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University of Massachusetts at Amherst, Amherst, MA 01003. *Simply connected random surfaces.*

Let Z be a nonsingular projective surface over an algebraically closed field K , and let $A = \{C_1, \dots, C_d\}$ be an arrangement of curves on Z . For any A in a certain large class, we produce nonsingular projective surfaces X which have proportionally the same Chern numbers as the log surface $Z \setminus A$. We call any such X a random surface associated to (Z, A) , since the procedure involves a necessary random ingredient (random partitions of prime numbers). We will show how random surfaces provide examples of exotic simply connected surfaces. When $K = \mathbb{C}$, they improve the current record for the Chern ratio $\frac{c_1^2}{c_2}$ of simply connected smooth projective surfaces of general type. In positive characteristic, they give examples of étale simply connected surfaces with $\frac{c_1^2}{c_2}$ arbitrarily close to 3 from below (in any characteristic), and from above (violating the Miyaoka-Yau bound, in any characteristic except 2 and 3). (Received August 06, 2008)