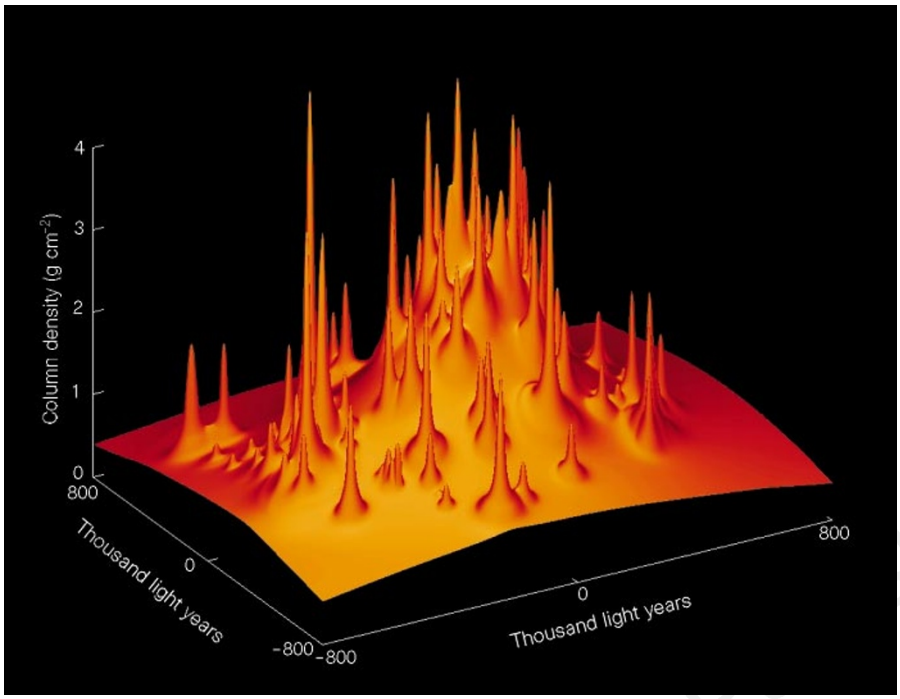

Figure 1 **Profile of a lens. This is a projected density plot of the galaxy cluster CL0024+1654, inferred from the cluster's gravitational effect on the images of more distant objects. (The sharp peaks are added to mark single galaxies in the cluster.) The mass in the cluster is less centrally concentrated than theories predict. Is this just an unusual cluster, or could it be a sign of the existence of 'hot' dark matter?**

galaxies, including the intracluster plasma. Because the plasma is known to be less centrally concentrated than the dark matter, its effect on the mass profile would tend to reconcile theory and experiment.

New fundamental physics is always more fun than new astrophysics as a solution to cosmic mysteries. A possible solution from this category is that the dark matter is not all cold. A hot, relativistic component would have too low a phase space density to create a very cuspy potential[6], so it would lower the inner parts of the cluster density profile, perhaps enough to satisfy the observations[7]. The new evidence for flavour oscillations of atmospheric neutrinos from Super-Kamiokande[8], discussed in these pages by Frank Wilczek[9], may mean that neutrinos have enough mass to do this.

More mundane solutions exist, of course. Tyson and colleagues use a complex fitting procedure, summing the effects of many individual mass concentrations ('mascons'), and end up with a model that has 512 free parameters — a frighteningly large number. One might be suspicious of finding a global best fit in such a large parameter space. But the much larger number of independent pixels (3,800) in the multiple galaxy images provides the grist for this modelling mill; and the end result, that just two superimposed mascons contain 98% of the non-galaxy mass, has a ring of trustworthiness about it.

Finally, 0024+16 may just be a bad egg. Because of their immense gravitational fields, clusters are constantly attracting and swallowing nearby cosmic debris. When smaller objects are absorbed they usually plunge near to the heart of the cluster while gravitational tides deform and ultimately dissolve them. If 0024+16 is in the process of digesting such a snack, that would invalidate comparison with simulation predictions that select against such objects.

What is ironic about this finding is a sense of inverted déjà vu. Only a few years ago, Tyson and co-workers stirred up the waters by revealing cluster cores that were *more* centrally cusped than the ageing, but still popular, theoretical model then in use. That finding helped spur the theoretical investigations that resulted in the universal density profile's enshrinement. Let's see: first time to the well came up too sharply cusped; second time, not cusped enough. One more time, perhaps, and it will come out just right. □

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100 YEARS AGO

In India, as elsewhere, the general doctrine of disease prevails that all abnormal and morbid states of body and mind are caused by *demons*, who are conceived either as attacking the body from without, or as temporarily entering the body of man. The consequence is that primitive medicine consists chiefly in chasing away or exorcising these hostile spirits. This is done, in the first instance, by *charms*. The spirit of the disease is addressed with coaxing words and implored to leave the body of the patient, or fierce imprecations are pronounced against him, to frighten him away. But these charms, powerful as they are (in fact, there is nothing more powerful to the primitive mind than the human *word*, the solemn blessing or curse), are yet not the only resource of the ancient physicians or magicians. From the earliest times people had become aware of the curative power of certain substances in nature, especially of herbs. … The principle that *similia similibus curantur* prevails throughout the whole range of folk-medicine. Thus dropsy is cured by water.
From *Nature* 7 July 1898.

50 YEARS AGO

Previous methods do not appear to give any indication of how to distinguish between young and old Colorado beetles, except during the first few days following the emergence of the young beetle. I have found evidence that it is possible to separate young and old beetles for a period of at least fourteen days after the emergence of the young adult by means of colour changes in the membranous wings. This fact is of considerable practical importance and assistance to entomologists, especially in countries where the beetle has not yet become an endemic pest. … The membranous wings of the fresh emergent are transparent and devoid of colour, while those of the mature beetle are red except for the apex and anal border of the wing. The wings remain colourless for at least four to five days after emergence, and afterwards develop a pink colour which gradually deepens and diffuses over the greater part of the wing surface … until the pink colour has given place to a distinct red hue.
From *Nature* 10 July 1948.