

Editorial

The Life and Work of Josef Rudinger

Abstract: The life and work of Josef Rudinger (1924–1975), a key figure in the history of peptide science, are outlined. Copyright © 2004 European Peptide Society and John Wiley & Sons, Ltd.

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Josef Rudinger was a charismatic genius who made wide-ranging contributions to peptide science. By convening the Prague 1958 *Symposium on Methods of Peptide Synthesis* (EPS-1) he began the movement from which the European Peptide Society and indeed the whole worldwide network of Peptide Societies grew.

There were obituary notices in German [1] and English [2] shortly after his death, as well as detailed reflections in English [3–5] which were published later in the proceedings of two symposia. A moving funeral eulogy by Robert Schwyzer survives in the ETH Zürich Archives. And there was an appreciation

in Czech marking what would have been Rudinger's 75th birthday [6]. But there is no readily accessible complete account of his life and work in any language. This is an attempt to remedy that deficiency, on the occasion of EPS-28, which is to be under joint Israeli–Czech auspices, in a free and vigorous Prague for which he would have been profoundly grateful.

BIOGRAPHICAL

Josef Rudinger was born on 20 April 1924 in Jerusalem, probably in the American Hospital, like his elder sister and only sibling Chitra.¹ Their parents, Zdeněk alias Zdenko Rudinger,² a Czech Jew, and Lisa his Austrian (but not Jewish) wife,³

Appendix notes with biographical information about key figures are indicated with numeral superscripts eg.¹ References are indicated eg [1] in the usual way.



Zdenko and Lisa Rudinger, October 1920.

were working on Kibbutz Beit Alpha, by Mount Gilboa in Northern Israel.

Josef Rudinger was a remarkable child of remarkable parents, and I make no apology for digressing to put them on record. Both had some agricultural training before joining the Kibbutz. Lisa was sent to England before the Great War to complete her education, and studied agriculture at what is now the University of Reading, moving the while in Fabian circles which nourished her feminist socialism. She left England hastily in 1915. Wartime paranoia had put her under suspicion of spying, because she had been seen out with binoculars. A keen horsewoman, she had actually been watching racehorses training. She continued her agricultural studies after the War at Bad Liebwerda (Lázně Libverda) in Northern Bohemia, and there met Zdenko, a dashing Zionist who had served in the Hapsburg imperial army on the Italian front.

Zdenko moved from the Kibbutz to be an administrator in the Tel Aviv building industry, but he had recurrent malaria, and his Zionist enthusiasm waned. So he took his family back to Czechoslovakia in 1927. There he was first a middle-level administrator in the plastics industry, moving into porcelain and then glass, as a cartel director. For a couple of years they were at Karlsbad (Karlov Vary) in the Sudeten area, near the deposits from which the porcelain industry sprang, but otherwise they lived in Prague, where Josef attended the Gymnazium in Truhlářská Ulice, a few minutes' walk from the family apartment, Biskupský Dvůr



Josef, Zdenko and Chitra Rudinger, Balaton-Lelle, Hungary 1936.

1, close to the centre of the City, looking out on the ancient Church of St Peter.

Lisa joined the Communist Party (secretly, it would have damned Zdenko's employability



The apartment where the Rudinger family lived before the War, 2003.

otherwise) in the late thirties. She became deeply involved in organizing the emigration to England of those in flight and fear: Jews of all ages, and political refugees, especially Social Democrat Sudeten Germans, who had fled Hitler and were desperate to get out of Czechoslovakia before it was overwhelmed — as many expected it would be before long. This brought Lisa into close collaboration and friendship with the English Quaker cousins Tessa⁴ and Jean⁵ Rowntree, who were in Prague with other volunteers, many of them English women, helping refugees [7,8]. Their activities were within the law, but they constantly sailed close to a dangerous wind, procuring papers, arranging temporary shelter, sponsors in England, and so on. Under the leadership of Doreen Warriner,⁶ they represented the conscience of a country with a government whose weak foreign policy was partly to blame for the plight of the refugees.

Many years later, Jean Rowntree remembered Lisa as 'a Communist in a very open trenchant, salty and honest way ... the best ally we could have had', teaching professional people to make themselves employable by passing themselves off as domestic servants, acting as interpreter and so on; 'one of the toughest, kindest people I have known' [9].

Tessa Rowntree's European adventure had begun as a plan for an extended break from social work in London, to explore the Danube by canoe. She was in Heidelberg when the German army marched into Austria on 12 March 1938. The Anschluss deflected her into Quaker-led humanitarian work almost casually, and by the autumn she was in Prague. That winter, with the confidence that a courageous spirit and a British passport gave, she escorted two large groups of endangered men across neutral Poland to pick up ships for England.

As the Nazi grip tightened in the spring of 1939, Tessa urged Lisa and Zdenko at least to send their children to safety. And so Josef was taken across Germany in a party of about sixty children and young people, some of them without proper travel papers, escorted by Tessa Rowntree. This perilous journey took place about a fortnight after Hitler's forces had goosestepped into Prague on 15 March 1939, with the atmosphere getting tenser by the day. The train was searched *en route*, but somehow Tessa cajoled or shamed the Nazi officials into letting all the party continue. Josef had papers, but his fate might well have been sealed if they had been turned back. His strictly limited luggage included a treasured microscope. He was placed at Bootham School in York, a boarding school in



Tessa Rowntree's 1938 Prague Christmas card.

the Quaker tradition where Tessa Rowntree's father Arnold Rowntree was Chairman of the Governors. In the July 1939 edition of the school magazine, Josef is listed as a 'new boy from Prague', in the Middle Senior School, Fox House. His sister Chitra had left Czechoslovakia about a month ahead of him, and, also at the instigation of Tessa Rowntree, been installed at Badminton School near Bristol.

Their parents followed them to England, but exactly how or with what (if any) sponsorship is unclear. But again their exit was legal, after interviews with Nazi officials at which it was suggested that Aryan Lisa could have a quickie divorce and stay. Their property was all made over to German ownership (i.e. confiscated) by the cynical bureaucratic formality of giving power of attorney to a German bank. Lisa worked in a Hull button factory, and then in a cheese factory in the South of England, and later in a London ice-cream factory. Zdenko meanwhile trained and worked as a tool and die-maker in Leeds, and they did not live together again until the last year of the War, when he was recruited by the Czech Government in exile to work

on reconstruction planning and economics. So Josef did not have a parental homebase like his English schoolfriends. When he left Bootham his address was given in the school magazine as Brook House at Thornton-le-Dale near Pickering, which was a Rowntree family house.

Lisa wrote to Tessa Rowntree in 1985, with a mother's pride and pain, to report the foundation of the Josef Rudinger Memorial Lecture:

'Ten years since Joe's tragic death he is still remembered and honoured When you took the fourteen year old boy with you in April 1939 and then cared for him and his further education at Bootham in such a marvellous way would you have thought of his still lasting scientific value? A heartfelt thank goes out to you and your friends again and again'.

