

Richard Klemen, the First Lecturer of Enzymology at the University of Ljubljana

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Abstract

Richard Klemen was the first teacher of enzymology at the University of Ljubljana. His early career in Ljubljana ended in January 1942 when he moved to Vienna, Austria. During the war he conducted experiments that led him to describe the so-called Hofmann-Klemen effect in clay. Later he was a research assistant and titular associate professor in the field of biochemical technology at the Vienna Technical University and finally a lecturer at the University of Natural Resources in Vienna. His life is an interesting example of a scientist and educator whose Gottscheer German origin would probably prevent him from continuing his career in post-war Yugoslavia. At the same time, he did not achieve in Austria the positions and status that his former colleagues and students had achieved in Slovenia. Although he was almost forgotten, he remains important as the first trained enzymologist and teacher of enzymology in Slovenia. This article also presents his full bibliography.

Keywords: enzymology education; University of Ljubljana; biochemistry

1. Introduction

Since its foundation in 1919, the University of Ljubljana (UL), Slovenia, has offered the study of chemistry. The first appointed professor of chemistry was Maks Samec (1881–1964), who graduated from the University of Vienna, Austria, in 1904. He was a versatile researcher with broad interests, who after joining UL concentrated on the study of biological polymers, mainly starch. The major part of this research today would fit into the field of physical chemistry, but also analytical, organic chemistry and biochemistry.

A hallmark of the first decades of chemical education at the University of Ljubljana was the duality of an academically-oriented and a technically-oriented chemistry programme, which were essentially divided between the Faculty of Arts (Slov.: Filozofska fakulteta) and the Faculty of Technical Sciences (Slov.: Tehniška fakulteta). This duality probably reflects the arrangement of chemistry studies in Vienna at the time, as chemistry courses were offered by both the University of Vienna and Vienna College of Technology (Ger.: Technische Hochschule; later Vienna University of Technology, TU Wien).

With the expansion of the understanding of enzyme function and structure in the late 1920s, it became clear

that a course on enzyme chemistry should be included in the chemistry curriculum of the University of Ljubljana. At about the same time, as Slovenia was still largely dependent on its own agriculture, the need arose to impart specific knowledge about agricultural chemistry.

It is remarkable that the development of biochemistry as an independent scientific discipline is even reflected in educational guidelines at the state level. Biochemical content in higher education has been officially requested by the General University Decree¹ (Slov.: Obča univerzitetna uredba) of 1932, which prescribed the organisation of state universities in the Kingdom of Yugoslavia. In this decree, 35 chairs were defined for the faculties of the arts, including a chair in chemistry (Article 96). It should cover topics of inorganic, organic and physical chemistry as well as biochemistry. For the faculties of agriculture and forestry (Article 102), agricultural chemistry was prescribed, among other fields. At that time the University of Ljubljana did not yet have a faculty specifically devoted to agriculture, which probably played an important role in the decision to include agrochemistry in the chemistry programme of the Faculty of Technical Sciences.

A pioneering role in biochemistry education in Slovenia belongs to Richard Klemen, one of the early students of Maks Samec. Klemen was the first lecturer in enzymol-

ogy and agricultural chemistry in Slovenia. The circumstances led him to move from Ljubljana to Vienna, where he was actively involved in biochemical and food technology research and teaching. Nevertheless, his work and career are almost forgotten, both in Slovenia and in Austria, where he spent most of his life.

2. Training and First Employment of Richard Klemen

Richard Klemen belonged to the German minority in Slovenia, the so-called Gottcheers (Slov.: Kočevjarji). Since the 14th century they were settled in about 170 villages in the wooded south of Slovenia, with the town of Gottchee (Slov.: Kočevje) as their cultural and administrative centre. Richard's parents lived in Tschermoschnitz (Slov.: Črmošnjice), where Richard was born on 24 January 1902 and where he attended primary school. At the age of 10 he enrolled at a grammar school in Ljubljana² (Ger.: Kaiserlich-königliche Staats-Oberrealschule, Slov.: Cesarско-kraljeva državna višja realka; Engl.: Imperial and royal secondary school) with German as the school language. He was an excellent student who in July 1920 graduated from the Realschule with distinction³. This falls into the post-war period, when the Austro-Hungarian Empire was dissolved and a new state – the Kingdom of Serbs, Croats and Slovenes – was founded. Accordingly, the language of school education changed from German to Slovenian.

At the age of 18, Richard Klemen was enrolled with the second generation of chemistry students (1920) at the newly founded University of Ljubljana (UL). He graduated on 18 July 1925 with an engineering degree (B. Eng.) in chemistry and was thus the 8th student to complete chemistry studies at the University of Ljubljana. The diploma thesis, which he completed under the mentorship of Maks Samec, dealt with the staining of starch with iodine⁴. The results of this work were published by Maks Samec in *Kolloidchemische Beihefte* shortly afterwards⁵.

