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JUBILEE: THE SIXTIETH BIRTHDAY OF PROFESSOR TIBOR KATRIŇÁK

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Professor RNDr. Tibor Katriňák, DrSc., one of the leading personalities of Slovak mathematics, celebrated his sixtieth birthday this year.

Tibor Katriňák was born on March 23, 1937 in Košice. He attended a grammar school in Spišská Nová Ves. In 1955–60 he studied Mathematics at the Faculty of Natural Sciences of the Comenius University in Bratislava. After graduating in 1960 he commenced and followed the academic career at this faculty and, since 1980, at the newly established Faculty of Mathematics and Physics of the Comenius University. He received his CSc. (Candidate of Sciences, the former Czechoslovak equivalent of PhD) degree from the Comenius University in 1965. The academic year 1967–68 he spent as a *Humboldt-Stiftung* fellow with the Department of Mathematics of the Univeristy in Bonn, Germany, and became an associate professor in 1968, after his come back to Bratislava. He was awarded the degree DrSc. (Doctor of Sciences) in 1980, and, only after the turn, in 1990 he was promoted a full professor at the Department of Algebra and Number Theory of the Faculty of Mathematics and Physics.

Professor Katriňák is a world-recognized authority in the fields of Lattice Theory and Universal Algebra. Together with his great teacher and, later on, the closest colleague Professor Milan Kolibiar they have been the central personalities of the 'Bratislava School of Algebra' since the late sixties. He contributed a good deal to the good name of Slovak and Czechoslovak mathematics, as well as to the ranking of the Comenius University.

His primary research interest has been the study of lattices and semilattices, in particular the lattices and semilattices with pseudocomplementation. The theory of pseudocomplemented lattices (p-algebras) and pseudocomplemented semilattices, which has its origin in the study of non-classical logics, became a vital branch of lattice theory since the early sixties and Katriňák's contribution to this theory was enormous. His papers devoted to the theory of pseudocomplemented lattices and semilattices were cited, for example, in the monographs [S 69], [G 71], [Bl-J 72], [B-D 74], [Je 76], [G 78] (20 papers!), [S 82], [Bl-V 94] and in hundreds of papers. He became famous by characterizations of various classes of pseudocomplemented lattices and semilattices by means of triples of simpler structures associated with each member and by a systematic treatment of the triple constructions.

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There are three types of triple constructions for pseudocomplemented semilattices and lattices in the literature: the first one, discovered by W. Nemitz [N 65] for Heyting semilattices, was improved by P. V. R. Murty and V. V. R. Rao [Mu-R 74]. Their version, which is described, e.g., in C. C. Chen and G. Grätzer [C-G 69] for Stone algebras, was later on extended and modified to work for all distributive pseudocomplemented lattices and Heyting algebras by T. Katriňák [21], [18]. The third one originated in the papers [12], [23] by T. Katriňák and was later developed and modified by W. Cornish [Co 74], P. Mederly [M 74], J. Schmidt [JS 75], and again by T. Katriňák and P. Mederly in [30], [46] and, in particular, in [65] where the previous triple methods were generalized to the largest possible class of "decomposable" pseudocomplemented semilattices.

A *pseudocomplemented semilattice* (PCS) is a bounded meet-semilattice $(S; \wedge, 0, 1)$, such that for every $a \in S$ there exists the *pseudocomplement* $a^\star$ of a, defined by $a^\star = \max\{x \in S \mid x \wedge a = 0\}$. A PCS which is even a lattice is called a *pseudocomplemented lattice* (PCL). A *p-algebra* $(S; \wedge, \vee, ^\star, 0, 1)$ is a PCL with the pseudocomplement operation included into its signature. A p-algebra is *distributive* or *modular* if its underlying lattice has the respective property. An element a of a PCS S is said to be *closed* if $a = a^{\star\star}$ and an element $d \in S$ is called *dense* if $d^\star = 0$. The sets of all closed and dense elements of S are denoted by $B(S)$ and $D(S)$, respectively. $B(S)$ is a Boolean algebra and $D(S)$ is a semilattice with 1, and even a lattice filter in S in case S is a PCL. Unfortunately, these two "substructures" associated with S do not entirely characterize S. However, in the late sixties W. Nemitz and, independently, C. C. Chen and G. Grätzer showed that, under certain conditions, a third bit of information, namely a kind of a connective map $\varphi(S) : B(S) \to D(S)$, is sufficient to characterize S by means of the triple $(B(S), D(S), \varphi(S))$. This gave rise to the "triple methods" in the theory of PCS's, PCL's and p-algebras, ellaborated mainly by T. Katriňák.

We shall continue with some concepts and results of [65]. A PCS S is said to be *decomposable* if for every $x \in S$ there exists a $d \in D(S)$ such that $x = x^{\star\star} \wedge d$. In a decomposable PCS S one can define, for every $a \in B(S)$, a semilattice congruence relation $\theta_a(S)$ on $D(S)$ by $x \equiv y \ (\theta_a(S))$ iff $a^\star \wedge x = a^\star \wedge y$. The map $a \mapsto \theta(S)(a) = \theta_a(S)$ is a $(0,1)$-isotone map from $B(S)$ into $\mathrm{Con}(D(S))$ and $(B(S), D(S), \theta(S))$ is the *triple associated with* the decomposable PCS S. On the other hand, an abstract triple (B, D, θ) consists of a Boolean algebra B, a $\wedge$-semilattice D with 1 and a $(0,1)$-isotone map $\theta : B \to \mathrm{Con}(D)$. Two (abstract) triples (B, D, θ) and (B', D', θ') are *isomorphic* if there is an isomorphism of Boolean algebras $f : B \to B'$ and an isomorphism of semilattices $g : D \to D'$ such that the diagram

$$\begin{array}{ccc} B & \xrightarrow{\ \theta\ } & \mathrm{Con}(D) \\ {\scriptstyle f}\big\downarrow & & \big\downarrow{\scriptstyle \overline{g}} \\ B' & \xrightarrow{\ \theta'\ } & \mathrm{Con}(D') \end{array}$$

commutes. (Here $\overline{g} : \mathrm{Con}(D) \to \mathrm{Con}(D')$ stands for the isomorphism of of congruence lattices induced by g.)

