *Jack Dunitz* in his capacity as professor of chemical crystallography at the ETH Zürich, and have benefitted directly from his research career at this institution. This move from the Royal Institution London was largely due to the foresight and vision of the director of the Laboratory of Organic Chemistry, ETH Zürich, Professor *Leopold Ruzicka*, who realised the power of crystallography and brought *Jack* to Zurich for discussions in 1956. It was to be a highly successful move, for, despite several attractive offers, *Jack* remained in Zurich until his retirement.

If the research period up to 1957 was *Jack*'s '*La Primavera*', then the ETH years may surely be considered his '*L'autunno*'. It is the episode of *Jack*'s career that introduced and formalised the notion of mapping reaction pathways through ingenious experiments. Students worldwide immediately recognise this fundamental work, and the implications it has had on our understanding of reactivity. We simply know it as the renowned *Bürgi–Dunitz* trajectory, to describe nucleophilic attack at carbonyl centres. Fortunately, the impact of this research is preserved for posterity in all good textbooks on organic chemistry!

The *Dunitz* laboratory contributed enormously to our understanding of the conformational behaviour of medium rings (*e.g.*, the *Dunitz* conformation of $C_{10}H_{20}$;

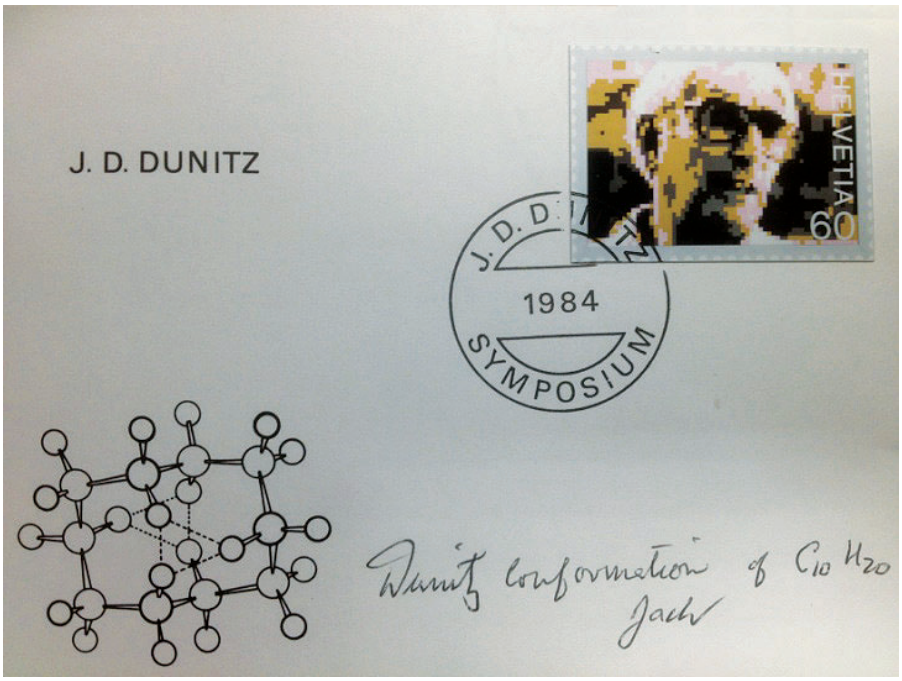

Fig. 2. *The* Dunitz *conformation of* $C_{10}H_{20}$. The special edition stamp was designed and produced by the late Professor *Edgar Heilbronner*.

Fig. 2), and conducted pioneering structural studies on important ionophores such as nonactin and monensin, not to mention the numerous other natural and non-natural products. *Jack*'s group reported on the existence of disappearing polymorphs (*Acc. Chem. Res.* **1995**, *28*, 193–200), and developed techniques to measure crystal structures at 98 K; a technique that is far from routine in most chemistry departments even today.

Even after retirement, *Jack* continues to address fundamental questions such as '*Is deuterium always smaller than protium*?' (*Angew. Chem., Int. Ed*. **2008**, *47*, 4208–4210). He noted that '*Organic Fluorine Hardly Ever Accepts Hydrogen Bonds*' (*Chem. – Eur. J.* **1997**, *3*, 89–98), and most recently that '*Among the half-million or so chemical compounds whose crystal structures have been determined by X-ray or neutron diffraction, the crystal structure of* D*-ribose is conspicuously absent*' (*Angew. Chem., Int. Ed*. **2010**, *49*, 4503–4505), a problem that *Jack* quickly resolved (*Helv. Chim. Acta* **2012**, *95*, 1687–1693)!

Jack's achievements are simply too numerous to list in this short dedication, his awards and recognitions too extensive. Fortunately, much of *Jack*'s work has been archived for posterity by the Oregon State University Libraries, and can be accessed free of charge (http://scarc.library.oregonstate.edu/coll/dunitz/). This valuable repository contains a more comprehensive collection of personal works and photographs.

Despite the grandeur of his scientific achievements, *Jack* has maintained a modesty and charisma that is truly admirable. He holds somewhat of a celebrity status at ETH

amongst the student population, which is testimony to his warmth of character. He has a razor sharp wit, and a remarkable breadth of knowledge. Indeed, Professor *Dieter Seebach* often refers to *Jack* as the '*Professor's Professor*', which is high praise indeed! Articulate in his turn of phrase, *Jack* has a passion for the English language that is immediately evident when speaking with him. In a recent interview with *Chimia*, *Jack* commented that he '*was always interested in literature, and therefore in clear expression*'. In a nutshell, *Jack* is the perfect role model for younger scientists to emulate (*Fig. 3*).

Fig. 3. *Thesis defence of* C. Sparr, *17th August* 2012, at the ETH. Left to right, *Jack Dunitz*, *W. Bernd Schweizer*, *Christof Sparr*, and *Ryan Gilmour*.

Jack often refers to his time at Caltech as the '*Golden Age*'. Those of us, who have had the privilege of working with *Jack*, hold this time in equally high regard. On this special occasion, we wish our dear friend and mentor, the '*professor's professor*', *Jack Dunitz* a very happy 90th birthday with continued good health and happiness for many years to come!

Fig. 4. Jack *and* Barbara Dunitz (Restaurant Pfannenstiel, Zurich, August 2012)