In 1925/26 Richard Klemen attended a military school for reserve officers in Maribor where he spent 8 months. After completion, he was ranked as second lieutenant in reserve pioneer troops. Immediately thereafter, he returned to Ljubljana to join the group of Maks Samec at the University of Ljubljana as a research assistant, but only for a relatively short period (1 July 1926 to 31 May 1927). This is certainly a consequence of the university's financial problems and years of discussions with the Belgrade administration about the need to maintain a technology-oriented faculty in Ljubljana⁶. Namely, for the last two months at the university, he had to agree to work as laboratory operator for a considerably lower salary.

Richard Klemen appeared on the list of members of the newly-established Yugoslav Chemical Society⁷, with his home address Črmošnjice near Semič, Dolenjska region, not the university address as would be expected for

a faculty member. In the years 1927–29 Klemen worked as an expert in a sugar factory in North Croatia. In the first edition of the *Index Biologorum* almanac⁸, Richard Klemen was listed as an assistant to Professor Samec at the UL Institute of Chemistry, working in the field of physical chemistry, but this probably reflected his status in mid-1927.

3. Klemen's Connection to Agrochemistry

A part of the Klemen family lived in Gonobitz (after 1918: Konjice, today Slovenske Konjice) in northern Slovenia, where Richard's uncle Ferdinand was town councillor, deputy mayor and mayor in several mandates. He was one of the pro-German local politicians⁹. Richard was very close to his uncle Ferdinand and they visited regularly. In addition, Richard's parents bought a considerable plot of land with vines in a place named Škalce not far from the town of Gonobitz as early as 1900. Apparently the funds for the purchase of vineyards came from wood sold from forests in South Slovenia that were premarital assets of Richard's mother Maria. They still owned a farm in Tschermoschnitz and a vineyard in the Bela Krajina region, and Richard's father Franz was a merchant who, anecdotally, represented the Bavarian coffee substitute factory Kathreiner in the Duchy of Carniola, so that the family could be regarded as well-off (Ulrich Klemen, personal communication).

The connection to family and land in Gonobitz could be the reason Richard was attracted to agriculture. His stage in the state sugar factory in Beli Manastir (September 1927 to January 1929) was the first obvious step in this direction, followed by employment (in 1929) at the agricultural experimental and control station in Maribor (Slov.: Laboratorij državne poskusne in kontrolne postaje v Mariboru) where he held an assistant position. It was during his Maribor stage that he was also adjunct professor (Slov.: pomožni učitelj) of chemistry with agricultural chemistry¹⁰ at the winemaking and fruit-growing secondary school (Slov.: Vinarska in sadjarska šola v Mariboru).

In addition to the routine work in the agricultural station, Klemen was also interested in the basic and applied chemistry. In 1930 his first professional article appeared in the Austrian journal *Das Weinland*. The subject of the article¹¹ was a comparative chemical analysis of the leaves of selected grape varieties. His work mainly referred to some earlier publications by German and French authors who suggested that the nutritional status of vines could be determined quantitatively by chemical analysis of individual leaves. Klemen has improved this approach by combining three leaves per vine and determining the average values for the chemical composition. Soil samples were analysed for comparison. Klemen discovered no obvious difference between well- and poorly-fed vines from the Maribor and Konjice vineyards, respectively. The elemental analysis of

the vine leaves did not seem to be prognostic for the condition of the vines, and the analysis of the soil could indicate the condition of the vines much better.

4. Doctorate and Habilitation

After years of financial crisis and the uncertainty to keep the Faculty of Technical Sciences as a constitutive part of the University of Ljubljana, a new law on universities was passed in 1930, according to which all faculties at the then renamed University King Alexander I in Ljubljana were retained⁶. This could be one of the reasons for Klemen's return to the faculty (Figure 1), where he worked as a teaching assistant between 1930 and 1933. His first research topic in Ljubljana had nothing to do with his other scientific activities. He worked with his colleague Janko Kavčič (a future professor of inorganic chemical technology) on a study of coal from various Slovenian mines. The aim of this study was to determine



Figure 1: Identity photograph of Richard Klemen from 1930. Photographed from his civil servant folder from University of Ljubljana Archives with permission.

which coal was best suited for heating in the so-called Celus heaters and what is the best practice for heating different types of coal¹².

Richard Klemen concluded his doctoral studies on 8 October 1931 with a dissertation on the characterisation of individual starches in connection with their systematization into groups¹³ under the mentorship of Maks Samec. In the same year, Samec and Klemen published an article in the journal *Kolloid-Beihefte* in which they described properties of different starch types¹⁴ which obviously summarized the results of the doctoral thesis.

