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Prime, Knots and the Adele Class Space

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We show that the scaling site and its periodic orbits of length log p offer a geometric framework for the well-known analogy between primes and knots. The role of the maximal abelian cover of the scaling site is played by the adele class space which is the quotient of adeles by the action of rational numbers by multiplication. The inverse image of the periodic orbit C_p is canonically isomorphic to the mapping torus of the multiplication by the Frobenius at p in the abelianized étale fundamental group of the spectrum of the ring Z localized at p, thus exhibiting the linking of p with all other primes. We give a functorial construction of finite covers of the scaling site associated to finite abelian extension of Q. These covers share the same ramification as the field extension, and the monodromy of the periodic orbit C_p in the cover corresponds to the Frobenius(p) element of the Galois group. This is joint work with C. Consani.

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