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We are like dwarfs perched on the shoulders of giants; thus we are able to see more and farther than they can, not because we have keener eyesight, or stand taller, but because we are raised and lifted aloft on their gigantic greatness.

Bernard of Chartres

The thirty-second anniversary of the Department of Microbiology of the Faculty of Pharmacy and Biochemistry, University of Zagreb, is a good opportunity to remember all the events that led to its foundation, as well as the events and people who, for the last 120 years, have developed the education of pharmacists as health professionals at the Faculty of Pharmacy and Biochemistry. The subject that we nowadays call *Microbiology* was once called *Hygiene*. This was defined as the prevention of communicable diseases and improvement of health standards in the population. The term microbiology was introduced in the 1920s, as the science that investigates the microscopic microorganisms that are agents of the spread of diseases. But how did microbiology develop within the Zagreb University at the Faculty of Pharmacy and Biochemistry and how did the important discoveries in the field of microbiology influence the development of microbiology as a university discipline?

The golden age of microbiology and teaching of pharmacy at the University

When Hans Christian J. Gram published his investigation concerning some colours on bacterial cells in 1884, he did not suspect how much our understanding of the differentiation of bacteria would change (1). Solid nutritive cultures were already used in Koch's laboratory since 1882 for *in vitro* isolation and the growth of bacteria (2). In 1882 when Robert Koch defined the agent that causes tuberculosis (3), the Faculty of Pharmacy was founded in Zagreb. One year earlier, Paul Erlich had selectively dyed the agents of tuberculosis (4), and in 1880 Alphons Laveran discovered the agent causing malaria – *Plasmodium* spp. in the erytrocites of infested patients (5). The causative agent of anthrax was already known (1876) (6). The golden age of microbiology brought about not only better

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knowledge of the causative agents of infectious diseases but it also defined microbiology as a scientific discipline. This enthusiasm of the golden age is still present today, when long established beliefs crumble, *e.g.*, that the ventricle is sterile, and with the discovery of the bacterium *Helicobacter pylori* as an agent causing ulcers, when drugs or vaccines against virus infectious are being sought (AIDS, SARS); when infectious agents smaller than viruses are being discovered (causative agents of BES), and old bacteria become the reality again (bioterrorism with *Bacillus anthracis, Yersinia pestis, Francisella tularensis*).

University education of the future health professionals at the end of the 19th century included teaching about the agents causing infectious diseases known at that time, methods of prevention of infectious diseases (hygiene), and there was already a well known way of treating infectious diseases. In order to make a diagnosis, the causative agent had to be isolated and had to grow in an isolated culture (7). Robert Koch's observations were later defined as known postulates, although some of the microorganisms do not fit in nowadays, because the agent could not be cultivated or it does not cause the same infection in animals.

Picture taken on the island of Brijuni, Croatia, represents the monument »*Dem grosser Forscher dem Befreier der Insel von der Malaria, Dr. Robert Koch, Annis* 1900–1901« (in translation: To the great researcher and deliverer of the island from malaria, Dr. Robert Koch, 1900–1901).

During those troubled times for medicine, the university was founded in Zagreb in 1874, based on the privileges Leopold I awarded to the Zagreb Jesuit college in 1669 (8). This was the basis for the future medical studies. Namely, until 1917 students had to go to Vienna, Innsbruck or Budapest in order to study medicine, and until 1882 to study pharmacy.

The importance of microorganisms and the role of hygiene in the prevention of infectious diseases were soon introduced as a subject for the students of pharmacy at the Zagreb University.

The study and teaching of pharmacy and microbiology at the Faculty of Pharmacy and Biochemistry, University of Zagreb

Following the foundation of the Zagreb University, teachers of the »Mudroslovni« Faculty (nowadays the Faculty of Philosophy) and pharmacists craved for their own study of pharmacy. By the decree of the Emperor and King Franz Joseph I of October 4, 1882, and the order of the Royal Office of Seminarists and Teaching of October 11 of the same year, a two-year pharmacy course was established at the Faculty of Philosphy, which started in the winter term of 1882/83. Since then, the university study of Pharmacy has developed slowly. First, the Department of Pharmacy was created at the Faculty of Philosophy (1928–1942), then the Faculty of Pharmacy (1942–1963), and finally today's Faculty of Pharmacy and Biochemistry, University of Zagreb, which celebrates 120 years of continuous teaching (9).