From May 1931 until June 1932 Richard Klemen was a visiting scholar in Prague, Czechoslovakia, in the group of Ernst Waldschmidt-Leitz. He was a productive German enzymologist who graduated in Munich in 1920 under the supervision of Richard Willstätter (1915 Nobel Prize Laureate). Waldschmidt-Leitz wrote a book¹⁵ on enzyme activity and properties as early as 1926, which was one of the first extensive monographs on enzymes. In 1927 Waldschmidt-Leitz became head of the Institute of Biochemistry in the German Technical College (Ger.: Deutsche Technische Hochschule) in Prague where his research on various enzymes and their substrates continued.

In Ljubljana, Maks Samec's interest in enzymes may have increased as a result of working with Waldschmidt-Leitz, with whom he published the first paper on the enzymatic degradation of starch in 1931. In addition, colloid chemistry, which was at the forefront of chemical research in Ljubljana, was considered to be closely related to enzyme chemistry¹⁶. The fact that the 1929 Nobel Prize for chemistry was awarded to Arthur Harden and Hans von Euler-Chelpin for their investigations of fermentative enzymes could be important as well. On the part of UL, starch degradation by enzymes was first investigated by Zvonimir Čanić as part of his B. Eng. degree¹⁷, for which the experiments were carried out in the Waldschmidt-Leitz laboratory in Prague. Next, Richard Klemen joined the Czech group to complete his postdoctoral training in enzymatic techniques. It is easy to see that one year in Prague paved Klemen's way to enzymes, which he studied over the next almost 10 years.

On 20 November 1931 Richard Klemen was appointed a Privatdozent for colloid chemistry and enzyme chemistry at the Faculty of Technical Sciences in Ljubljana (Fig. 2), and on 29 March 1933, by a royal decree, a University Assistant Professor of chemical technology. He appeared in 1934 in the compendium on Education in the Drava Banate (Slov.: Dravska banovina; the administrative province of the Kingdom of Yugoslavia, to which Slovenia largely belonged between 1929 and 1941) as university assistant professor at the Faculty of Technical Sciences responsible for 'agricultural chemistry and work instructions in the analytical and physical laboratory'¹⁸. It was not until 27 February 1936 that he was appointed honorary lecturer at the Faculty of Arts, although he held lectures and practical courses for students of this faculty since 1934.

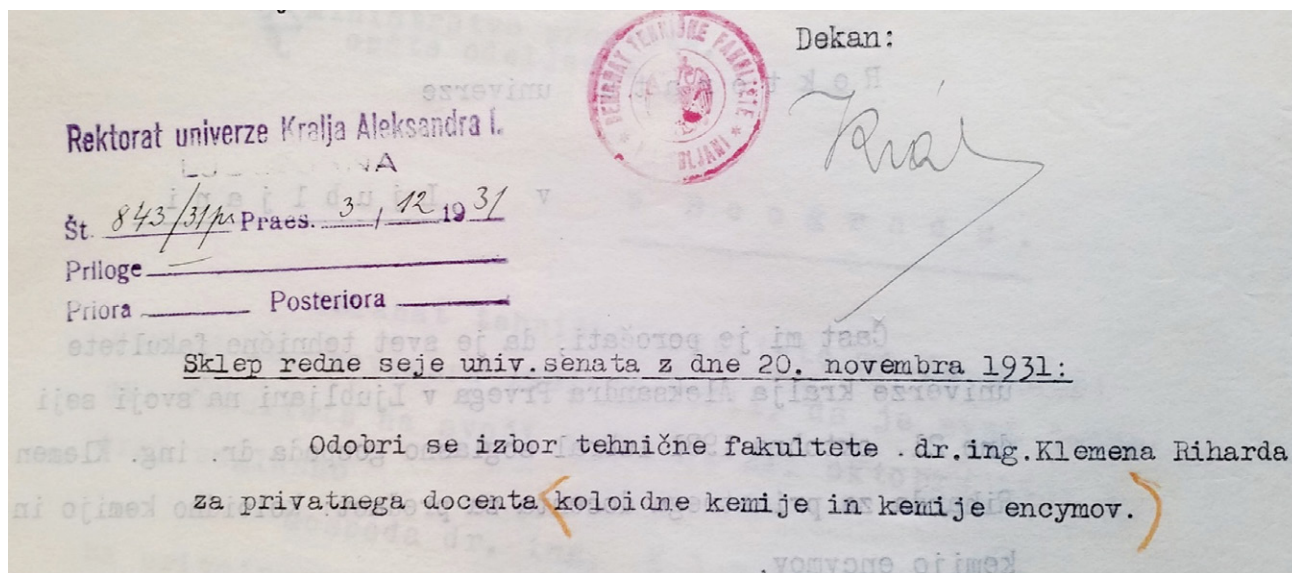


Figure 2: Decision of the university senate dated 20 November 1931 approving election of Richard Klemen as Privatdozent for colloid chemistry and enzyme chemistry at the Faculty of Technical Sciences. Photographed from civil servant folder preserved at the University of Ljubljana Archives with permission.

