

## KARSTOLOGY AND SPELEOLOGY IN SLOVENIA (FROM THE HISTORY OF KARST AND CAVE SCIENCE TO THEIR PERSPECTIVES)

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### ABSTRACT

*The article presents briefly the development of the term "karst", karstology and speleology in Slovenia, with an emphasis on the achievements of Slovene researchers and response to them elsewhere in the world. Since the second World War, the Slovene karstologists have played increasingly active part on the international karstologic scene. The author of the article believes that the future of a successful affirmation of our karstology lies in a detailed study of our karst in as close international cooperation as possible, in the publishing of our achievements, in introduction of karstology to higher education, and in active participation in the attempts to solve the issues concerning everyday life and economy on the karst.*

**Key words:** karstology, speleology, history, Slovenia, "Kras"

### INTRODUCTION

Although many parts of karst and karst phenomena, specially karst springs, swallow-holes and caves have been known since antiquity (we must not forget that in the Mediterranean, where most of the ancient cultures had flourished, karst is an important and even preponderant landscape), it was just the name of the country in the background of the Gulf of Trieste, Kras - Carso - Karst, which became, during the 19<sup>th</sup> century, the international scientific term "Karst". Where the term "karst" came from and how it has developed to its present-day form, has been written in this particular magazine (Gams and Kranjc, Annales 4, 1994).

#### **From the topographical name "Kras (Karst)" to the technical term "karst"**

From the term "karst", which means a special type of landscape developed on soluble (mainly carbonate) rocks, with all its surface and underground features, to the "birth" of a new branch of science called karstology

(karst science) there has been a long way. In the middle of the 19<sup>th</sup> century the term karst as a general term was largely adopted by geologists and geographers in the Middle and in parts of the Southern and Western Europe. Yet, there were some researchers, for example well known French speleologist E.A. Martel, who even in the 20<sup>th</sup> century did not want to use the term karst and tried to persuade French scientists to use, instead of it, the "phénomènes calcaires, paysages calcaires, etc." (that is limestone phenomena, limestone landscapes). About karstology as a science one may not speak before the beginning of the 20<sup>th</sup> century. Even then, when karst science was already well used and well developed, the basic works upon it did not use directly the word karstology, but other terms containing the word karst (Cvijic's "Das Karstphänomen", Grund's "Karsthydrographie"). As the karst underground is the essential part of a karst landscape (although it is studied by a special branch of science, called speleology, often looked upon as a part of karstology), speleological works have to be treated as karstological also. Thus they are not only basic speleological works but at the same time basic works



**Fig. 1: Up to the 1<sup>st</sup> World War the descending by rope into the shafts was a largely used technique (Photo by Pavel Kunaver).**

**Sl. 1: Do 1. svetovne vojne je bilo spuščanje v brezna na vrvi običajna tehnika (foto Pavel Kunaver).**

on karstology, such as Kraus's "Höhlenkunde" or Martel's "Les Abîmes ...".

#### THE BEGINNINGS OF THE "KARSTOLOGICAL" INVESTIGATIONS

Besides some geographical and historical advantages, one of the reasons why just the country Kras - Carso gave the name to the term, was also the popularisation, the studies and the publishing of karst phenomena in the Duchy of Carniola (Kranjska). Learned men of that time, later researchers and scientists living in Kranjska or visiting it with special intentions, contributed a lot. These studies started long before scientists began to talk about karst and karstology.

Specially important among them are the works of Valvasor (1689), Nagel (1748), Steinberg (1758), Hacquet (1778-1789) and Gruber (1781). We may call them the predecessors of karst and cave science in Slovenia. They

studied and described numerous karst phenomena of Kranjska, but they were not aware of the fact that the karst is also a general phenomenon. It seemed that Hacquet thought already that karst is a special kind of landscape, general and typical for all the limestone terrain. So he marked down the general expression for karst terrain he presumably heard from native people, the "karos". F. Hohenwart, 50 years later (1830), was the first of the scientists who began to write and to spread the idea that the "karst" is not only on the Kras - Carso, but everywhere where limestone country is. He was followed by distinguished geologists (Morlot, Lipold, Stur, Boué, Stache, Mojsisowicz) and geographers (Schmidl, Lorenz, Urbas) mostly. The terms "kras" or "kraševina" were suggested by Jesenko in his geography (1874) to be used in the Slovene language

In Kranjska it was soon generally adopted that the "real karst" was not only on the Kras but that this was the whole region between Vrhnika and Trieste. It is known, more like an anecdote, that at the beginning of this century at Vrhnika, where the road begins to climb up the karst plateau, there was a panel board with an inscription (or written on the rock) "Here begins the karst".