The Faculty of Philosophy of that time, had already the teaching staff and basic departments for pharmacists, so the establishment of the pharmacy program did not require new financial resources or new staff. Mathematics, chemistry, botany, physics, mineralogy and zoology were then introduced (9, 10).

It is important to point out that as part of the subjects at the Faculty of Philosophy, and before teaching was established at the Faculty of Medicine (12), in the summer term of 1879/80, five years after the University of Zagreb was founded, lectures were given on *The importance of air, water and earth for health.* This was a forerunner of today's teaching of hygiene and microbiology. The lecturer was the private assistant professor for hy-

Javni izvanr. prof. dr. Gustav Janeček	Praktične vježbe u kemičkom laboratoriju (Exercitationes in laboratorio chemico)	Svaki dan osim subote od 9—12 i od 2—5. Vriedi za 6 sati. Honorar 6 for. 50 nvč. a. vr.	U kemičkom laborato
	Uputa u eksperimentiranju iz anorganičke kemije (Exercitationes experimentales chemicae anorganicae)	3 sata, po dogovoru	
Privatni docent dr. Fran Hensler	O važnosti zraka, vode i tla po zdravlje.	1 sat, po dogovoru	

Faximile from the Faculty of Philosophy schedule, academic year 1880, with dr. Fran(jo) Hensler's course *About the importance of air, water and soil for human health* (*O važnosti zraka, vode i tla po zdravlje*).

giene Dr. Franjo Hensler (13). During the next academic year 1880/81, in the winter term, Dr. Franjo Hensler gave lectures on the subject *Dietary health considerations* and in the summer term on the *Influence of health upon epidemics*. Next year, 1881/82, in the winter term, Dr. Franjo Hensler taught a new subject *Conditions for good health in the human body*.

After the pharmacy course was established, Dr. Franjo Hensler did not lecture in the academic years 1882/83 and 1883/84, although his name was on the list of lecturers of the Royal University of Franz Joseph. His official position was in Innsbruck, but in 1884/85 Dr. Franjo Hensler taught at the Faculty of Philosophy. In the winter term, he lectured on *Diseases in the population and how hygiene can prevent them* (14), but it is not clear if students attending the pharmacy course attended these lectures. After Dr. Franjo Hensler died in 1885, there was a vacuum in the teaching program, and in 1896 the teaching staff of the Faculty of Philosophy suggested that hygiene be introduced as an obligatory subject for pharmacy students, and in 1897 a new post for a lecturer of hygiene was created (15).

Privatni docent dr. M. Kišpatić.	Općenita petrografija (Petrographia generalis)	2 sata, po dogovoru	Dvor.
Privatni docent dr. Franjo Hensler.	Bolesti pučanstva u veliko i kako im hygiena predusreta.	2 sata, sriedom i petkom od 11—12	XI.
Privatni docent dr. Drag. Gorjanović	Palaeontologija sisara (Palaeontologia mammalium)	1 sat, po dogovoru	

Faximile from the Faculy of Philosophy schedule, academic year 1884/85, with Dr. Franjo Hensler's course *Diseases in the population and how hygiene can prevent them* (*Bolesti pučanstva u veliko i kako im hygiena predusreta*).

Obligatory lectures on *Public hygiene* and on *Pharmaceutical laws and principles* (14) for pharmacy students started in the winter term of the academic year 1897/98. The lecturer was Dr. Mihajlo Joanović (doctor and teacher of hygiene, bacteriology, health laws and anatomy). Dr. Mihajlo Joanović was the first principal of the Institute of Hygiene and head of the Anatomy Collection; he also taught human *Anatomy* and *Educational hygiene* at the Faculty of Philosophy (16). Dr. Joanović was a regular university teacher in the following years, together with Dr. Antun Heinz, Dr. Gustav Janeček and Dr. Julije Domac. It is interesting that Dr. Mihajlo Joanović gave lectures in the summer term of 1905/06 on *Infectious diseases of the genitalia*, in 1909/10 on *Non-pathological microbes (theoretical and practical courses)*, and in 1920/21 on *Pathological microbes*. Lectures and practical work were held in the premises of the Institute of Hygiene and Bacteriology. These lec-

tures were held at the University, that is, at the Faculty of Philosophy. They were probably the precursors of the studies of microbiology at the Faculty of Pharmacy and Medicine. Even before the first lectures were held at the Faculty of Medicine in 1917, besides Dr. Hensler and Dr. Joanović for the subject of hygiene, there were other lecturers such as Dr. Mavra Sachs, Dr. Lobmayer, Dr. Joanović and Dr. Daniel Riessner, who lectured on forensic medicine at the Faculty of Law (12).