At first, Richard Klemen continued to supervise students who were completing their degrees under the mentorship of professor Maks Samec, but soon he took on some practical and his own theoretical courses. In Table 1, Klemen's tasks per semester are summarized for the period 1933 to 1942.

Interestingly, Richard Klemen was leading several practical courses in the analytical laboratory, which was located in the premises of the 1st State Real Gymnasium (essentially the same school he attended from the age of ten to eighteen), which housed several chemical laboratories that belonged to the Faculty of Technical Sciences in the basement. Faculty actually arranged laboratories in this building in the year Richard completed his secondary education, so that this might have played a role in the choice of chemistry studies.

As shown in Table 1, enzymology has been part of chemical education at the University of Ljubljana since 1933. In the first three years of Klemen's teaching there seems to have been little interest in the Chemistry of Ferments course, as neither the time nor the place were fixed in the course description. The same applied to his newly established course on Agricultural Chemistry.

Klemen's teaching and research initially remained largely associated with starch, but soon turned to enzyme biochemistry, as his published works show. He was a co-mentor (mentor M. Samec) for the B.Eng. dissertation by Anton Tepež on pancreatic amylolysis²⁰, the results of which were published in the journal of the Yugoslav Chemical Society under the authorship of M. Samec and R. Klemen (1934) under the title A trisaccharide observed in pancreatic amylolysis of erythroamyloses²¹. Although

today obsolete, the starch subspecies were divided in the 1930s into amyloamylose and erythroamylose, based on iodine staining²².

In the mid-1930s there was a gap in the published articles, but from 1938 the publications began to take on a new dynamic. Klemen's next article came from the field of analytical biochemistry and appeared in 1938 in the journal *Biochemische Zeitschrift*. It dealt with influence of nitrogenous compounds on the determination of maltose by two established methods²³. This work was also presented at the natural science conference in Ljubljana in February 1938 and published in conference proceedings²⁴ a year later in Slovenian language.

In continuing his early work on amylolysis with the help of his student Dušan Stucin, whom he supervised for his B.Eng. dissertation entitled Contribution to kinetics of amylolysis in wheat autolysates²⁵, an accompanying work on yeast autolysates was published²⁶ in *Biochemische Zeitschrift* in 1939. Another enzymes-related contribution from the late 1930s was Klemen's supervision of a B.Eng. thesis of Karel Andreč on amylase²⁷.

In memory of the work of the late Johan Rudolf Katz (1880–1938), an important Dutch colloid chemist, a special edition of *Kolloid-Beihefte* was published in March 1939. In this issue an article appeared²⁸ which contained results of Richard Klemen and Zvonimir Čanić. A detailed analysis of the temporal changes (aging) of the starch solution was described in this paper. The collaboration with J. R. Katz probably begun in early 1930s, since in 1932 a joint article²⁹ with M. Samec appeared in the January issue of the *Zeitschrift für physikalische Chemie*, followed by three further articles in the following years.

Richard Klemen not only worked as a university teacher. In 1939 he co-authored two textbooks^{30,31} on mineralogy and chemistry for secondary schools (3rd and 4th grade) together with Vladimir Žitko, another former student of Maks Samec initially working on starch chemistry who later taught chemistry at various grammar schools in Slovenia and Croatia. In addition, in 1940 he wrote an article³² on chemistry of fertilization for the Slovenian popular science magazine *Proteus*. In this article Klemen described the activity of extremely highly diluted saffron crocin-type molecules onto gamete mating in green algae as previously reported by Kuhn and co-workers³³.

5. Emigration and Early Career in Vienna

With the death of Richard's father in 1936, his land in Konjice was inherited by Richard. As assistant professor he was not able to be personally involved in grapevine cultivation and wine production. Instead, in their Konjice house lived two families of vintners who worked in the Klemen vineyards³⁴. In April 1941 World War II began in Yugoslavia. The Slovenian territory was divided between Italy, Germany and Hungary. The Province of Ljubljana was integrated into the Kingdom of Italy and the work at the university was significantly impeded³⁵.

For the winter semester 1941/42, which ended on 15 February, Richard Klemen was still listed as a lecturer, but he received permission from the Italian provincial authorities to quit his position at the UL and emigrate to Germany after 31 January 1942. His enzymology course was later appointed to honorary lecturer Marta Blinc, who was advertised for the summer semester 1942/43 as lecturer for the course Selected Topics in Biochemistry and Enzymology (Slov.: Izbrana poglavja iz biokemije in enzimologije). Strangely enough, Richard Klemen still appeared in the course catalogue¹⁹ for the winter semester 1942/43, which indicates that these lists are to be regarded as a historical source with care.