The essence of the generalized triple method presented in [65] lies in the following two results:

1. Two decomposable PCS's are isomorphic if and only if their associated triples are isomorphic.
2. Let (B, D, θ) be an (abstract) triple. Then one can construct a decomposable PCS S such that its associated triple $(B(S), D(S), \theta(S))$ is isomorphic to (B, D, θ).

We note that the idea of decomposing a PCS S into triple using congruence relations on $D(S)$ occured already in Katriňák's most cited paper [12] and that especially his paper [23] brought a new idea which later on led to this third type of triple constructions. Other important achievements of [65] can be summarized as follows:

3. Connections between all previous triple constructions were clarified.
4. It was shown that all the previously studied decomposable PCS's were "filter-decomposable", meaning that every congruence $\theta_a(S)$ was determined by the filter $D(S) \cap [a^\star)$.
5. A triple construction for a large class of the so-called *quasi-modular* PCL's, obtained by weakening the concept of modularity for PCL's to the quasi-modular identity
$$((x \wedge y) \vee z^{\star\star}) \wedge x = (x \wedge y) \vee (z^{\star\star} \wedge x),$$
was presented.
6. It was shown how homomorphisms and congruence relations of PCL's can be studied by means of triples.
7. Possible directions of further development of the topic were indicated.

In [22] the Stone and Post algebras of order n were studied. Almost the whole paper was taken into the monograph [Ba-D 74] (chapter X). G. Epstein and A. Horn [E-H 74] consider the Stone algebras of order n introduced in [22] to be one of the most interesting generalizations of the Post algebras which are known as algebraic models of multi-valued logics.

In [20] and [35] triples associated with the free Stone algebras with m generators are characterized. This solved the problems formulated in [C-G 69] and [G 71; Problem 54]. By 1982, all the known papers describing free p-algebras were concerned with distributive p-algebras. In [61] T. Katriňák extended these results giving a characterization of free algebras for the whole variety of p-algebras.

The other area of research interests of Professor Katriňák was the study of subdirectly irreducible algebras in certain varieties of p-algebras [19], [26], [28], [48], and the study of varieties of p-algebras [27], [66]. In [27] it is shown that the lattice of lattice varieties can be embedded into the lattice of all varieties of p-algebras, answering a problem formulated in [G 71] and explaining the major difficulties one meets when dealing with p-algebras.

A series of papers of T. Katriňák is devoted to the study of double p-algebras, mainly to the properties of distributive double p-algebras [24], [31], [63], and to the constructions of regular double p-algebras [32] and modular double p-algebras [44]. His results about injective double Stone algebras [33] were used by R. Beazer, B. Davey, A. Romanowska, A. Urquhart and many others. Representations by congruence lattices of distributive p-algebras are investigated in [42] and [84]. Many results of T. Katriňák concern characterizations of lattices and algebras whose congruence lattices belong to some variety of p-algebras [70], [72], [73], [77]. Characterizations of projective p-algebras in the classes of distributive p-algebras and all p-algebras are given in the papers [87] and [78], respectively.

So far we have focused mainly on research activities of Professor Katriňák. But it is important to say that he has also been an inspired teacher who instructed and positively influenced the careers of many Slovak mathematicians of the middle and young generations. He supervised seven PhD students and many others within the annual "student scientific competition".

Professor Tibor Katriňák has accepted many responsibilities within the Faculty of Mathematics and Physics, Comenius University and both the Czecho-Slovak and the Slovak mathematical community. This has been particularly invaluable after 1989 when, also within the mathematical community, not many poeple were ready "to give more than they receive". T. Katriňák has devoted a lot of time and energy serving in many ways the mathematical community in Slovakia. He did a lot of professional and organizing work as a chairman of the Committees for candidate and doctoral dissertations in Algebra and Number Theory, as a member of the Slovak Grant Agency for Mathematical and Physical Sciences, member of the Scientific Boards both at the University and Faculty levels, Editor in Chief of the journals Acta Mathematica Universitatis Comenianae (AMUC) and Mathematica Slovaca, as a member of editorial boards and a reviewer for other mathematical journals, organizer and co-organizer of several Summer Schools in Algebra, and we could follow by many other less official responsibilities like, for example, the responsibility for the faculty library. By his unselfishness, friendliness and willingness to help or offer an advice, by his commitment to serve the mathematical community, he nobly continues in the work and mission of his great teacher and close friend, the late Professor Milan Kolibiar.

It remains to conclude by saying that on the occasion of his 60th birthday, the entire Slovak and Czech mathematical community wishes Tibor Katriňák good health and a lot of success in his scientific, pedagogical and organizational work, as well as in his personal life.

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