Knowledge of karst in Slovenia is closely connected to the knowledge of the karst underground. The predecessors of karstology, mentioned above, wrote more or less about the caves also. Caves are the karst features best known to the lay people. Regarding the development of cave tourism (if it is appropriate to use this expression of visiting the caves before the "invention" of modern tourism), for example mass in Sveta Jama near Socerb from the 3<sup>rd</sup> to 4<sup>th</sup> century onwards, the cave church at Landar mentioned in 888, and the Vilenica being a show cave in the 17<sup>th</sup> century, those people who crossed or voyaged through Kranjska, had enough opportunity to visit some cave. And at the beginning of the 19<sup>th</sup> century "the real cave tourism started", due to the fact that Postojnska and Škocjanske Jame were organised as show caves.

During the 19<sup>th</sup> century not only show caves, but also some other activities were very important for the popularisation of the karst underground. First the investigations for the Trieste water supply must be mentioned. A group led by Svetina tried to follow the underground Reka river course downstream into Škocjanske Jame; another group, headed by Lindner, tried to find the underground Reka beyond Trieste through deep shafts. In 1841 they discovered Labodnica (Abisso Trebiciano), 329 m deep, which held the world's deepest record for nearly 70 years (Shaw, 1961). The second achievement was the exploration of Schmidl: under an impulse and with the support of Southern Railways (the Vienna - Trieste railway reached the Carniolan karst in 1857) he published descriptions of his investigations. His book "Die Grotten und Höhlen von Adelsberg, Planina und Laas" (1854) had the greatest influence. In 1884 the

caving section of Deutsche und Österreichische Alpenverein, Section Küstenland, was founded in Trieste and this is the beginning of successful explorations of Škocjanske Jame (Svetina penetrated few hundred meters only and Schmidl just little further). The main explorations ended with the discovery of Tiha Jama in 1904. Another important work of this section was exploration of Kačna Jama (1888) where later (1972) the underground Reka river was discovered. Nearly at the same time (1886) Putick came to Kranjska to make investigations in order to prevent floods on the karst poljes. At first he wanted to explore spring caves and ponor caves there and to find the underground channels connecting the poljes. In 1886 he explored the shaft Gradišnica, over 200 m deep (where Schmidl had failed) and his name is associated with most of the important water caves in the Ljubljanica river basin. His co-operation was essential for Martel's successful descent of the underground Pivka river, from Postojnska to Magdalena Jama (1893).

At the end of the 19<sup>th</sup> century a lot was already known about the caves of Kranjska, so that the data collected here could be used in the dispute between the followers of Grund's "karst underground water table conception" and Katzer's "underground streams".

The general situation at the beginning of the 20<sup>th</sup> century was as follows: karst as an international term and karstology (with speleology) as a special "karst & cave science" were widely recognised. The basic karstological and speleological works have been already published. There were several organisations dealing with karst research: speleological organisations at Trieste (3), Ljubljana and Postojna (all were amateurs). "Društvo za raziskovanje jam na Kranjskem" (DZRJ - Cave research society in Carniola) had even "scientific" and "hydrological" sections. Gratzy (1897) published a sort of Cave register of Kranjska, where the biographical data for more than 100 caves were gathered.