It could only be speculated about the reasons for Klemen's decision to leave the Italy-occupied Ljubljana, but there were probably several of them: German language ties, family property in the north of the country, which were now part of the German Reich, constantly growing teaching duties (reflected in the number of courses he delivered, see Table 1), rumours that resistance troops were hostile to people of German origin, and perhaps the fact that he appeared on the list of Kočevje Germans to be moved from the Kočevje area³⁶ to the plains along the Sava river on the then German side of the border to the Slovenian territories occupied by Italy. In this exodus almost all members (about 12,000, i.e. 95%) of the German minority left their villages³⁷. The inability to conduct competitive research under Italian occupation in Ljubljana could also be important. The difference between the highly produc-

tive years of 1938–9 and the war situation must have been considerable. At that time Austria seemed isolated from war activities and thus offered itself as a comfortable refuge with perspectives for further research in the field of chemistry. Last but not least, Vienna was regarded as the centre of chemical education and he might have used some connections to colleagues of his former mentor, Maks Samec.

It seems obvious that Klemen's emigration to Germany (actually Austria, which was annexed to Germany in 1938) was well planned, as he was already working as a research assistant at the Vienna College of Technology on April 1, 1942. He was a member of the Institute of Inorganic and Analytical Chemistry led by Ulrich Hofmann and later by Robert Strebing.

Essentially from the wartime comes Klemen's research, which was published only in 1950 in *Zeitschrift für anorganische Chemie*³⁸ with double authorship of Ulrich Hofmann and Richard Klemen. This is certainly the most frequently cited work of Richard Klemen. It describes an important observation in clay chemistry that is still referred to as the Hofmann-Klemen Effect. Ulrich Hofmann (1903–1986) is a well-known German chemist who (between 1942 and 1945) headed the institute in Vienna, where Klemen began as a research assistant after leaving Ljubljana. Hofmann's earlier position was that of a university professor in Rostock, Germany, from where he received one of the then rare and valuable electronic microscopes. In addition to basic research, he conducted several military projects³⁹. Due to his involvement in German army-linked research and his membership in the paramilitary SA (*Sturmabteilung*) forces where he held the title of *Scharführer*⁴⁰, he had to leave Austria in 1945. Since it was not possible for him to work in an exposed position after the war, he was first engaged as a gardener in a chemical production plant in Bavaria. Then, in 1948, he was asked to establish chemistry courses at the Regensburg university (then *Philosophisch-Theologische Hochschule*), where he first had to set up laboratories and start up courses⁴¹. For this reason, Klemen's research was probably published only in 1950 and with affiliation to the Regensburg university. However, Klemen remained bound to Vienna College of Technology and belonged to the minority of researchers who were not removed from their positions during the so-called "denazification" in post-war Austria. Only 35% of the researchers were allowed to remain⁴².

In their 1950 paper, Hofmann and Klemen presented results that had already been achieved in Vienna in 1944⁴¹. Experimental data indicated that in clay (bentonite, more precisely montmorillonite) suspension with lithium, swelling and cation exchange capacity were lost when heated to 125°C. The proposed explanation was that lithium ions diffused into the octahedral sheet of the montmorillonite layer. This effect was later studied by several authors and the 1950 paper is still occasionally quoted.

Klemen's habilitation obtained at the University of Ljubljana in 1933 was recognized in January 1946 as proof

Table 1: List of courses assigned to Richard Klemen, sorted by semester. The two newly established Klemen's courses at the University of Ljubljana are presented in red. R. Klemen was the first university teacher at the University of Ljubljana with a habilitation in enzyme chemistry. If defined, the number of hours per week is shown in brackets next to the planned times. Slovenian course titles are only listed in brackets where they first appear. All data from the published lists of lectures at the University of Ljubljana¹⁹, n.d. – Data not available.

Semester	Course 1	Course 2	Course 3	Course 4	Course 5	Course 6
Winter 1933/34	Instructions for research work (Navodila za znanstveno delo), together with Prof. Samec; (20 h; Mo-Sa 8 ^h -18 ^h)	Instructions for work in analytical and physical-chemistry laboratory (Navodila k delu v analitskem in fiziko-kemičnem laboratoriju) (8 h)	Chemistry of ferments (Kemija fermentov) (1 h)			
Summer 1933/34	Instructions for work in analytical and physical* laboratory (Navodila k delu v analiznem in fizikalnem laboratoriju) (6 h)	Agricultural chemistry (Agrikulturna kemija) (2 h)				
Winter 1934/35	Experimental chemistry practical course (Vaje iz eksperimentalne kemije) for chemistry students enrolled at the Faculty of Arts (4 h)	Chemistry of ferments (2 h)				
Summer 1934/35	Experimental chemistry practical course for chemistry students (enrolled at the Faculty of Arts; 4 h)	Agricultural chemistry (2 h)	Instructions for work in analytical laboratory (2 h)			
Winter 1935/36	Experimental chemistry practical course for philosophers** (Faculty of Arts; 4 h)	Chemistry of ferments (2 h)	Instructions for research work (2 h)			
Summer 1935/36	Experimental chemistry practical course for philosophers – natural scientists (Faculty of Arts; 4 h)	Instructions for practical course on experimental chemistry for philosophers – natural scientists (Faculty of Arts; 1 h)	Agricultural chemistry (2 h; Mondays 7:15 to 9:00)	Instructions for work in analytical laboratory (2 h)		
Winter 1936/37	Experimental chemistry practical course for philosophers – natural scientists (Faculty of Arts; 4 h)	Instructions for practical course on experimental chemistry for philosophers – natural scientists (Faculty of Arts; 1 h)	Chemistry of ferments (2 h; Mondays 7:15 to 9:00)	Instructions for work in analytical laboratory (2 h)	Instructions for research work (20 h)	