And, speaking for both herself and her brother, Chitra wrote to me in 2003:

'Tessa Rowntree was indeed completely central to what became of us. We would have probably got out somewhere, sometime, somehow. But without her we would not have wound up in these superior schools that not only made us feel we belonged, but in large part determined the trajectories of our lives by the superior academic nurturing they gave us'.

Tessa Rowntree's marginal note on the copy of Lisa Rudinger's letter which is preserved in the Archives of Bootham School deflects the credit to Donald Gray [10], the Headmaster, who took a special interest in Rudinger. Gray not only recognized Rudinger's talents, but took him into the bosom of his family for at least one extended stay at their country cottage. It was a time of considerable turmoil for the School, which was evacuated away from the danger of urban bombing to the rural safety of Ampleforth College in September 1939, not returning to York until August 1940. But the upheaval caused little academic disruption, and Rudinger did well. The School had a number of European refugees, and he was only unusual in his brilliance. John Gray remembers that he had 'a soft voice, and a modest kindly gentle disposition' with 'an air of quiet authority' and that he quickly made friends. His English was already very good in 1939, but it is still staggering that he did outstandingly well in Higher School Certificate and Matriculation examinations as well as winning, in open competition, scholarships for his support at university — all only two years after arriving in England as a refugee, and at an age that would have been precocious even for a clever native. If



Josef Rudinger having tea with the Gray family at 'Aumitts', their country cottage at Brandsby near Ampleforth, 1939.

he engaged more than casually in the sport which features so much in the ethos of English public schools, it escaped notice, and he recorded his hobbies for the school magazine as 'Scientific and technical society (Committee), debating (Committee), genetics and chess.'

In Rudinger's second year at Bootham, he worked part-time as a laboratory steward, partly paying his way. The School had a tradition of strength in biology, and there was at that time an outstanding biology master called John Dell,⁷ who suggested to Rudinger that he should take part in an investigation of the genetics of eye-colour characteristics in the fruit fly *Drosophila melanogaster*. This was a serious piece of work, well above the level of an ordinary school project; the original experimental records survive at Bootham, mostly in Rudinger's hand.

Further evidence of a serious early interest in biology is provided by a letter he wrote from Bootham at the end of his first term to an unidentified uncle or family friend:

'Do you remember telling me, that when I am 16 I might start my microbe-hunting job in your Institute? Well I have started it now, though in an utterly different place: here at school we have got wonderfully equipped laboratories, with chemicals, fixing fluids,



Josef Rudinger at his new microscope, Prague 1938.

stains, mounting agents, slides, a good microtome ... and so I have done a few blood-films and helped with a frog's brain, chick-embryos, root-tips for mytosis etc, and I get much more pleasure out of it than the others out of cricket. After December, when I do my matriculation exam and get some more time, I shall take this up seriously, and hope to follow in your steps!' [11].

Rudinger was admitted to King's College Newcastle-upon-Tyne, then an outpost of the University of Durham, in 1941. But at the end of his first academic year there, just a few weeks after his eighteenth birthday, he enlisted in the Czech Army, transferring to the RAF in October 1942. By early 1944 he was a WOP/AG — wireless operator/air



Josef Rudinger in academic dress at Newcastle.

gunner — in the aircrew of 311 Squadron, with the rank of Sergeant. It was a Czech bomber squadron, part of RAF Coastal Command, then based at Predannack in Cornwall, operating against U-boats. As the War in Europe drew to a close, 311 Squadron was transferred to RAF Transport Command, operating flights between the UK and Czechoslovakia. Warrant Officer 788396 Josef Rudinger was discharged with an exemplary record on 21 August 1945.

He resumed his studies at Newcastle, graduating BSc with First Class Honours in Chemistry in 1947. He also secured a postgraduate studentship, which enabled him to stay at Newcastle to work under the supervision of G.R. Clemo FRS [12], the distinguished but somewhat old-fashioned alkaloid chemist who was Head of Department. The records of King's College for the period are sadly defective, but he did not complete a PhD thesis. The work was perhaps unexciting, and there was family and political pressure to return to his homeland.

The Communist Party, of which Zdenko was by now a middle-ranking member, seized power in 1948, and there was for some intellectuals a spirit of optimism and idealistic socialism which Josef shared in, especially with his parents. They had returned to Prague in 1945, and in 1949 he went to live with them in their apartment at Jičínská 10.

In Prague Josef Rudinger joined František Šorm⁸ at the Institute of Chemical Technology, as a member of the section which became the nucleus of the Institute of Organic Chemistry and Biochemistry of the Czechoslovak Academy of Sciences in 1953 [13]. Šorm encouraged Rudinger to take up peptide work, at that time a very small and undeveloped field of which few had recognized the emerging importance, and soon put him in charge of the Peptide Laboratory. Šorm was also no doubt instrumental in his appointment as Editor of *Chem. Listy* and *Coll. Czech. Chem. Comm.*; with the latter he played an important role in 1950–1956 in opening up Czech chemistry to the wider world.

Šorm was a powerful personality and a brilliant scientist who became securely established in the apparatus of the Party and State, but remained an honest pragmatist and meritocrat for whom science and people came before dogma. This was important for Rudinger, who must have been a suspect figure as Stalinist repression set in during the early fifties. He had spent ten formative years in England; worse, his father was a victim of the purges; sacked from his management job in the engineering industry in 1951, in which he had had responsibility for foreign



František Šorm.

deals, Zdenko was arrested in 1952, and in 1954 was convicted of 'treason, sabotage and espionage', sentenced to 21 years in prison and confiscation of property. He was held in miserable conditions, in solitary confinement for long periods, and Josef and Lisa were involved in untiring petitions on his behalf. They were lucky not to lose their apartment, and had to fight to retain such basics as the refrigerator, which the authorities grudgingly accepted had been partly paid for by Josef.

Šorm's stature cast a protective shadow, and in 1956 Rudinger was even awarded (with his colleagues Milan Zaoral and Jan Honzl) a prestigious Klement Gottwald Prize by the State for his oxytocin work. The Prize gave him the opportunity of lodging a protest, and when he was invited as a Gottwald Laureate to a State Dinner, he replied with regrets explaining that arrangements had been made to visit his father in prison [14]. But he accepted the Prize, because it gave him clout. By this time Zdenko's case was under review, but was bogged down by institutional lethargy and reluctance to admit illegality and injustice. Rudinger, appointed by his father to be his spokesman (*důvěrník*), made

strongly worded attacks on his father's behalf in at least two formal letters to the Central Committee of the Czechoslovak Communist Party. In the second of these, he said that in the original investigations and trial:

'gross violations of socialist law occurred, and the sentence — I was myself present at its reading — contained a number of assertions that were untrue or obviously went beyond the facts.'

A Party Commission had begun a review:

'and it was clear even in the initial stages that this was an instance where it was necessary in the interests of justice to re-open the case. Since then, however, the re-investigation has been dragging on endlessly We thought that those who themselves violated socialist law, or who tolerated these violations because it was in their self-interest that the truth continue to be suppressed, would not be able assert their influence in a Party investigation. Unhappily, it turned out that even the Party investigating Commission did not always work consistently in the uncompromising spirit of Marxist truth. . . . it seems that the work of the Commission was influenced by considerations that have nothing to do with an effort to right wrongs as speedily as possible.'