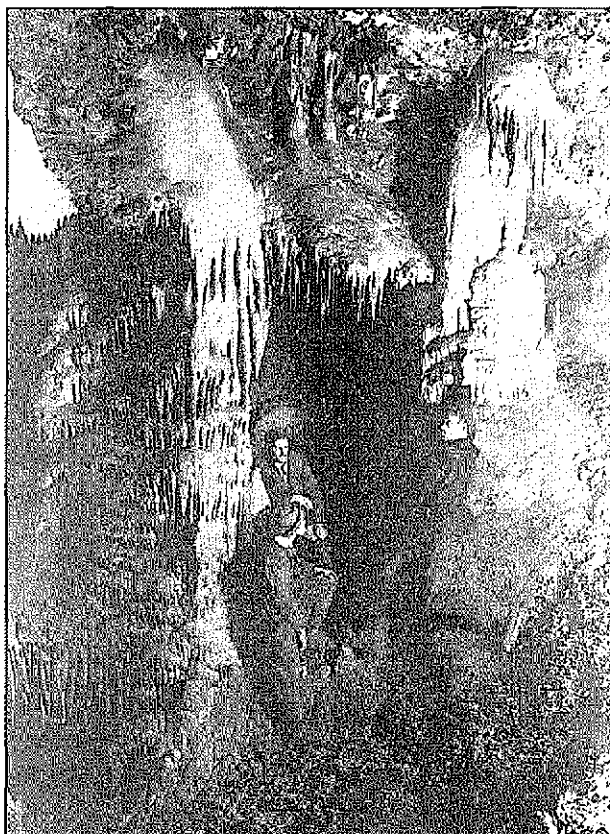
#### KARST SCIENCE AND SPELEOLOGY BETWEEN THE 1ST AND 2ND WORLD WAR

At the end of the 1<sup>st</sup> World War the situation changed. A great part of Kranjska karst became Italian and it was a core of their karstological and speleological activities. In 1926 the book "Duemila Grotte" (Two thousand caves) was published, financially supported by the money of Postojnska Jama, containing mostly caves from the Dinaric part of karst, although some data are doubtful. In 1929 "Istituto Speleologico Italiano" (Italian speleological institute) was founded at Postojna, and the next year the Biospeleological station was opened in a passage in Postojnska Jama. The institute published the review "Le grotte d'Italia" and started scientific work in caves (cave vegetation, sedimentological analyses, geophysical research).

In the Slovene part of the Kingdom of the Serbs,

Croats and Slovenes, later called Yugoslavia, the leading organisation was DZRJ, dealing mostly with cave explorations in Notranjsko and Dolenjsko areas. Very important was the foundation of the Cave Register (Kataster jam) where the documentation of about 600 caves was gathered up to the beginning of the 2<sup>nd</sup> World War. Slowly other caving organisations were founded in other parts of Slovenia. Two events have to be mentioned: in 1927 Županova jama was opened as a show cave, and in 1928 biospeleological station in Podpeška Jama (Dobrepolje), run by biologists of Ljubljana University, began to operate.

Maybe the most important change from the previous period was the absence of foreign researchers on our karst. Slovene specialists, mostly geographers, published a number of works about the karst in Slovenia. Among the first were K. Pick (1920) on karst hydrography and P. Kunaver (1922) on karst phenomena, later followed by Bohinec, Melik, Rus, etc. The common ground is that



**Fig. 2: Members of the Cave research society at the bottom of a shaft (Photo by Pavel Kunaver).**

**Sl. 2: Člani Društva za raziskovanje jam na dnu brezna (foto Pavel Kunaver).**



**Fig. 3: Winch was used for deeper shafts - at the winch is Alfred Šerko, the first head of the Karst research institute at Postojna (Photo by Roman Kenk, 27<sup>th</sup> July 1932).**  
*Sl. 3: Za globlja brezna so jamarji uporabljali vitel - ob njem Alfred Šerko, prvi direktor Inštituta za raziskovanje krasa v Postojni (foto Roman Kenk, 27.7.1932).*

they studied Slovene karst (although in the 1930s they organised an "expedition" to Vjetrenica in Herzegovina) and published their results in mostly Slovene language. Their work was very important for the knowledge of the karst in Slovenia, regarding the popularisation of karst and cave science among the Slovenes, but it did not play an important role in international circles.