Semester	Course 1	Course 2	Course 3	Course 4	Course 5	Course 6
Summer 1936/37	Experimental chemistry practical course for philosophers – natural scientists (4 h; Thursdays 14 ^h -18 ^h)	Instructions for practical course on experimental chemistry for philosophers – natural scientists (Faculty of Arts; 1 h)	Agricultural chemistry (2 h; Saturdays 7:15 to 9:00)	Instructions for work in analytical laboratory (2 h)	Instructions for research work (20 h; Mo-Fr 8 ^h -18 ^h)	
Winter 1937/38	Experimental chemistry practical course for philosophers – natural scientists (4 h; Thursdays 14 ^h -18 ^h)	Instructions for practical course on experimental chemistry for philosophers – natural scientists (1 h; Wednesdays 17 ^h -18 ^h)	Chemistry of ferments (2 h; Saturdays 7:15-9:00)	Instructions for work in analytical laboratory (2 h)	Instructions for research work (20 h; Mo-Fr 8 ^h -18 ^h)	
Summer 1937/38	Experimental chemistry practical course for philosophers – natural scientists (4 h; Thursdays 14 ^h -18 ^h)	Instructions for practical course on experimental chemistry for philosophers – natural scientists (1 h; Wednesdays 17 ^h -18 ^h)	Agricultural chemistry (2 h; Saturdays 7:15 to 9:00)	Instructions for work in analytical laboratory (2 h)	Instructions for research work (20 h; Mo-Fr 8 ^h -18 ^h)	
Winter 1938/39	n.d.					
Summer 1938/39	Experimental chemistry practical course for philosophers – natural scientists (4 h; Thursdays 14 ^h -18 ^h)	Instructions for practical course on experimental chemistry for philosophers – natural scientists (1 h; Wednesdays 17 ^h -18 ^h)	Agricultural chemistry (2 h; 7:15 to 9:00)	Instructions for work in analytical laboratory (2 h)	Instructions for research work (20 h; Mo-Fr 8 ^h -18 ^h)	
Winter 1939/40	n.d.					
Summer 1939/40	Experimental chemistry practical course for philosophers – natural scientists (4 h; Thursdays 14 ^h -18 ^h)	Instructions for practical course on experimental chemistry for philosophers – natural scientists (1 h; Tuesdays 14 ^h -15 ^h)	Agricultural chemistry (2 h; Saturdays 7:15 to 9:00)	Instructions for work in analytical laboratory (2 h)	Instructions for research work (20 h; Mo-Fr 8 ^h -18 ^h)	
Winter 1940/41	n.d.					
Summer 1940/41	Experimental chemistry practical course for philosophers – natural scientists (4 h; Thursdays 14 ^h -18 ^h)	Instructions for practical course on experimental chemistry for philosophers – natural scientists (1 h; Tuesdays 14 ^h -15 ^h)	Agricultural chemistry (2 h; Saturdays 7:15 to 9:00)	Instructions for research work (20 h; Mo-Fr 8 ^h -18 ^h)	Practical course in physical chemistry (Vaje iz fizikalne kemije) (10 h)	Instructions for research work (20 h, Mo-Fr 8 ^h -18 ^h)
Winter 1941/42	Experimental chemistry practical course for philosophers – natural scientists (4 h; Thursdays 14 ^h -18 ^h)	Instructions for practical course on experimental chemistry for philosophers – natural scientists (1 h; Tuesdays 14 ^h -15 ^h)	Chemistry of ferments (2 h; Saturdays 7 ^h -9 ^h)	Physical chemistry (Fizikalna kemija) (2 h)	Practical course in physical chemistry	

* With 'physical laboratory' physical chemistry laboratory is meant

** With 'philosophers' chemistry students who enrolled at the Faculty of Arts (Slov.: Filozofska fakulteta) are meant

of competence for teaching in Austria, but it seems that he was not regularly involved in teaching over the next few years. In June 1950 Richard Klemen moved from the Institute of Inorganic and Analytical Chemistry to the Institute of Biochemical Technology and Microbiology under the direction of Armin von Szilvinyi. Between 1953 and 1955 Klemen was acting head of this institute before appointment of Alexander Janke and during his illness. On 1 October 1954 Richard Klemen was appointed permanent university assistant.