With uncharacteristic ostentation for political effect, he signed himself 'Josef Rudinger, Laureát státní ceny Klementa Gottwalda, Jičínská 10, Praha 12' [15]. This was bold and brave, even for a Gottwald Laureate. Unlike another of his father's supporters, Maria Kreibichová [16], Rudinger did not draw the spite of the Party on himself personally, although it is possible to speculate that his outspoken stand was one of the reasons for the difficulties he had during 1956–7 over arranging EPS-1 (see below).

Zdenko was released in 1958, and fully rehabilitated by the State in 1963, but he never returned to industrial management, working from home as a technical translator. Despite his sufferings at the hands of perverted Communism, the only person his daughter knew 'who had actually read and digested *Das Kapital* from soup to nuts' remained a believer. Vladimir Gut remembered that when he visited the elder Rudingers after 1968 'in connection with transfer of messages between Prague and Zürich', 'I was surprised by a very big portrait of Lenin hanging on the wall, a decoration quite uncommon at that time' [17]. This portrait, which made memorable impact on others too, was quietly spirited away by Lisa after Zdenko died.

Recognition of a common interest in glutamic acid peptides [18,19] prompted Rudinger to write

to Geoffrey Young in 1949, and thus began the formation of a network embracing all the main peptide players in Europe [20]. By 1956, Rudinger was bold enough to float the idea of an international scientific meeting. In the spring of the following year, he described his vision in a letter to Vincent du Vigneaud:⁹

'... we are hoping to hold a colloquium on methods of peptide synthesis in Prague at the beginning of September this year. The main aim is an exchange of practical experience on the various methods at present in use, and their scope and limitations. Perhaps we may get a fair picture of the present state of our "arsenal" of methods that way, and a glimpse of future perspectives. We are hoping to have a meeting on what might be termed a modest international scale, with European workers — both East and West — taking part ' [21].

The 1957 plans ran into difficulties, probably political, and came to nothing, but in 1958 a *Symposium on Methods of Peptide Synthesis* (EPS-1) was convened in Prague with Šorm formally in the Chair, although Rudinger actually ran the show. There were about thirty official participants, but only six from the West and one from the USA: Max Brenner, S. Goldschmidt, D. W. Russell, Theodor Wieland, Erich Wunsch and Geoffrey Young. For the Westerners, entering the realm of Communism was a venture into the unknown, approached with some trepidation, as Max Brenner has described to me:

'I remember our "last meal" at the Austrian border. The Austrian police took down our complete life stories, apparently expecting our probable disappearance. Indeed, crossing the border we rolled directly into a sort of mousetrap, the entry being barred at once, and no exit visible. Somewhat uneasily we presented our papers, including the invitation by the Czechoslovak Academy of Sciences. . . . At once and henceforth we were treated as VIPs, which at that time in that Country meant a great deal. And the meeting turned out to be the beginning of lifelong friendships, of a most fruitful exchange of experience and ideas.' [22]

Nine out of the dozen published contributions were in German, and three in English; the Proceedings [23], which were edited by Rudinger, also included the thorough discussions which took place, verbatim. The agenda was confined to methods of peptide synthesis. Considerable evolution has since taken place in the style, scale and scope of the European and other International Peptide Symposia, but



Max Brenner with Josef Rudinger at EPS-1, Prague 1958.

Prague 1958 is where it all began, through the imagination, initiative and sheer drive of one cosmopolitan Czech.

In the same year as he masterminded EPS-1, Rudinger married Edita Adlerová,¹⁰ herself also a chemist: their daughter Dana was born in 1959. The three generations of Rudingers lived together at Jičínská 10, a spacious apartment by the standards of the time and place, until the mid-sixties, when the grandparents moved into the suburbs.

Around the same time, perhaps under pressure — despite his by now established reputation — to regularize himself professionally by acquiring a doctorate, he wrote a dissertation putting ten years' work in context, and was awarded the degree of DrSc (Chemistry), with simultaneous Habilitation. Submitted in 1960, the thesis was entitled 'Synthesy derivátů a peptidů polyfunkční aminokyselin'. In the Introduction, ever one to give credit where due, he warmly acknowledged Šorm's prescient introduction to such a fruitful field and subsequent guidance, and gave special thanks to his colleagues K. Poduška, M. Zaoral, Z. Pravda and J. Honzl, as well as to Hana Farkašová for assistance over a long period.

He was fortunate in his collaborators throughout his career, and only one of them let him down. Joseph Cort, a left-wing citizen of the USA who

had found a long-term refuge in Prague, worked on the synthesis and pharmacological activity of neurohypophyseal hormone analogues. He seemed to enjoy Rudinger's confidence, and the work he did in Prague has not been brought under explicit doubt, but after Cort returned to the States he perpetrated gross scientific fraud in exactly the same field [24,25].

In the decade following EPS-1, Rudinger was a frequent East-West traveller. He never missed an EPS (EPS-2 Munich 1959, EPS-3 Basel 1960, EPS-4 Moscow 1961, EPS-5 Oxford 1962, EPS-6 Athens 1963, EPS-7 Budapest 1964, EPS-8 The Netherlands 1966, EPS-9 France 1968) and participated in many other conferences. At these meetings he made his command of languages legendary, assisting with multidimensional interpretation in discussion; he was trilingual in Czech, German, English, and also had good Russian. He even learned some Chinese, presumably stimulated by the lengthy visit to China he made in 1957.

The freedom to travel he owed to the Party and Šorm, and his appointment as External Professor of the Technical University of Prague in 1964 must have had the same support. Before electing him to Corresponding Membership in 1965 the Czechoslovak Academy of Sciences reviewed [26] the relationship of his family to the Party, his



Josef Rudinger outside the Prague Institute, about 1965.



The Prague Institute, 2003.

English education and RAF service, and noted the fact that he had a sister in the USA, but accepted that he was a mature and active Party member:

'Byla zůstává vyspělým a aktivním členem strany'. Actually his personal history with the Party had been complex. Shortly after first entering the Party books as a candidate member in 1952, he had lost that status because of his father's arrest, and he did not acquire full Party membership, albeit back-dated to 1953, until Zdenko's rehabilitation in 1963 [27]. A convinced idealistic socialist he certainly was, and he deployed powerful Marxist rhetoric very adroitly on his father's behalf, but it is difficult to swallow that he was ever a sincere member of the Party. Rather, it was probably a necessary pretence.