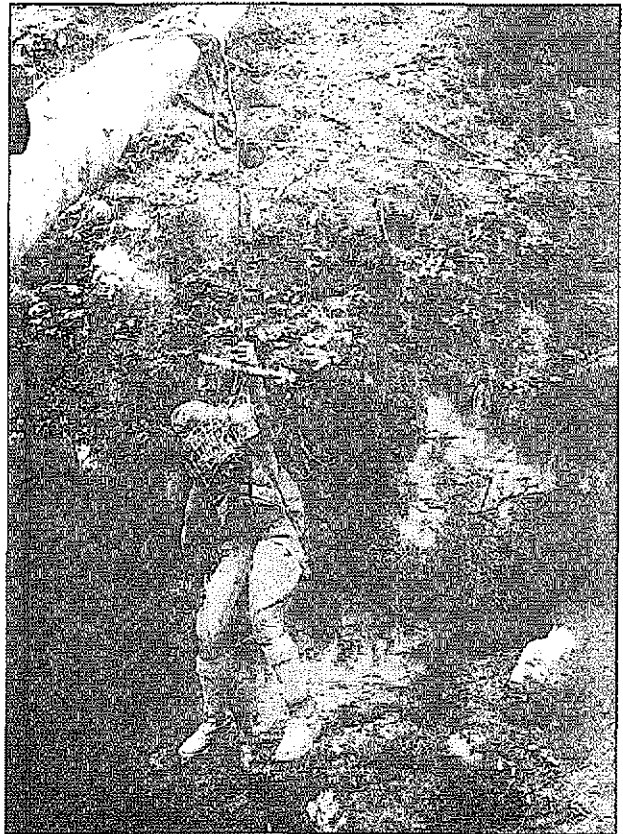
#### PROSPERITY AFTER THE 2<sup>ND</sup> WORLD WAR

After the 2<sup>nd</sup> World War both karstology and speleology got a new impetus. Caving organisations were founded in smaller places also, the DZRJS developed into an association and accordingly changed its name into Speleological Association of Slovenia. "Kataster jam" has complete documentation on some 7,000 caves, and in the Alps deep shafts (more than 1000 m) are being discovered and achieving world importance again.

Often the leading persons in caving activity were

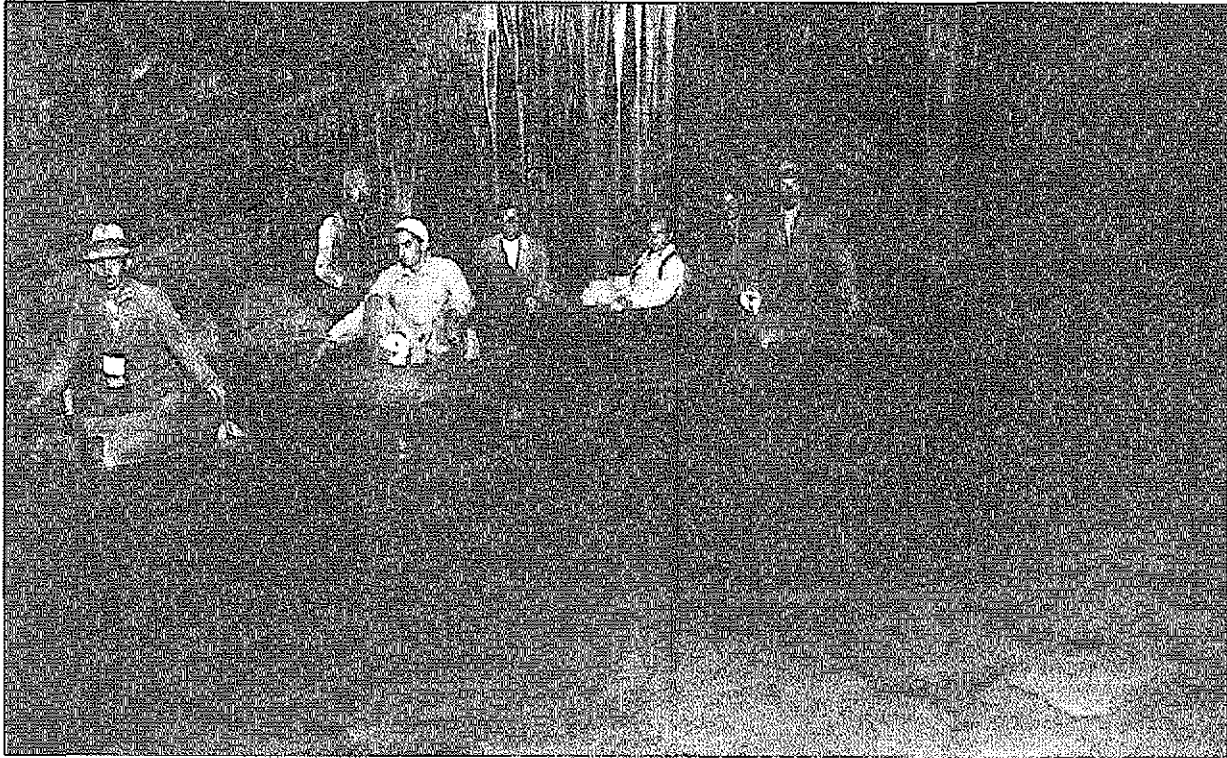
also the leading karstologists. Essential for karst research was the reopening or founding of the Karst Research Institute at Postojna by the Slovene Academy of Sciences and Arts. From one point of view this was the continuation of the Italian speleological institute but the staff changed completely and the research was oriented slowly from speleology to karstology. The Institute started to publish "Acta Carsologica" in 1955, and the caving organisation its journal "Naše jame" in 1959.