While employed at the Vienna College of Technology, Richard Klemen contributed the biographical outline of Max Bamberger⁴³ for volume 1 of *Neue Deutsche Biographie*. Max Georg Matthias Bamberger (1861–1927) was an Austrian chemist, professor of organic and technical chemistry, associated with the Vienna College of Technology. He investigated natural compounds which is a connecting point to Klemen's interest. In addition, Bamberger was supervisor of the doctoral thesis of Margarete Garzuly (1923), who later married Alexander Janke, head of the Institute of Biochemical Technology and Microbiology⁴⁴. One can imagine that A. Janke was originally supposed to write the text, but either because of his illness or perhaps because of a conflict of interest, the biography was finally prepared by Klemen.

The list of publications from Klemen's Vienna period is unexpectedly short, which is likely due to the fact that he was not in the role of project leader but rather assisted in various research and applied projects. Nevertheless, he was co-author of some of the publications in the field of food technology. In 1957, together with Alexander Janke he published a professional paper on the biological stabilization of grape juice with an ion-exchange resin⁴⁵. Two years later, together with E. Seitz, he published an article on paper chromatographic analysis of the Maillard reaction⁴⁶. This paper was dedicated to Professor Janke on the occasion of his 70th birthday.

6. Klemen's Late Career in Vienna

In April 1964 Richard Klemen was appointed "Titular Associate Professor", which is an honorary professional title in Austria. In 1967 he retired from the Vienna College of Technology, but continued to teach at the University of Agriculture in Vienna (BOKU), from 1966 as an external lecturer. He was in charge of the course on operational and quality control (Ger.: Betriebs- und Qualitätskontrolle), appointed to the Institute of Food Technology and Chair (Ger.: Lehrkanzel) of Biochemical Technology. In 1964, Klemen was actually among the candidates for the head of the newly founded BOKU's Institute of Food Technology as the second choice after Hans Klaushofer, who was later appointed to this office⁴⁷.

The appointment of Klemen to BOKU coincided with the retirement of Professor Armin von Szilvinyi in

1966. Interestingly, von Szilvinyi held two positions: he was head of the Institute of Biochemical Technology and Microbiology (where Klemen was employed from 1950 to 1967) at the Vienna College of Technology and professor at the Chair for Applied Biochemistry and Microbiological Research Methods at BOKU, where Klemen from 1966 was finally offered the opportunity to give his own lectures.

In each semester Klemen gave 3 h lectures per week, while the practical course was not under his direct supervision. In the academic year 1976/77 this course was taken over by Helmut Zenz, the later head of the Institute of Food Technology. In parallel to his assignments at the BOKU, Klemen also worked with the Experimental Station for Fermentation Professionals (Ger.: Experimentalstation für Gärungsgewerbe)⁴⁸ which was closely associated with BOKU⁴⁷, but later developed into an independent school for professional education. From his late career, Klemen's contribution at a seminar on sensory analysis in milk production was published⁴⁹.

On the occasion of his 85th birthday, Alfred Lechner, head of archives at TU Wien, assembled a curriculum vitae⁵⁰ summarizing Richard Klemen's achievements. This summary was an important source of information for the present article.

7. Richard Klemen's Private Life

In his young years, especially when he attended schools with German as language of instruction, Klemen's first name was written with a 'ch' (*Richard*), while as student and until 1942 his first name was written with an 'h' only (*Rihard*). After his move to Austria he adopted the German form of his first name again.

During the outbreak of World War II in Yugoslavia in April 1941, Richard Klemen was mobilized to Serbia where he was captured by German troops and sent as a prisoner to Essen, Germany. After several weeks of imprisonment^a, he was allowed to return to Ljubljana, where he continued his work at the university.

Richard's mother (aged 82) and his younger brother Toussaint and his family were part of the 1942 organized Gottscheer move from their home villages to the German-occupied lowlands along the Sava River, from which the local population had previously been expelled. Toussaint worked on a farm, but after partisans attacked the area he decided to move to Konjice. There, Richard's mother died in 1943. Toussaint and his family were expelled⁵¹ to Austria in January 1946. They initially lived as war refugees in Austria, but later settled in Germany.

^a UL archives keep a letter from the Italian chemical supplier Eigemann e Veronelli dated 3 July 1941, which was replied in written on 12 July 1941. The Italian company inquired about the current address of Richard Klemen. UL rectorate replied as follows: »We have the honour to inform you that Dr. Richard Klemen is prisoner of war in Germany«.

After Richard Klemen obtained his research assistant position in Vienna in 1942, he refused to join the National Socialist German Lecturers League (Ger.: Nationalsozialistischer Deutscher Dozentenbund), a division of the Nazi Party. This could be the reason why he was not allowed to work as a lecturer, which was his previous position at the University of Ljubljana. It is known that until 1945 the 'Lecturers League' was giving opinion about all candidates for teaching positions at German (and also Austrian) universities⁵².