In 1965 he spent a period as Visiting Professor of Biochemistry at Yale (where he was associated with Joseph Fruton), and he made many shorter trips to the USA in the sixties, meeting with Vincent du Vigneaud several times, also visiting Heinz Valtin at Dartmouth Medical School. He came to England often, and Oxford was always on his itinerary. On an early Oxford visit he happened to be with Geoffrey Young in the Dyson Perrins Laboratory on the day of the annual laboratory photograph, and was invited by the Head of the Laboratory (E. R. H. Jones) to take a seat of honour in the front row with Geoffrey and the senior staff — thus perpetrating a unique confusion in the historical record. Oxford would be glad to claim him, but we have to admit he was only a welcome visitor. At conferences and on his foreign tours he did not seclude himself with the grandees, but gave his time generously to young people starting to make their way in peptide science, and I know there are others like me who, forty years on, still remember his friendliness, his enthusiasm, the freely dispensed ideas, and above all the encouragement of being taken seriously by an obviously great but nevertheless unpretentious man. He was a star, but without the usual taints of stardom.

No surprise, then, to read in a letter to Šorm from the Master of Davenport College, where Rudinger stayed during his extended 1965 visit to Yale: 'It is relatively seldom that a Guest Fellow comes to be well known among the undergraduates, but in Professor Rudinger's case he has very definitely made a place for himself with the young men in all fields of learning. His interest in the undergraduates and their appreciation of him has been most unusual and of enormous benefit to us all.' [28].

A travelling salesman of peptide chemistry, someone has called him. Honey bee would be a more dignified simile, perhaps; he was a great



Josef, Edita and Dana Rudinger, about 1965.

cross-fertilizer. And it was not only ideas that he moved through the Iron Curtain, but rats. Rats with hereditary hypothalamic diabetes insipidus, Brattleboro rats, to be more specific. Discovered in 1961, this strain of rat drinks and excretes vast amounts of water, an abnormality which can be corrected by the administration of vasopressin, making it a valuable experimental system. Rudinger was responsible for introducing these rats to the

Eastern bloc in 1965 — by no means as simple an operation as it sounds, given their relative delicacy and the long haul flights involved. In 1965 he took several of them with him from Hanover New Hampshire, to launch them on a journey via Boston and New Haven to New York, and thence to Prague by Air India. He reported from New Haven to Heinz Valtin in Hanover: 'So far so good. We had ... an uneventful journey back, and I trust I can say the

same on behalf of the rats. They seem cheerful enough to me, though I am a layman as far as rat psychology is concerned'. A 'Prague branch', as he called it, was soon established and from it the strain spread to laboratories in Central Europe and as far east as Siberia [29].

Hard-line Communism faltered and wilted in Czechoslovakia in the later sixties, with an eruption of free discussion and political debate in early 1968 when Alexander Dubček came to power; the phenomenon of the 'Prague Spring' [30]. Rudinger welcomed this, but recognized the fragility of the liberalization which began to take place, and feared that the headlong rate of change would lead to a crash. It did, and the Soviet leadership, alarmed by counter-revolution on their doorstep, sent in an invasion coalition of 165 000 troops and 4600 tanks during the night of 20–21 August. Within a week, a force of around half a million men dominated the scene.

The occupation ended Rudinger's Prague career. He described the next few weeks in a letter written to his friend Murray Goodman from the ETH in Zürich in October:

'After living through two weeks which were both harrowing and exhilarating following on August 21, I drove to Yugoslavia, collected Edita and Dana who were on vacation there and came here following an invitation from Robert Schwyzer to spend a year here as visiting professor. The Academy has given its blessing to this arrangement by granting me a year's leave of absence



The ETH Zürich Hönggerberg Institute, 1970.

and this enables me to keep in touch with the lab at home and also to postpone any final decision about the future. If things improve (though at the moment there is no sign that they might) we want to return; but if things go from bad to worse I would probably look for a job here or in England for preference. It is a very hard decision to make after all these years and perhaps even more difficult in this situation than ever before. Karel Bláha¹¹ was in Sweden with his family when it happened but returned just about the time I left. He is in charge of the group in my absence and we are in lively correspondence' [31].

He wrote similarly to Fruton in December:

'The Academy has given me a year's leave of absence, so we are fully "legal" and can also keep in touch with friends and colleagues at home, including my lab and its work. My mother has visited us in October and we expect my father tomorrow. However, the future remains unclear. If things improve we would of course want to return home; if not, we may stay here — we are putting off a decision as long as we can. If we stay abroad we would probably prefer England or Switzerland though there has been one tentative offer from the U.S. which may be so good in terms of facilities that if it is made serious we might be tempted.' [32].

Rudinger's departure was legal — the borders were open and his travel documents were in order — but it was furtive. Although he spoke with Šorm on the eve of his exit, he gave another close friend no hint that he was about to leave; to yet another he remarked prophetically that he could not wait another twenty years. The leave of absence which Šorm swiftly gave [33], in response to a formal proposal from Schwyzer that Rudinger should be a one-year Visiting Professor in Zürich, has all the appearances of collusion, thinly veiled. An informal private standing invitation had in fact been made five years previously when Schwyzer had visited Prague and had frank discussions with both Rudinger and Šorm [34].

It is remarkable that Šorm himself not only stayed put, but was to keep his place for the time being, despite a vigorous open letter of protest he wrote as Academy President to Comrade President Keldysh of the Soviet Union Academy [35]: 'Our people have received the occupation with shock and indignation, and reject this violent act', he wrote, four days after the invasion. 'The occupation has gravely lamed our science. The building of the Czechoslovak Academy of Sciences, in which you were a guest of honour, has been groundlessly occupied by Soviet personnel.

Members of the academy and staff present were expelled out of it under points of guns I urge you to use your influence so that our country will be free from occupation and that it can independently build socialism'. Note the repeated use of the word "occupation" — the absurd official Soviet line was that the troops were there by invitation to help with local difficulties.

The overwhelming military presence did not lead to an immediate normalization — the partyspeak euphemism for resumption of repression — and there was a year or so during which it seemed that some way of shaping the liberalizing passion of the people within an acceptable Communist framework would be found. In this period Rudinger actually returned to Prague once, but it does not seem that he ever seriously considered going back for good, and was even then hoping for his leave to be extended. In June 1969 he wrote to Hans-Dieter Jakubke [36] 'Vor kurzem war Bláha zwei Tage hier, und, wie Du vielleicht wissen wirst, war ich nach Ostern zuhause. Mein Urlaub und die Gast-Professur — sollen um ein Jahr verlängert werden.'. Eastertide 1969 was the last time he was 'zuhause', literally 'at home', a revealing choice of word perhaps.

The grip of authoritarianism tightened, Dubček was ousted, Šorm's position weakened, and formal recalls were sent to Academy scientists who had taken refuge abroad [37]. Rudinger's deadline for return was the end of March 1970; he was dismissed in April [38] and expelled from the Academy on government orders in June [39]. He was also sentenced to three years in prison for illegal residence abroad. In 1972 his name was struck out of the register of Gottwald Laureates [40]. Šorm himself was increasingly marginalized and removed from his offices, but never lost his moral authority in the scientific community. It is not often that academic dedications can be construed so powerfully as one which appears on a *Helv. Chim. Acta* paper Rudinger published from Zürich in 1973: 'This paper is dedicated to Professor František Šorm in respect and gratitude on the occasion of his 60th birthday' [41].

