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## **ON UNSMOOTHABLE DIFFEOMORPHISMS**

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There exists on any two-manifold  $M \ge C^r$  diffeomorphism f which is not topologically conjugate to any  $C^{r+1}$  diffeomorphism for every  $r \ge 0$ .

The basic construction is on the annulus and consists of a sequence of annuli the sides of which are fixed and the center circles of which are rotated. The annuli converge to a fixed circle. After carefully specifying the rotation number of each center circle the widths of the annuli can be chosen so as to make the function  $C^r$  but they cannot be wide enough for f to be  $C^{r+1}$  at the limit circle. Since the speed of the rotation cannot be effectively altered under a topological conjugacy there is no way to make the function  $C^{r+1}$ .

By suspending we obtain examples of foliations on  $M \times S^1$  which are  $C^r$  but cannot be made  $C^{r+1}$ .

The full details of the construction and the proof of invariance under a topological conjugacy are given in [1].

I am informed that C. Fefferman and W. Thurston have also constructed such an example (unpublished).

## REFERENCE

1. Jenny Harrison, Unsmoothable diffeomorphisms, Warwick University Notes (to appear).

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