After World War II Richard Klemen was visited several times by strangers, who inquired about his possible return to Yugoslavia. On 17 September 1947 he was granted Austrian citizenship. Richard married to Gertrud Steindl, a chemist by profession. Their son Ulrich was born in 1948. During his stay in Vienna, Richard Klemen occasionally hosted colleagues from Slovenia, among others Friderik Gerl (a chemical engineer who received his B.Eng. from UL in 1926, later Associate Professor of Economics and Organization of the Chemical Industry at the University of Ljubljana, retired in 1972) and his former student Dušan Stucin (who died in 1976 as Professor of Biochemistry and head of the Institute of Biochemistry at the UL Medical Faculty).

Richard Klemen was not particularly satisfied with his career in Austria and often spoke with sympathy about Slovenia and his land in Konjice (U. Klemen, personal communication). Their family land and house were confiscated by the state in November 1945 (registered in Land Registry in January 1946) and declared 'general people's property' in 1948. Since 1951 it has been managed by the local agricultural enterprise (Kmetijsko gospodarstvo v Slovenskih Konjicah), later by the company Zlati grič³⁴. Attempts by the family to recover possession of the confiscated property were unsuccessful.

Richard Klemen died on 19 May 1998 at the age of 96. He is buried in Vienna Central Cemetery. He is survived by his son Ulrich, who studied medicine and specialized in ophthalmology. He became chief physician and associate professor of ophthalmology. His wife Christine is also an ophthalmologist.

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English translations of original titles are in square brackets. Richard Klemen as (co-)author is underlined in all entries.

R. Klemen (1925) Kako se spreminja jodova barva ter množina adsorbiranega joda pri spremembi koloidnega stanja škrobvih sestavin. Univerza Kraljevine Srbov, Hrvatov in Slovencev v Ljubljani, Tehniška fakulteta. Engineer degree thesis, mentor: Maks Samec [How iodine stain and amount of adsorbed iodine change with changing colloidal state of starch compounds]

M. Samec (1925) Studien über Pflanzenkolloide XVI. Verhalten der Stärkekompenten zu Jod und ihre kolloide Schutzwirkung / nach Versuchen von R. Klemen. Kolloidchemische Beihefte 21(3–6), 55–77 [Studies of plant colloids XVI. Behaviour of starch components against iodine and their colloid protection activity / Based on experiments of R. Klemen]

R. Klemen (1930) Ueber vergleichende Reblattanalen in verschiedenen Weinbergslagen zu bestimmten Zeiträumen. Das Weinland, Zeitschrift für Keller-technik und Weinbau 2, 90–92 [On the comparative analysis of grapevine leaves in different vineyards at selected timepoints]

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Povzetek

Richard Klemen (1902–1998) je bil prvi učitelj encimatike na ljubljanski univerzi. Za privatnega docenta za področje kolidne kemije in kemije encimov je bil izvoljen takoj po doktoratu leta 1931, poleg predavanj iz encimatike in kmetijske kemije pa je vodil tudi kemijski praktikum. Doktoriral je pod mentorstvom Maksa Samca na temo sistemizacije škrobov, nato pa se je eno leto izpopolnjeval iz encimatike na Nemški tehniški visoki šoli v Pragi. Z raziskovalnim delom na področju encimatike je nadaljeval do italijanske okupacije, nato pa januarja 1942 z dovoljenjem takratne oblasti emigriral v Avstrijo. Na Dunaju se je že aprila istega leta zaposlil kot raziskovalni asistent na Inštitutu za anorgansko in analizno kemijo Tehniške visoke šole. Iz medvojnega obdobja je njegovo najbolj citirano delo, ki je sicer izšlo šele leta 1950 z afiliacijo regensburške univerze, kjer se je kasneje zaposlil Klemnov nekdanji predstojnik Ulrich Hofmann. Po njima se imenuje tudi Hofmann-Klemnov pojav v kemiji gline. Leta 1950 se je Klemen zaposlil na Inštitutu za biokemijsko tehnologijo in mikrobiologijo Tehniške visoke šole na Dunaju, kjer je ostal kot raziskovalni sodelavec in občasno učitelj do upokojitve leta 1967. Tri leta pred upokojitvijo je bil imenovan za nazivnega izrednega profesorja in v letih 1966 do 1976 predaval na dunajski kmetijski univerzi predmet Nadzor obratovanja in kakovosti. Njegova znanstvena bibliografija je sorazmerno kratka in je v tem sestavku prvič zbrana. Ob stoletnici ljubljanske univerze in bližnji 60-letnici katedre za biokemijo na Fakulteti za kemijo in kemijsko tehnologijo je poznavanje začetkov biokemije na Slovenskem za stroko še posebej pomembno.