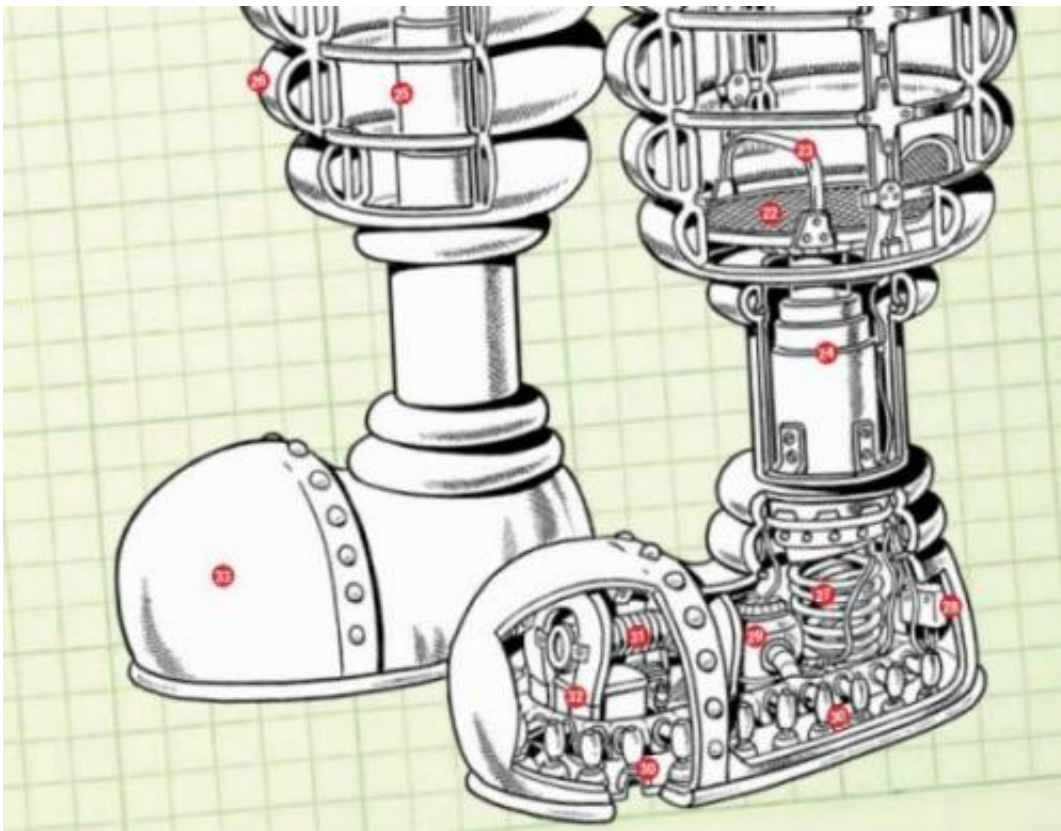


Students show Wallace and Gromit 'Wrong Trousers' are scientifically possible for a short period of time

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Detailed drawing from the Haynes manual of the boot part of the trousers. 30 indicates the vacuum tubes. Credit: University of Leicester

In the classic 1993 Wallace & Gromit film *The Wrong Trousers* Gromit receives a pair of ex-NASA robotic Techno Trousers from Wallace for

his birthday which allows for its wearer to walk on walls – and physics students from the University of Leicester have found that scaling walls and ceilings using the technology would indeed be scientifically possible, albeit for a short period of time.

The group of fourth year students from the Department of Physics and Astronomy examined what suction is required to allow a fully grown man wearing the trousers to walk on the ceiling without losing contact.

They calculated that the vacuum generator in the boots of the trousers, if powerful enough, would allow for a level of suction that could allow people to see the world upside down.

Katie Raymer, 22, from Whitstable, explained: "To walk on walls and ceilings it will be necessary for the trousers to be able function with only one of the boots in contact with the ceiling as well as both. All the simple calculations in the study were worked out with one boot supporting all the weight.

"In order for the vacuum generator in the sole of the boots to work, we assumed there is a slightly raised rubber insulator surrounding the boot of the trousers. This would create a cavity which has a lower pressure than the surroundings when the vacuum is applied.

"We observed the difference in pressure between the atmosphere and the cavity and found that the vacuum generator needs to be powerful enough to reduce the atmospheric pressure inside the boot cavity by approximately 18% in order to create a vacuum capable of supporting Wallace and the trousers. This corresponds to a low vacuum, which has a similar strength to a [vacuum cleaner](#)."

Student Ben Jordan, 22, from Bury St Edmunds, added: "Although this is a feasible vacuum required, the main issue that arises is that the trousers

operate from a rechargeable battery. So by making a quick comparison with a wireless vacuum cleaner with a similar strength, the operating time would only be around 20 minutes."

In the film Gromit uses the trousers to help him paint the ceiling – and in this scenario the trousers could be connected to a mains electricity supply and would function well.

However, the trousers are also used to scale a building and steal a diamond from the city museum, which would likely take considerably longer than 20 minutes in real life, and could result in a sticky end for the unfortunate wearer of the trousers.

The students encountered a further challenge when assessing the feasibility of the mechanical leggings.

Tom Morris, 22, from Chelmsford explained: "Originally the trousers were designed for use by astronauts for spacecraft repairs and other extra-vehicular activities. As the spacecraft would be in freefall at this altitude, there will be no acceleration relative to the spacecraft. The pressure in outer space is very close to a perfect vacuum.

"In order for the trousers to work, the pressure that needs to be created in the boot needs to be less than this. Achieving a pressure which would be lower than the local environment in space would be very complex and beyond the capability of the vacuum generator in the trousers."

However, it is likely that the magnetic generators would still be able to function in outer space – and thus in theory the techno trousers could work both on Earth and in space.

The students presented their findings in a paper for the *Journal of Physics Special Topics*, a peer-reviewed student journal run by the

University's Department of Physics and Astronomy. The student-run journal is designed to give students practical experience of writing, editing, publishing and reviewing scientific papers.

Course tutor, Dr Mervyn Roy, a lecturer in the University of Leicester's Department of Physics and Astronomy, said: "Every year we ask each student to write around 10 short papers for the *Journal of Physics Special Topics*. It lets the [students](#) show off their creative side and apply some of physics they know to the weird, the wonderful, or the everyday."

Student Oliver Youle, 22, from Nottingham, added: "Every other module that we do is a lot more serious and so the *Physics Special Topics* module was nice in order to do something different – allowing us to apply basic physics to something a bit more fun."

More information: The full paper, "'It's the wrong trousers Gromit!' Part 1' can be found at: physics.le.ac.uk/journals/index/article/view/651/437

Provided by University of Leicester

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