Further visits to Prague after April 1970 were out of the question, but channels of communication with former colleagues such as Karel Bláha and Vladimír Gut were found, and Rudinger's mother was able to travel to the West. After her husband and son were both dead 'She wrote a long letter to the Party formally resigning her membership, on the ground that the Party had repeatedly betrayed



Left to right Josef Rudinger, Robert Schwyzer, Herbert Zuber and Kurt Wütrich, about 1972.

its ideals over many years During the last 15 years of her life when her mobility was severely impaired by rheumatoid arthritis, a constant trickle of visiting dissidents and other lapsed communists came and went in her apartment', Na Chodovci 2544, 'showing up there to warm themselves on her vitality, her sturdy refusal to feel sorry for herself, her animated interest in her doings, her beamish satisfaction with small triumphs over the regime'. The apartment was '..... a transfer station in the circulation of samizdat materials, and for the routing of Amnesty International funds for the destitute families of political prisoners, smuggled in by visiting friends from abroad. She also listened to the BBC and the Vienna radio for two solid hours every day — no exceptions — so she could tell all visitors what was REALLY going on.' She also gave free English lessons, free in order to avoid having to report the names of her pupils to the State via the income tax authorities. Although she greatly enjoyed her visits to her American family, she gently refused to go and live in the USA: 'I wouldn't be any use here', she would say, 'There I am helping to keep open windows to the world' [14].

Schwyzzer's proposal to bring Rudinger on to the strength at the ETH met with ready support (particularly from Vladimir Prelog), and he was appointed *Ordinarius ad personam für Molekularbiologie*, i.e. Full Professor, from 1 October 1970. This coincided with the move of the ETH Institute of Molecular Biology and Biophysics to the Hönggerberg campus, and he played a full part in setting it up there. Vladimir

Pliška also joined the Institute in 1970, and in time there were established the Gruppe Rudinger and Gruppe Pliška, working in complementary collaboration as they had before in Prague. In October 1973 Rudinger became Director of the Institute by rotation (*turnusgemäss Institutsvorsteher*). His comment on this was: 'To be invited to give a lecture and share a meal is one thing; to be offered a permanent position and to share space, another.' [42].

If the door had not been open wide in Switzerland, or things had not worked out so well there, Rudinger would have found an appropriate haven in England or the USA with ease. Discretion has left few traces of the moves to recruit him by the English-speaking world, but there were several. One which he may have been unaware of which is on record gives us du Vigneaud's opinion of him:

'In my opinion Dr Joseph [sic] Rudinger would indeed make an excellent Chairman of Biochemistry in your Medical School. He is one of the leaders in peptide chemistry, both from the chemical and biochemical standpoint. He is a man of great breadth of chemical and biochemical knowledge. I have heard him lecture in my own department when I was Professor of Biochemistry at Cornell University Medical College. He is a wonderful lecturer, and I am confident that he is an excellent teacher. He has an extremely pleasing personality, and I have found him to be an inspiring man. From all aspects he is truly a top-flight man' [43].

Emanuel Escher has sent me a telling anecdote about Rudinger as Head of the Institute in Zürich:

There was a 'special lab space on the roof where a man who had probably no olfactory system and appeared to be completely immune not only to stench but also to mess' was working with organosulfur compounds. 'At some point, without telling anybody, he quit and left all his facilities in a dire state of hit and run. During warm days, the unbearable stench invaded the whole ventilation system of the Institute and I presented to Joe a petition of the graduate student body The next day, a hot and muggy summer day, I chanced, during the late afternoon, upon Mario Caviezel, Robert Schwyzer's senior technician. He was drenched in sweat, exhausted and a gas mask dangled from his neck. In the morning, Mario had seen Joe on the roof, all alone with permanganate solution, sponge and gas mask, cleaning up the mess. So Mario went up to help him. Joe had just sent him down from the roof since he thought there was not enough work left for two! Joe took this horrible task on himself, all alone without saying a word to anybody instead of organizing a clean-up party after he found out that the messy postdoc was

gone. Joe was already sick at that time but he did not tell. This was very typical for Joe.'

While based in Zürich, Rudinger travelled in Western countries even more than before; although he never became a Swiss Citizen, the Swiss authorities gave him and his family travel documents in 1970. In the period March 1971 to November 1972 alone he gave lectures in London, San Francisco, Canada, Boston, Cleveland, Liège, Brussels, Giessen, Geneva, Swansea, London again, Denver, Indianapolis, Boston again, Bern and Aachen, as well as making numerous other semi-private scientific visits. He could not attend EPS-12 at Reinhardtsbrunn in the GDR, but he was certainly there in spirit, as many remarked *sotto voce* at the time.

In May 1973 he spent an extended stay in the land of his birth at the Weizmann Institute, and gave a whole course of lectures on peptide hormones there. In 1974 he participated vigorously in EPS-13 at Kyriat Anavim in Israel, but later that year terminal liver cancer was diagnosed. He faced the inevitable with courage, visited the USA for the last time, called close friends to take his leave, received others, and reflected in private several times that he felt as if he was preparing to emigrate for the third and last time; and that he had evaded Nazi and Communist repression, but cancer had got him beat.

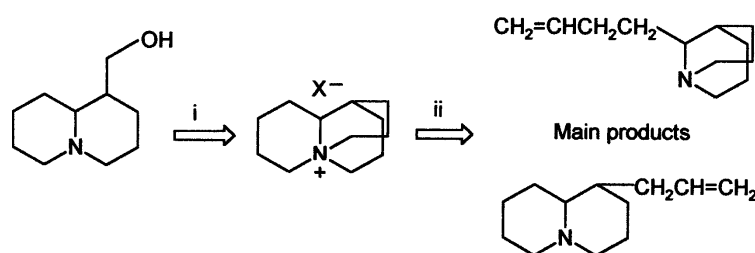
He died in Zürich on 30 April 1975. He had a strong personality, laughing eyes, tolerance, energy, imagination, the gift of friendship, and was a natural leader whose influence in peptide science was worldwide. As Robert Schwyzer said in his eulogy, 'Man sagt er sei tot — aber in uns allen lebt und wirkt er weiter!'

SCIENTIFIC WORK: AN OVERVIEW

A SciFinder Scholar® trawl for Rudinger, J[osef] 1950–1979 scored 210 hits, of which 19 were patents and a handful were posthumous. This is quite a few more than the number of items listed [3] in 1976, but the discrepancy seems to comprise mostly review lectures, minor, or repetitious material. The 1976 list can safely be regarded as practically definitive, even if it is not exhaustive. In any event, it and the database are enough to excuse printing a full bibliography, and only a few of Rudinger's publications will be cited here. Further, it would be an impertinence for me to try and improve on the two magisterial essays [3,4] on Rudinger's science which are available. So all I shall give here is an illustrative overview.