If it is necessary to compare the post-war research with that from before the war the main characteristic is the change (slow, of course) from describing karst phenomena to the investigation of karst processes. The second characteristic is the internationalisation of cave and karst science and international co-operation. It was symbolised by the foundation of the International Speleological Union during the 4<sup>th</sup> International speleological congress (Ljubljana - Postojna 1965). Cavers soon participated in foreign or international caving activities (in Teufelskessel, Austria, and in Tatras, Poland, both in 1959) and later organised expeditions to remote



**Fig. 4: The caver is lowered by the winch down the shaft, on 3<sup>rd</sup> September 1929 (Photo by Roman Kenk).**  
*Sl. 4: Jamarja spuščajo z vitlom v brezno, 3.9.1929 (foto Roman Kenk).*





*Fig. 5: "Caves' navy" in Križna jama cave on 18<sup>th</sup> July 1935 (Photo by L. Mandl?).  
Sl. 5: "Jamska flota" v Križni jami 18.7.1935 (foto L. Mandl?).*

karst terrains (South America, Philippines, China). Karstologists took part in and organised international professional meetings, study visits and inter-academic exchange which allowed them to introduce their work and to get acquainted with karst in foreign countries. Karstology was slowly becoming more and more important from an economic point of view. The research was incorporated in planning and implementation of different projects such as water supply, motorway construction, show cave displays, etc.

#### **ROLE OF SLOVENIA IN THE INTERNATIONAL KARST SCIENCE**

And what are the intentions of karst research in Slovenia?

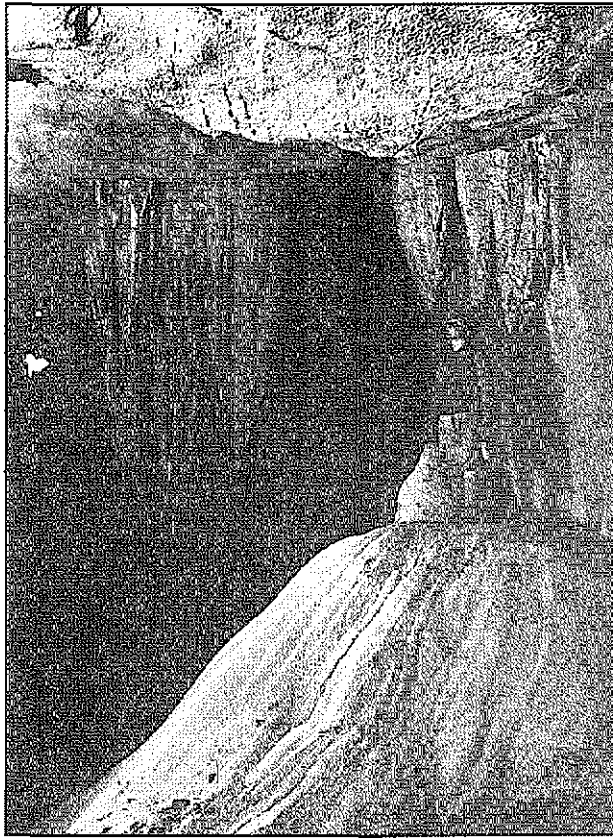
Full, detailed studies in all the branches of karstology, but specially in:

