mentally different: the behaviour of superfluid ^{4}He in narrow gaps. This might contribute to the knowledge of transfer phenomena.

The behaviour of superfluids is not as well known as capillarity of a normal viscous wetting liquid. The viscosity of superfluid helium is zero. This provides a method[2] to detect and to estimate the size of sub-microscopic pores in solid materials as well as in small, packed grains. Those materials with small enough pores and through which only the superfluid helium flows are called superleaks.

When liquid ^{4}He is cooled to a temperature of 2.17 K, the λ point, there is a phase transition, and some of the liquid becomes superfluid. As the temperature decreases further, the proportion of superfluid increases. The temperature at which the superfluid starts to flow through a superleak is called the onset temperature and is always below the transition temperature. The difference between the two temperatures is the 'depression of the transition temperature'. The smaller the pores the lower the onset temperatures.

The channels through a superleak are not uniform but are at random, interconnecting each other. If φ_m is the minimum diameter along a connection path, then the largest φ_m of all possible paths determines the onset temperature, because in that diameter superfluid movement will occur first, that is, at the highest temperature below the λ transition. This is a 'size effect' and arises from interactions between excitations of quasi particles of the liquid helium and the solid. When the temperature is high and the gap or diameter is small, the interaction is equivalent to the presence of viscosity. The number of excitations diminishes with the temperature.

To estimate the widths of the gaps, or the 'diameters' of the pores through which the superfluid penetrates the superleaks, the following two relationships between the depression ΔT_λ of the transition temperature and the width d of those gaps are used

$$\Delta T_\lambda \simeq -\frac{2\times 10^{-14}}{d^2}\ \mathrm{K}$$

$$\text{or } \Delta T_\lambda \simeq -\frac{2.5\times 10^{-11}}{d^{3/2}}\ \mathrm{K}$$

if d is expressed in cm. The first relationship was derived by Ginzburg and Pitaevskii[3] and the second, which seems to be more consistent with the experimental data, by Mamaladze[4]. It was, however, pointed out[5] that the width of a parallel-sided channel, which probably occurs most frequently, is $2d$. Using this latter criterion and the two expressions given above, the width of the channels in a granite and a limestone, which were found to be superleaks, was estimated for both between 34 Å and 22 Å (ref. 6) and the onset temperatures measured were 1.48 K and 1.45 K, respectively.

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Antibiotic resistance in laboratory workers

RECENT publications by Williams Smith[1] and Anderson[2] have been concerned with the ability of *Escherichia coli* K12 to survive in the human alimentary tract. This is a matter of importance since a detailed knowledge of the behaviour of this much used *E. coli* strain is needed to assess the potential hazard of many genetic engineering experiments.

In this department we have monitored the faecal flora of laboratory workers engaged in work with R-plasmids to see whether they have ever excreted the K12 strains with which they were working, or other *E. coli* carrying plasmids which were being studied in this laboratory. Most of our experiments have involved a restricted number of R-plasmids (Table 1) in *E. coli* UB1139, a nalidixic acid-resistant derivative of *E. coli* K12.

A total of 52 samples was taken from the two individuals under study during a period of 184 d. Suspensions of faecal material in physiological saline were plated on McConkey agar to determine the total coliform count, and on agar containing either ampicillin (25 μg ml^{-1}), streptomycin (10 μg ml^{-1}), tetracycline (25 μg ml^{-1}), chloramphenicol (25 μg ml^{-1}) or nalidixic acid (30 μg ml^{-1}). Resistant colonies arising on these plates (if any) were then tested for indole production in peptone water, and for acid+gas production in McConkey broth after overnight incubation at 44 °C (refs 3 and 4). If available, ten resistant colonies from each plate were O-antigen typed[5] and tested for the transferability of their resistance patterns by mating with a standard *E. coli* R$^-$ (ref. 5). In all, 590 isolates were examined in this way.

A total of 38 R-plasmid carrying *E. coli* have been isolated so far, and seven different resistance patterns have been encountered (Table 1). None of these resistant *E. coli* was UB1139, nor were the resistance patterns encountered those of the plasmids used for experimental purposes.

The workers concerned in these studies used conventional procedures for testing low risk bacteria[6,7]. Mouth pipetting was not used but experiments were conducted in the open laboratory. These results therefore reinforce the views of Williams-Smith[1] and Anderson[2] that *E. coli* K12 lines are unlikely to establish themselves as major components of the faecal flora of workers handling these bacteria so long as reasonable laboratory procedures are used.

Table 1 Comparison of the resistance patterns of the plasmids isolated from faecal samples with the patterns of the experimental plasmids used by the workers concerned

Faecal samples		Experimental plasmids	
Pattern	No. of times isolated	Plasmid	Pattern
Tc	23	R*ldrd*19.K1	Kn
Sm Su	3	R46	Tc Sm Sp Ap Su
Tc Su	1	R55-1	Su Cm
Sm Ap Su	1	R64-11	Tc Sm
Tc Sm Su	8	R100-1	Tc Sm Su Cm
Tc Sm Ap Su	1	R388	Su Tp
Tc Sm Ap Su Cm	1	R391	Kn
		R751	Tp

Total number of isolates examined: 590. Abbreviations for resistance markers: Tc, tetracycline; Sm, streptomycin; Ap, ampicillin; Su, sulphonamide; Cm, chloramphenicol; Sp, spectinomycin; Kn, kanamycin; Tp, trimethoprim.

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