JOSEF RUDINGER'S DEGREES, HONOURS & DISTINCTIONS

CJ Alexander Prize, Bootham School 1941
 Open Entrance Scholarship, Durham University 1941
 Earl Grey Memorial Scholarship, King's College Newcastle 1941
 BSc Dunelm (First Class Honours) 1947
 Johnston Post-graduate Studentship, King's College 1947
 Klement Gottwald State Prize for Science 1956
 DrSc Czechoslovak Academy of Sciences 1961
 Member of the Czechoslovak Academy of Sciences 1965
 Hon. Member of the American Soc. of Biological Chemists 1967
 Medal of the University of Liège 1971
 Josef Rudinger Memorial Lecture, established 1984



Scheme 1 Lupinine derivatives. Stages: i, multistep homologation and terminal activation of the side-chain; ii, Hofmann elimination.

Rudinger's apprenticeship piece, which was largely done in Newcastle but finished off in Prague, involved the conversion of lupinine to tricyclic derivatives and the multi-ambiguous Hofmann degradation of the products; Scheme 1 [44]. The experimental detail, laconically recorded, shows it to have been messy and difficult work, leading to complex mixtures which were only partially resolved. It must have required great skill and patience, and was no doubt a good training ground in the techniques of classical organic chemistry. Experience perhaps which emboldened him for peptide work, which would also have seemed daunting at that time.

The side-chain homologation of lupinine employed lithium aluminium hydride, then a very novel reducing agent, for ester to primary alcohol conversions, and 'Lithal' was an interest of Rudinger's which persisted for several years [e.g. 45], culminating in an exhaustive review in Czech which appeared as a heavyweight volume of 570 pages [46].

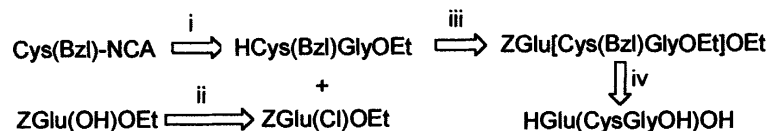
He wrote no other books, but demonstrated his powers of exposition with several wide-ranging reviews in English, on unusual amino acids and abnormal peptides [47], the organic chemistry of peptide synthesis [48] and peptide drug design [49].

His first practical foray into peptide chemistry was an unambiguous synthesis of H₂N[Tyr]OH, Scheme 2 [19], and this work led into the use of CCD, a then very modern technique, to separate $\alpha\gamma$ -Glu derivatives [50], and a synthesis of glutathione, Scheme 3 [51]. Difficulties were experienced with azide coupling side-reactions in the glutathione work, and this stimulated a thorough study, eventually leading to the development of greatly improved azide coupling protocols in non-aqueous solvents, based on diazotisation with nitrosyl chloride, or, preferably, organic nitrites, e.g. Scheme 4. The classic paper by Honzl and Rudinger [52] is probably Rudinger's most cited publication; certainly the former Dyson Perrins Laboratory copy of *Coll. Czech. Chem. Comm.* 1961 is dog-eared and grubby at page 2333.

In late 1953, a few weeks after du Vigneaud's landmark synthesis of oxytocin [53] was announced, Rudinger wrote to him to say that he too [54] was working with TosGlpCl, a key intermediate in the oxytocin synthesis. This contact began a formal but cordial correspondence of twenty years [55] which is a model of the courtesy which scientists on close research trajectories should extend to each other. At the outset du Vigneaud, 52 years



Scheme 2 γ -Glutamyltyrosine synthesis. Stages: i, CH_2N_2 ; ii, NaNO_2 -AcOH-HCl- H_2O , 0°C , Et_2O extraction then TyrOEt-EtOAc., 40% yield; iii, aq, NaOH, then H_2 -Pd(C)-AcOH.



Scheme 3 Glutathione synthesis. Stages: i, GlyOEt-NMP-THF; ii, PCl_5 - Et_2O ; iii, THF; iv, NaOH-aq. EtOH, then Na- NH_3 .



Scheme 4 Honzl-Rudinger azide coupling. Stages: i, HCl-anhydrous THF-BuONO, -20°C , then Et_2O extraction; ii, GlyOEt-EtOAc. 86% yield overall.

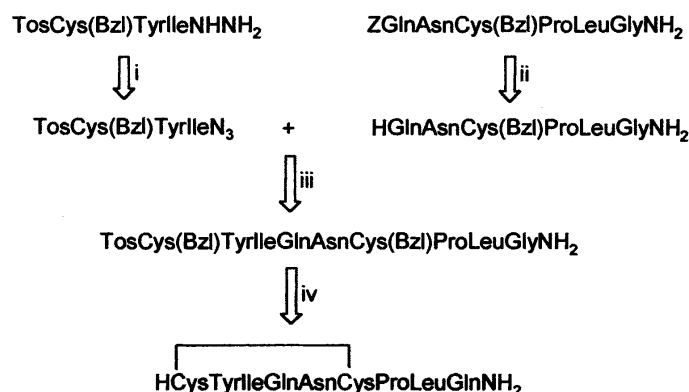
old, already immensely distinguished, and soon to become a Nobel Laureate, might have brushed off the unknown Rudinger, who had not yet had his thirtieth birthday. On the contrary, du Vigneaud welcomed the approach. Thereafter they regularly sent each other reprints and information. A typical exchange, of 1956, is 'Now we should be very sorry to trespass on what is undoubtedly your territory, and I should therefore like to inform you of further work we have done along this line and to inquire your intentions', from Rudinger, to which du Vigneaud replied 'I hope you will go ahead with what you have planned and I wish you the best of success. We here have admired greatly your contribution to this field' [56,57]. Rudinger had entered the neurohypophysial peptide arena himself with an alternative oxytocin synthesis, Scheme 5 [58] in 1956. This synthesis was ideally suited for the preparation of variants with residue substitutions in the *N*-terminal tripeptide region. Twenty years later, a quite different synthesis which was ideally suited for the generation of analogues modified in the *C*-terminal tripeptide was described: Scheme 6 [59]. In between, a very large number of oxytocin analogues was prepared and thoroughly studied. The first Prague oxytocin synthesis was what earned Rudinger, Zaoral and Honzl the State Prize mentioned earlier; it was the departure point for the central research theme of Rudinger's life. It was also the origin of the school of neurohypophysial peptide hormone science which flourishes to this day in Prague.