- geomorphology (morphogenesis of "cone hills" and quantitative measurements of geomorphologic agents),
- tectonics, and the role of geological discontinuities in morphogenesis and speleogenesis,
- study of the epikarst from different points of view (CO<sub>2</sub>, percolating water, transport of pollutants, flow-stone deposition),
- detailed speleological studies supported by monitoring (microclimate, cave ecology, sediment datations),

- detailed local and regional karstological and speleological studies focused on the protection and safeguarding of karst phenomena and the karst environment.

More and more detailed study of wider topics demands changes in education too. In Slovenia, not long ago the karstologist were self-taught, while in recent years some karst topics have already been included in regular study, as for example lectures on karst geology or on karst geography in the geological and geographical departments of Ljubljana University. The number of universities and high schools is increasing and I hope that some of them will decide to include karstology in their regular programmes. This could be a speciality and appeal of the "third university" in the Slovene Littoral, and it could distinguish it from other high schools in Slovenia and elsewhere. Of course, "informal education" can be very important too, as it is proved by widely accepted "International karstological school Classical Karst". At the initiative and with the help of the Slovene National Commission for UNESCO, the first of these was organised in 1993, and the fifth in 1997. That it is successful has been proved by the wish of the Commission for Education of the International Speleological Union to take active part in the organisation.

Regarding karstology, Slovene researchers are involved in so many international project that they cannot be enumerated. And what are their trump cards?



**Fig. 6: Motif from the end of the cave Logarček (Photo by Ivan Michler).**  
**Sl. 6: Motiv s konca jame Logarček (foto Ivan Michler).**

The location on (or the possession of) the Classical Karst (the Kras itself), a part of "classical Dinaric karst" is without doubt very important, because every serious researcher is supposed to know it and visit it as well. And this can be best achieved in connection with Slovene researchers. Our advantage is also a great number of caverns appropriate for different observations and investigations taking into account their easy accessibility and equipment (electricity, doors). And last but not least there are also researchers of various specialisations speaking foreign languages who present the results of our investigations by attending international professional meetings, by publishing them in the form of articles and monographs and by being co-authors with foreign researchers. The organisation of international professional meetings - in Slovenia there is at least one per year - has to bear fruit sooner or later. A good example is the sym-

posium "Classical Karst" at Lipica in 1997, being a pre-congress event of the International Congress of Geomorphology at Bologna (Italy). From the planned relatively humble symposium a top-level meeting of the world's leading karstologists developed, with the participation of over 70 members from all over the world including papers and discussions on a very high professional level.

The general trends of development of karstology in Slovenia should be a detailed knowledge about the karst in Slovenia, in order to acquaint international professional circles with our results, intensive international co-operation, publishing (a lot in foreign languages), initiation of karstology as a subject at university, co-operation in solving practical questions (water, constructions, tourism), and, of course, an adequate support of the state, moral, financial, and otherwise.

## O KRASOSLOVJU IN SPELEOLOGIJ V SLOVENIJI (O ZGODOVINI VEDE O KRASU IN JAMAH TER O NJUNIH PERSPEKTIVAH)

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### POVZETEK

Čeprav so bila številna kraška ozemlja znana že v antiki, je ravno iz imena pokrajine Kras v zaledju Tržaškega zaliva nastal mednarodni strokovni termin "kras" (karst), o čemer je bilo pisano tudi že na straneh te revije (Gams in Kranjc, *Annales* 4/94, 1994, 131-142).

