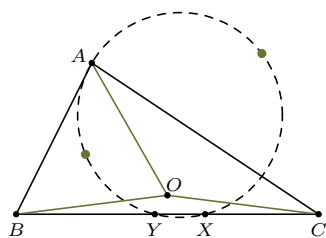




## Problems



frequency of occurrence of different liverwort species was found to be related to the type of forest – which was an interesting discovery (Fig. 11).

A characteristic feature of the work of the *Seminar* was tackling of every problem, even the most unusual ones. At a meeting in January 1952, *Julian Perkal announced that he had made a dendrite of folk songs for Professor Czekanowski's daughter* (quote from the carefully kept minutes of the *Seminar*). The classification of folk songs using the method of Wrocław taxonomy became one of the important research tools for Anna Czekanowska-Kuklińska, a professor at the University of Warsaw (d. 2021) and the head of the Ethnomusicology Department she established.

In 1953, Stefan Zubrzycki published a work [5] using the Wrocław taxonomy, which answered astronomer Włodzimierz Zonn's question of whether stars form non-random constellations (referred to by the authors as "chains") or are randomly distributed on the celestial sphere. He showed that they are randomly arranged, confirming that constellations are only a mnemonic method of remembering the position of stars.

Julian Perkal ends his work on taxonomy (op. cit.) with a warning that *"...one can construct a machine for making dendrites. This creates a danger of a mechanical approach to natural objects and of gyrating false sometimes natural bills with mathematical methods."* It is worth remembering this.



*Edited by Dominik BUREK*

**M 1750.** Can the numbers from 1 to  $2023^2$  be placed in the squares of a  $2023 \times 2023$  board in such a way that for any choice of a row and a column, we can find three numbers on them, where one of the numbers is the product of the other two?

Solution on page 2

**M 1751.** Let  $O$  be the circumcenter of triangle  $ABC$ . Points  $X$  and  $Y$  on side  $BC$  are such that  $AX = BX$  and  $AY = CY$ . Prove that the circumcircle of triangle  $AXY$  passes through the circumcenters of triangles  $AOB$  and  $AOC$ .

Solution on page 8

**M 1752.** Let  $x_1, \dots, x_n \in [0, 1]$ . Prove that

$$(1 - x_1x_2 + x_1^2) \cdot (1 - x_2x_3 + x_2^2) \cdot \dots \cdot (1 - x_{n-1}x_n + x_{n-1}^2) \cdot (1 - x_nx_1 + x_n^2) \geq 1.$$

Solution on page 4

*Edited by Andrzej MAJHOFER*

**F 1075.** An eclipsing binary star system with radii  $r_1$  and  $r_2$  is observed from Earth at an angle  $\alpha$  to the plane of the stars' mutual orbit. What is the relation between the angle  $\alpha$ , radii  $r_1$  and  $r_2$ , and the diameter  $d$  of the orbit? We assume that the orbit is circular.

Solution on page 7

**F 1076.** On one of the plates of a flat capacitor with capacitance  $C$ , a charge  $Q_1$  is placed, and on the other plate, a charge  $Q_2$  is placed. What is the potential difference between the plates?

*Hint:* As usual in problems of this type, we neglect boundary effects.

Solution on page 7