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Letter of recommendation for Dr. Elisabetta PASTORI

It gives me great pleasure to write in support of Elisabetta Pastori who is applying for a position in your department.

Elisabetta is a very bright and hard-working person. Her area of research is infinite permutation groups and connections with model theory. At the suggestion of Prof Puglisi, her former supervisor in Florence, Elisabetta visited me for 3 months at the start of her PhD work in September 2002 and I proposed several problems to her. She has subsequently visited UEA on several occasions and has spent a total of two years in our department since 2002. The problems I suggested were all on finite covers of infinite permutation groups and it may be helpful if I say something about these problems and their context.

The set-up is that one is looking at permutation groups Γ on a (infinite) set C on which there is a Γ-invariant equivalence relation with finite classes and the permutation group G induced on the set W of classes is a prescribed permutation group. One usually restricts to the case where Γ is closed in the usual topology (of pointwise convergence) on the symmetric group. In this case, the group G is a closed permutation group on W and the kernel K of the map $\Gamma \to G$ is a profinite group. Thus we have a short exact sequence of topological groups $1 \to K \to \Gamma \to G \to 1$ and one is considering an extension problem in the category of permutation groups: the basic problem is to describe the possible permutation groups $(\Gamma; C)$, given the permutation group $(G; W)$. What is perhaps surprising is that for various important $(G; W)$ one can say something non-trivial about this problem.

Problems of this sort first arose in model theory in studying the fine detail of totally categorical structures (the permutation groups are the automorphism groups of certain of these structures). An important case to understand is when $(G; W)$ consists of the symmetric group on an infinite set acting on finite subsets (or ordered finite subsets) of a fixed size. One can attempt to analyse this using the representation theory of the (finite) symmetric group and low degree group cohomology suitably adapted to deal with infinite permutation groups.

Elisabetta's thesis is a contribution to the study of this case. The first part of the thesis, and the

subject of her paper which is accepted for *Communications in Algebra*, gives an analysis where the group induced on an equivalence class is a non-abelian finite simple group. Here the methods are elementary, but the analysis is intricate. The second part of the thesis is much harder and looks at the case where the group induced on an equivalence class is cyclic of order 4. Previous results of myself and others showed that this is an exceptional 'hard' case where one can expect some non-trivial cohomology groups (and non-split extensions) to appear. Elisabetta's work is very interesting in that it shows that the non-splitting only arises in a very straightforward way: from the non-splitting of the cyclic group over its subgroup of order 2. This answers a question posed by myself, A. Ivanov and D. Macpherson in 1997. This work is being written up as a joint paper between myself and Elisabetta (and I have to admit that I am responsible for the delay in the production of this paper!).

Though her background was originally in Algebra, Elisabetta has acquired a sound knowledge of contemporary model theory, including stability theory. She has given some very polished talks to our seminars here (both the Logic seminar and the general Pure Mathematics seminar. She is currently visiting UEA and we are working on Hrushovski's paper on Groupoids and Generalized Imaginaries where we hope to understand more about the connection between finite covers and higher amalgamation problems. I very much enjoy having Elisabetta to visit us here at UEA and working with her, and I strongly recommend her to you for your consideration.

Yours faithfully,