

# New Scientist

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## Analysis Space exploration

### Battle of the billionaires Elon Musk's SpaceX has won a NASA contract to land humans on the moon. Do his rivals, including Jeff Bezos, have cause to complain, asks Leah Crane

SPACEX is going to the moon, and its competitors are complaining. On 16 April, NASA announced that it had selected Elon Musk's space-flight company to build the lunar lander that will take humans to the moon's surface as part of its Artemis programme.

SpaceX beat out two rivals that hoped to secure the \$2.9 billion contract – defence firm Dynetics and private space-flight company Blue Origin – both of which have now filed complaints with the US government alleging that the selection process was unfair.

Experts in the space community had expected NASA to select two of the three finalists vying for the contract to continue working on their landers, as it did with the capsules that were developed to shuttle astronauts back and forth to the International Space Station (ISS). The reasoning behind this is twofold: it encourages competition in the space industry and it gives NASA a backup plan in case one of the projects doesn't work.

#### Only one winner

But NASA barely had enough money to hire one firm to build a moon lander, let alone two. It only managed to do so by renegotiating its payment schedule with SpaceX, which submitted a plan that was less than half as expensive as those of the other two firms. In NASA's assessments of each company's management and the technical plans in each proposal, SpaceX was rated higher overall than its competitors.

But Blue Origin, led by Jeff Bezos, took issue with the decision. A statement from the company said: "NASA



PABLO MARTINEZ MONSIVAIS/AP/SHUTTERSTOCK



JOHN RAOUX/AP/SHUTTERSTOCK

**Jeff Bezos (left) and Elon Musk (right) are two of the richest men in the world, and they both own private space-flight firms**

has executed a flawed acquisition for the Human Landing System program and moved the goalposts at the last minute. In NASA's own words, it has made a 'high risk' selection. Their decision eliminates opportunities for competition, significantly narrows the supply base, and not only delays, but also endangers America's return to the Moon."

Dynetics also released a statement saying it "has issues and concerns with several aspects of the acquisition process as well as elements of NASA's technical evaluation", and it has filed a protest with the US Government Accountability Office to address them.

After the protests were filed, Musk tweeted poking fun at the fact that Blue Origin hasn't sent a rocket into orbit yet – all of the company's flights have been suborbital so far. In contrast, SpaceX has already sent its Falcon 9 and Falcon Heavy rockets into orbit 117 times. It has flown humans

to the ISS three times, while the other firm selected for that programme, Boeing, has yet to send even a test capsule without a crew to the station successfully.

The craft that SpaceX is developing for NASA's lunar landings is a modified version of its Starship rocket, prototypes of which are being tested in Florida regularly.

All of this is to say that without the budget to select two lunar landers, SpaceX seems to be the obvious choice. While it may not have the historical expertise of the team of major space-flight companies that Blue Origin has assembled, its more recent accomplishments

**\$2.9bn**  
Value of SpaceX's contract with NASA for a crewed lunar lander

demonstrate that the firm is doing just fine without recruiting others to come in and help.

Regardless of scuffles between two billionaires, someone will have to land humans on the moon for the first time since the final Apollo mission in 1972, and it is pretty clear that Musk is determined to win out. ■

## Health

### A baby's first stool reveals risk of allergies

Clare Wilson

**CHILDREN** could be set on a path to developing allergies before they are born. Analysis of a baby's first stool, known as meconium, shows that those with a lower diversity of biochemicals or gut bacteria are linked with a higher risk of allergies and other conditions.

Allergic conditions such as food allergies, hay fever, asthma and eczema are caused by the immune system overreacting to harmless compounds in the environment. Many studies have found links between such immune system reactivity and a lower diversity of gut bacteria, or microbiome. One idea is that a diverse ecosystem of beneficial bacteria helps to "train" the developing immune system to tolerate non-harmful compounds.

Charisse Petersen at the University of British Columbia in Canada and her colleagues analysed the meconium of 100 babies. Meconium isn't normal faeces, but a mixture of substances that entered the baby's mouth in late pregnancy, such as amniotic fluid, skin cells and substances made by the baby's skin.

Chemically, it includes a range of fatty molecules, amino acids and other compounds from the mother's diet. "Meconium is kind of a time capsule because it contains all of the molecules that the baby was exposed to," says Petersen.

Most allergic conditions develop in later childhood, so to get results when the infants were 1 year old, the team did a skin test to measure the immune system's reactivity.

The quarter of the group with the most chemically diverse meconium had half the risk of an overreactive immune system, compared with the quarter who had the least variable meconium. There was a similar-sized link between diverse gut bacteria in the meconium and later immune reactivity (*Cell Reports Medicine*, doi.org/f9f5). ■