With the development of new subjects and the adaptation of new scientific ideas to academic needs, the discipline of microbiology in 1924/25 involved *General hygiene with bacteriology* with practical work. From 1927/28 Dr. Emil Prašek, full professor at the Faculty of Medicine, together with his assistant Dr. Milan Prica, took over the lectures and practical work under the title *Bacteriology and hygiene for pharmacists*.

After Dr. Emil Prašek died in 1934, classes were taken over by Dr. Milan Prica who taught them until 1941. At the beginning of World War II, classes were taken over by Dr. Ante Žuk, assistant at the Institute of Pharmacology, Faculty of Medicine in Zagreb. In the official announcement of the establishment of the Faculty of Pharmacy in Zagreb (Narodne novine, No. 155. of July 14, 1942) the subject was listed in the study program as *Microbiology with sterilization of drugs and equipment*. After World War II in 1945, the Federal Yugoslav Government abolished all legal decisions taken previously and the Faculty of Pharmacy, University of Zagreb, was founded once again on June 8, 1945.

The subject under the name of *Microbiology* was then introduced into the teaching program. Microbiology classes were taken over by Dr. Dora Filipović, associate professor at the Faculty of Medicine, with the assistance of Dr. Vladimir Bezjak, up to 1957.

In 1956/57, microbiology studies were taken over by the part-time assistant professor Kruna Tomić-Karović, a longtime associate of the Faculty of Medicine in Zagreb. Dr. Živojin Žagar, assistant at the Faculty of Medicine, helped her with the practical work. Assistant professor Kruna Tomić-Karović was elected associate professor on November 15, 1957 for the subject of *Microbiology* at the Faculty of Pharmacy, University of Zagreb. Professor Kruna Tomić-Karović taught this subject until 1968.

Scientific and teaching conditions for independent teaching at the Faculty of Pharmacy and Biochemistry, University of Zagreb, were not achieved until June 21, 1973, when microbiology started to develop at the faculty. Dr. Stjepan Ćuturić, assistant professor at the Faculty of Veterinary Medicine, University of Zagreb, was elected the first permanent teacher of microbiology in 1970, and in the same year associate professor at the Faculty of Pharmacy and Biochemistry, University of Zagreb. He was also the founder of the Department of Microbiology at the Faculty of Pharmacy and Biochemistry.

Towards the end of 1970s, a new assistant, Zdenka Cvetnić, who had a degree in biology, joined the Department and in 1971 another assistant**,** Stjepan Pepeljnjak, who had a degree in veterinary medicine, today's Head of the Department of Microbiology, which he founded in 1980.

In 1997, the Department got a new assistant Ivan Kosalec, who had a degree in pharmacy, and project assistant Maja Šegvić, a teacher of biology and chemistry.

At present, the Department for Microbiology is doing research work within projects financed by the Ministry of Science, Education and Sports of the Republic of Croatia. This is already the seventh project in succession for the glory of science, microbiology, pharmacy and Croatia.

The 30th Anniversary of the Department of Microbiology was celebrated at the new location of the Department of Microbiology in the Pharmaceutical-botanical garden »Fran Kušan« by the Academy ceremony of June 21, 2004.

Historical data of the teaching and research at the Department of Microbiology were published in the memorial book (17) under the auspices of the Croatian Academy of Sciences and Arts (HAZU), University of Zagreb, Ministry of Science, Education and Sport of the Republic of Croatia and the Croatian Microbiological Society, written by the members of the Department of Microbiology, University of Zagreb, together with the renowned writer of the history of Croatian pharmacy and teaching of pharmacy (Professor Vladimir Grdinić).

After more than 30 years of teaching and researching microbes, on December 10, 2004. we dedicated the first Croatian Scientific Symposium with International Participation *Mycotoxins – Clinical Aspects and Prevention* (18) to the 120th Anniversary of Microbiology at the University of Zagreb and the 30th Anniversary of the Department of Microbiology at the Faculty of Pharmacy and Biochemistry of the University of Zagreb and 30 years of mycotoxin research in Croatian.

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