Why did NASA hire chemists to try to recreate the *smell* of outer space?

Astronauts have reported distinctive smells in space, from gunpowder to ozone to burnt steak, and NASA wants astronaut trainees to be able to tell the difference between the *normal* smells of space, and potential onboard hazards like a chemical leak.

Now, time out — how can outer space *have* a smell? Even if your nose didn't freeze off when you removed your helmet, smells come from particles in the air … and in the vacuum of space there *are* no particles, and there is no air … right?

Actually, not really. While the particle density is much lower than in Earth's atmosphere, it's far from zero. Within the solar system, the average is five to forty particles per cubic centimeter. Some of these particles latch on to astronauts' spacesuits during extravehicular activities, and get carried back into their vehicles with them where they can then be smelled.

So why *those* smells? Chemists think that individual oxygen atoms combine with O2, the astronauts' breathing oxygen, to form O3, resulting in the ozone smell. The burnt steak smell probably comes from another particle common in outer space — polycyclic aromatic hydrocarbons, which are also produced when — you guessed it — you accidentally burn a steak to a charcoal-y crisp.