Termin *kras* so v drugi polovici 19. stol. vpeljali predvsem avstrijski geologi in geografi, čeprav so se nekateri strokovnjaki (npr. E.-A. Martel) temu upirali. Kljub temu, da je bil izraz *kras* že splošno sprejet, pa se ime za vedo "krasoslovje" še ni pojavilo. Izraz *kras* je bil sprejet zahvaljujoč tudi opisom učenjakov in popotnikov med 17. -19. stoletjem. Med temi je treba omeniti Valvasorja (1689), Nagla (1748), Steinberga (1758), Hacqueta (1778-1789) in Gruberja (1781). Prvi, za katerega vemo, da je jasno povedal, da "kras ni le na Krasu", je bil Hohenwart (1830). Sledili so geologi (Morlot, Lipold, Stur, Boué, Stache, Mojsisowicz) in geografi (Schmidl, Lorenz, Urbas). Končno je J. Jesenko (1874) predlagal, naj slovenska terminologija sprejme izraza "kras" ali "kraševino".

Poznavanje krasa na Slovenskem je tesno povezano s poznavanjem kraškega podzemlja. Jame so obiskovali že od nekdaj, npr. Sveto jamo pri Socerbu po izročilu od 3. ali 4. stol. dalje, cerkev v Landarski jami je omenjena l. 888, Vilenica je bila že v 17. stol. prava turistična jama.

V 19. stol. so še nekatere druge dejavnosti pripomogle k poznavanju krasa tudi med laiki. Take so bile raziskave v zvezi z oskrbo Trsta z vodo (prodiranje v Škocjanske jame, odkritje 329 m globoke Labodnice), raziskovanje Škocjanskih jam ter njihovo urejanje za turistični obisk (1884-1904) ter Putickove raziskave (od 1886 dalje) v zvezi s preprečevanjem poplav na notranjskih kraških poljih.

Na začetku 20. stol. sta bila tako termin *kras* za posebno obliko zemeljskega površja in veda *krasoslovje*, ki se z njim ukvarja, splošno sprejeta. Izdana so bila temeljna *krasoslovna* in *speleološka* dela, več organizacij (v Trstu, Ljubljani in Postojni) se je ukvarjalo z raziskovanjem krasa in Gratzy (1897) je objavil zbrane bibliografske podatke o preko sto kranjskih jamah.

Med obema vojnama je bil razvoj v delu pod Italijo in v delu pod Jugoslavijo različen. Postojnska jama je postala državna, 1929 so v Postojni ustanovili Italijanski speleološki inštitut (ta je izdajal revijo *Le Grotte d'Italia*), 1930 pa Biospeleološko postajo. V Sloveniji je potrebno omeniti raziskave Društva za raziskovanje jam, odprtje Biospeleološke postaje 1928 v Podpeški jami in odprtje (1927) Županove jame za turizem. S *krasoslovjem* so se ukvarjali predvsem geografi, kot Bohinec, Kunaver, Melik in Rus.

Po II. vojni je iz Društva za raziskovanje jam nastala Jamarska zveza Slovenije, v njenem "Jamskem katastru" se je nabralo podatkov že o 7000 raziskanih jamah, med katerimi so tudi preko 1000 m globoka brezna, kar spet uvršča naše jame med prve na svetu. 1947 je bil v Postojni ustanovljen Inštitut za raziskovanje krasa, 1955 je pričel izdajati zbornik *Acta carsologica*, 1959 pa je začela izhajati jamarska revija *Naše jame*.

In kakšne naj bi bile bodoče naloge in perspektive slovenskega *krasoslovja*? Morali bi čim podrobneje preučevati in spoznavati kraške pojave na Slovenskem ter procese, ki jih oblikujejo, s svojimi dosežki seznanjati mednarodno strokovno javnost, skrbeti za čim tesnejše mednarodno sodelovanje, čim več in čim hitreje objavljati svoje izsledke in spoznanja (s poudarkom na objavah v tujih jezikih), skušati vpeljati poučevanja *krasoslovja* na univerzitetni študij, sodelovati pri reševanju vprašanj vsakdanjega življenja (oskrba z vodo, gradnje, turizem) in pridobivati zaupanje ter pomoč družbe oziroma države.

**Ključne besede:** *krasoslovje*, *speleologija*, zgodovina, Slovenija, Kras

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