Three contributions stand out among the many which Rudinger made to oxytocin studies. First,

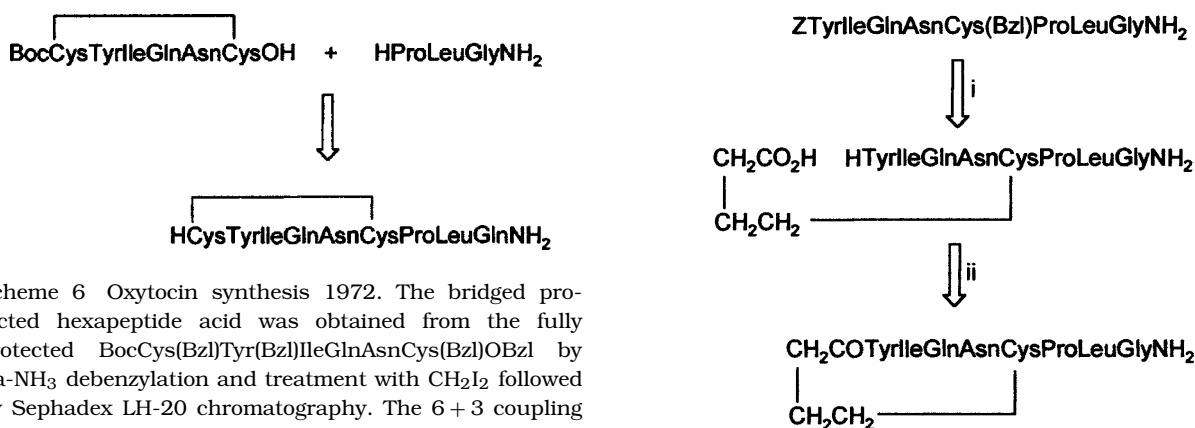
his group showed that the disulphide bridge has conformational rather than functional significance, by synthesis (Scheme 7) of a carba analogue of desaminoxytocin which proved to have oxytocic activity [60,61]; the dicarba analogue of oxytocin synthesized later was also found to be active [61,62], and the same principle was also demonstrated for the intrachain bridge in insulin [63]. Second, they predicted and confirmed the biological activity of neurohypophysial peptide hormone analogues which were unknown in Nature, but which could have been stepping stones from one known hormone to another for evolution: Scheme 8 [64]. Third, it was demonstrated that analogues extended at the *N*-terminal could act as 'hormonogens' [65].

The tosyl protection of Scheme 5 looks a bit dated now, but Rudinger had a long affair with the tosyl-group in amino acid and peptide chemistry, which was the subject of yet another comprehensive review [66]. One of his earliest papers from Prague [54,67] was concerned with the chemistry of TosGlpOH, and one of his last full papers from Zürich [41] was a careful study of the mechanism of Tos-NH cleavage by Na- NH_3 . This last study was, like the azide coupling work already mentioned, carried out in order to give a rational basis for optimization. The published peptide synthesis discussions of the early European Peptide Symposia show him constantly probing mechanistic detail, and in what he called 'stargazing' in 1972, he said:

'I am often shocked to realize to what extent we are still working essentially by rule of thumb, in spite of the highly advanced state of contemporary organic chemistry Normally, the synthetic chemist is of course impatient to get to his product, but I would suggest that occasionally he could save a lot of time by investing a little more of it in systematic study and intellectual effort instead of proceeding by mere empirical experimentation' [68].



Scheme 5 Oxytocin synthesis 1956. Stages: i, NaNO_2 -AcOH-HCl- H_2O , -12°C , then EtOAc extraction; ii, HBr-AcOH then Amberlite IRA 400(OH); iii, DMF; iv, Na-NH₃, then oxidation. Tosyl protection was also used in the run-up to the hexapeptide moiety.

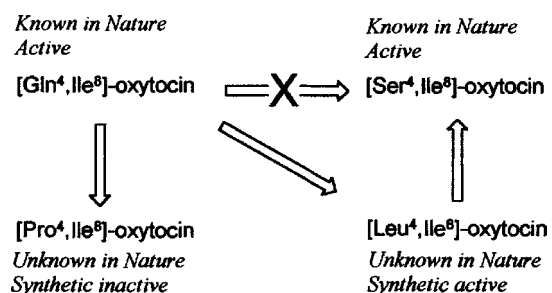


Scheme 6 Oxytocin synthesis 1972. The bridged protected hexapeptide acid was obtained from the fully protected BocCys(Bzl)Tyr(Bzl)IleGlnAsnCys(Bzl)OBzl by Na-NH₃ debenzoylation and treatment with CH_2I_2 followed by Sephadex LH-20 chromatography. The 6 + 3 coupling was performed with DCCI-HOBT-DMF, followed by mixed bed resin treatment (Amberlysts 15 and A-21), and TFA Boc removal.

Further examples of his own contributions to that philosophy are his work on the relative lability of Pht-protection and alkyl esters to alkali [69], and the mechanism of Z-group acidolysis [70,71]. And although he does not seem to have published on the subject, I can testify myself that in the sixties he was taking a very close interest in the detailed physical organic chemistry of acyl-transfer reactions, the core chemistry of peptide synthesis.

The Pht- and Z-cleavage studies just cited both involved rather unusual techniques for an organic chemist to employ — polarography and manometry, respectively. He had the ability to spot where something out of the ordinary could be useful, and also the willingness to embrace the methodology of the moment. A point in his earliest work on lupinine derivatives had been clinched in Prague by IR, which must have seemed pretty trendy then, and later on

Scheme 7 Carba-desaminooxytocin synthesis. Stages: i, Na-NH₃, followed by alkylation with $\text{Bu}^1\text{O}_2\text{C}(\text{CH}_2)_3\text{I}$ and TFA treatment; ii, cyclization with Woodward's Reagent K in DMF.



Scheme 8 $[\text{Leu}^4, \text{Ile}^8]$ -Oxytocin, a stepping stone for evolution. The 4-Pro analogue is no doubt inactive because of conformational disruption.

he moved apparently effortlessly into detailed work with other techniques, including ORD investigations of cyclopeptides with Karel Bláha [72].

Like most leading exponents of classical peptide synthesis, Rudinger was cautious in the early days of SPPS [73], but unlike some of them he was never dismissive. He never took the line that it was somehow a breach of etiquette. Gentlemen, some myopic critics implied, always checked their intermediates, and did not mess about with materials conceived in the shadows. Garland Marshall remembers, with amusement now, how mauled he was by such critics at the Vienna EPS in 1971 when he presented the SPPS of acyl carrier protein, and how reassured he was by Rudinger and Ralph Hirschmann, sages to reckon with, who took a more objective and constructive view [74,75]. Rudinger had begun working with Vladimír Gut on kinetic measurements, which they believed 'can be of assistance in the rational use of the solid-state method', as early as 1966 [76,77]. They contrived to continue to exchange information surreptitiously — 'basically it was illegal' [17] — despite the iron curtain which separated them after 1968, and it was on this subject that Rudinger made his last EPS contribution [78].

To some who knew him, he was a pioneer of structure–activity studies in the field, to others an innovator in synthetic methodology; in either case driven by rationality, not hit-or-miss science. To others he was above all a great interdisciplinary networker. All are right, but in any event we have his own private overview. It is in a remarkable letter [79] he wrote to his mother in 1967, when she was away on holiday in the Alps — remarkable not least because it is in English. After some self-effacing remarks — 'The report you ask from me is very difficult to write ... I have never been good at simple exposition' — he continues:

'... oxytocin and vasopressin are still our daily bread after all this time. Recently we have also ventured into the synthetic insulin field, which is a very new thing, and we have done this in cooperation with people at Aachen (Deutsches Wollforschungsinstitut) who were one of the pioneering groups in the field. We combined their experience with some of our special knowledge and made an insulin analogue which proves a fairly popular theory of insulin action incorrect.

Besides this work on biologically active peptides (in which we do the synthetic work and a good deal of the thinking, and others do the pharmacological, physiological, and clinical work — here in Prague, in London (National Institute for Medical Research), Winnipeg (Cort), Brookhaven (Schwartz), Leningrad (Natočín), and wherever we can find anyone interested) we still work on the chemistry of peptide synthesis,

mainly testing and modifying new synthetic methods or looking at their mechanism to see if a knowledge of this mechanism would help to use them more rationally. Finally, we are interested in the stereochemistry (spatial arrangement) of peptides, mainly cyclic peptides, and the way in which it is determined by their structure and in which in turn it affects their physical and chemical properties; in this work, our peptides should be simple models of proteins and give information, in the long run, about protein function. This last line is going forward rather slowly because it needs expensive physico-chemical apparatus which we are only gradually acquiring and learning to use.

Because of the way in which our interest spread from synthetic organic chemistry and physical chemistry at the one end to clinical physiology at the other we tend to have quite a lot of contacts in the various fields — I am quite often in the well-known position of the man of whom the chemists say "he is presumably a competent biochemist", the biochemists "perhaps he knows something about pharmacology", and the pharmacologist "I believe he is supposed to be an organic chemist". Anyway, it is fun (sometimes).'

Josef Rudinger's career in peptide science lasted only a quarter of a century, and one that was full of personal stress and distraction. But with awesome versatility, range, thoroughness, and consistency of purpose, he achieved a great deal, and mostly described it in English few native British chemists have ever equalled for lucidity.

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I must first thank Drs Edita and Dana Rudinger, and also Professor Chitra Smith (formerly Rudingerová) and her daughter Pat and son Stephen for their cooperation in the preparation of this Memoir.

I am also grateful to Josef Rudinger's friends, colleagues, and others who met him professionally for their recollections and help: Tom Barth, Max Brenner, Alex Eberle, Emanuel Escher, Joseph Fruton, Murray Goodman, Vladimír Gut, John Hawkins, Vadim Ivanov, Hans-Dieter Jakubke, Tom Leplawy, Maurice Manning, David Morris, Vladimír Pliška, Robert Schwyzer, Bob Sheppard, Heinz Valtin, Geoffrey Young and Milan Zaoral. The readiness with which they all responded is in itself a testimony to the esteem in which his memory is held. Max Brenner and Vladimír Pliška freely gave permission for use of their 1976 appreciations [3,4].

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The responsibility for all omissions and errors of fact or judgement is of course entirely mine.

Much of the rich material I collected on Josef Rudinger's life, and on those of his parents and Tessa Rowntree, and on the wider scene, is used but indirectly here. I have only cited sources specifically on key matters. It was an evocative and humbling experience searching for scraps of information about his life and attempting to place them in context. He lived in a period which was cruel and turbulent, and some of my correspondents probed painful memories. One Prague friend, not named above, shall have the last word: his reflective letter on Czech affairs 1930–1990 concluded 'All is very deeply in our souls'.

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APPENDIX: BIOGRAPHICAL NOTES ON KEY FIGURES

Where a reasonably full and accessible biography has been published (as in the cases of G.R. Clemons and Donald Gray), it is simply cited in the text in the usual way. It has been assumed that readers of this Journal do not need to be informed about the luminaries of peptide science mentioned who were happily still flourishing when I wrote this Memoir.

1. Chitra Maria Rudingerová, b. 16 Dec. 1922, Jerusalem. Educ. Badminton School and St Hilda's College Oxford. m. Bruce L. Smith about 1946. Faculty member, James Madison College MSU from 1968; subsequently also Associate Director Honors College MSU. Retired 1987. Living in Michigan 2003.
2. Zdeněk Rudinger, b. 16 June 1898, Pilsen, son of Vítěslav (alias Siegfried) and Eugenie Rudinger (b.1868, died in Theresienstadt). Known in family circles as Zdenko. Died 3 September 1969, Prague.
3. Elisabeth Wilhelmina Augusta Gerber von Zabernberg, b. 18 July 1894, Salgo Tarjan, Hungary, daughter of Friedrich Gerber and Marie Gerber (née Herber). Diploma in Agriculture, University College Reading, UK 1914. Known as Lisa Gerber from about age 18. m. about 1920, then known as Lisa Rudinger or Rudingerová [Alžběta Rudingerová]. Died 1 March 1987, Prague.
4. Elisabeth H. Rowntree, familiarly known as Tessa, b. 28 May 1909, York. Educ. The Mount School and LSE. m. John W Cadbury 1942. Died in the USA 30 September 1999. The Imperial War Museum has a series of autobiographical tapes recorded in 1994: IWM 14205; Haverford College Library has her family correspondence in MS.Coll.1172. Obituary: *The Burlington County Times* (New Jersey), October 1999. See

- also Oldfield S., *Women Humanitarians: A Biographical Dictionary of British Women Active between 1900 and 1950*, London 2001.
5. Jean Rowntree, b. 8 November 1905, England. Educ. The Mount School and Somerville College Oxford. Died 16 January 2003. Obituary: *The Guardian*, 15 March 2003.
 6. Doreen Warriner, b. 16 March 1904. Educ. Malvern Girls' College and St Hugh's College Oxford. Died 1 July 1972. See Oldfield S., *Women Humanitarians: A Biographical Dictionary of British Women Active between 1900 and 1950*, London 2001.
 7. John A. Dell, b. 1881; Biology Master Bootham School 1912–1942. Obituary: *Bootham* [School Magazine] 1964; **29**(2) p86.
 8. František Šorm, b. 28 February 1913. President of the Czechoslovak Academy of Sciences 1962–1969. Died 18 November 1980. See Garfield E, The restoration of František Šorm *Current Comments* 1992;**15**: 51–56 and Jindra J, 'František Šorm - závěr politické kariéry', in *Česká věda a Pražské jaro* (1963–1970), Zilyská B, Svobodný P (eds), Prague 2001; 135–157. Obituary: Barton D, Djerassi C Lederer E: *Tetrahedron* 1982; **38**: 2223–2224.
 9. Vincent du Vigneaud, b. 18 May 1901, Chicago. Nobel Prize for Chemistry 1955. Died 1978.
 10. Edita Adlerová, b. 29 November 1920, Tekovské Lužany South Slovakia (annexed to Hungary 1938). Deported to Auschwitz when the Germans invaded; after the War studied organic chemistry in Prague, and worked at the Research Institute of Pharmacy and Biochemistry until 1968. Living in Zürich 2003.
 11. Karel Bláha, b. 29 July 1927, Pilsen. Graduated from the Technical University of Prague 1949, and worked with Rudolph Lukeš; co-worker and eventual successor of Josef Rudinger from 1960 in the Peptide Laboratory of the Institute of Organic Chemistry and Biochemistry of the Czechoslovak Academy of Sciences; Head of the Department of Organic Chemistry 1982. Died 28 August 1987. Obituary: in *Peptides 1988*, Jung G, Bayer E (eds), Berlin 1989, pp xvii–xix.