

SCIENCE

UNIT 3

(SUMMARY)

SECTION	In this UNIT you will develop your			
	LISTENING SKILLS	SPEAKING SKILLS	READING SKILLS	WRITING SKILLS
Introduction	Listening to answers and comprehending them in a natural setting	- Interviewing people - Framing questions to elicit desired response and responding to questions appropriately.	- Understanding written instructions - Transcoding information from verbal to diagrammatic form	Completing a table
(A) Promise for the future: Renewable Energy	- Listening to an oral presentation for information required for a specific purpose - Listening to take notes.	Making an oral presentation clearly and confidently	- Identifying the main points of a text - Analysing, interpreting and inferring the ideas in a text.	- Writing a description of a process - Writing an e-mail
(B) Plugging into future		- Presentation: Making an oral presentation clearly and confidently - Presenting an advertisement effectively.	- Reading to extract information for a specific purpose - Analysing and evaluating the ideas in a text. - Interpreting texts by relating the information in them to the objects described.	- Writing an advertisement - Writing a description of an object.
				Words related to travel and pollution.
				Words related to new inventions
				Words related to gizmos.

SECTION	In this UNIT you will develop your				
	LISTENING SKILLS	SPEAKING SKILLS	READING SKILLS	WRITING SKILLS	VOCABULARY
(C) Space Travel		Speaking intelligibly using appropriate word stress, sentence intonation patterns.	Identifying the main points of a text.	- Writing a speech. - Writing a report	Words related to space travel.
(D) Letters from the Planet Aurigae II	Understanding and interpreting spontaneous spoken discourse.	Group/Class discussion	- Identifying the main points of a text - Anticipating and predicting what will come next in a text. - Analysing, inferring and evaluating the ideas in the text.	- Writing an informal letter. - Writing a science fiction story	Words related to life on alien planets.

Introduction

From Carelessness to Car-Lessness

The harmful gases emitted into the atmosphere from the vehicles are polluting the environment, especially the air we breathe. All of us have to take action individually and collectively to reduce air pollution as much as we can. So be an eco-journalist and do your bit to help reduce air pollution. And the first step towards saving the environment is to know where we stand.

Carrying out a door to door survey

- * Find out how your friends and neighbours commute to school or office
- * Interview at least 10 friends or neighbours who commute to school or office by personal cars
- * Find out if they would be ready to switch to a non-polluting mode of transport, like a bicycle, if their schools or offices are not too far away.
- * Find out if they would like to join a carpool or travel by public transport. Do not forget to mention the advantages of shifting from the use of personal vehicles, such as reduced pollution, savings and companionship.
- * If they are not interested and would like to continue travelling in their private cars, ask them the reasons why would they not make the change.

After collecting all the data, fill in a table like the one given below:

Respondent number	Type of car (small, big, SUV)	Fuel (petrol, diesel, CNG, any other)	Number of people travelling in car	Is the mode of transport polluting? Y yes; N no	Would consider change in transport? specify carpool or bus or bicycle	Cannot change their mode of transport	Reasons for not using public transport or car pooling or bicycle

At the end of your survey, find out how many interviewees are now travelling by bicycle, public transport, or car pool and how many have decided not to do so.

- * Number of people interviewed
- * Number of people who commute by private car
- * Number of people who have agreed to change their mode of transport
- * Number of people who now travel by public transport
- * Number of people who have joined a carpool
- * Number of people who are now cycling to work
- * Number of people who have not changed their mode of transport

A. PROMISE FOR THE FUTURE: RENEWABLE ENERGY

A1. In A.2 you will read about alternate sources of energy. Before doing so find out how much you already know about renewable sources of energy. Complete column A, to indicate whether you think each statement is True (✓) , False(X), or whether you do not know(?) After reading the passage, complete column B in the same way.

Statements	(A)	(B)
a. Solar energy is a powerful source of energy		
b. Electric battery operated cars are more powerful than those run on fossil fuels		
c. EV stands for electric vehicles		
d. Driving an electric vehicle is stressful		
e. Solar power can be the next source of pollution in the world		
f. India is one of the countries with a great potential for generation and use of solar energy		
g. Using alternate sources of energy can help India save a lot of money spent in foreign exchange		

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A2. Read the article:

Solar Power

With energy consumption being the buzzword in developing economies around the world, fears of an energy crisis looming ahead are not totally unfounded. The non-renewable nature of fossil fuels makes complete dependence on these for future energy needs, a very dicey affair. Renewable energy sources are the best bet in the scenario. And what can be a better renewable energy resource than the sun?

In a country like India, if the abundant amount of sunlight available is harnessed properly it could mean an end to the energy crisis. It is the most abundant source of energy. The average global solar radiation is around 5 kilowatt hours (KWH) per square meter per day with the sunshine hours ranging between 2300-4300 per year. India is in the sunny belt of the world. The country receives solar energy equivalent to more than 5000 trillion KWH per year, which is far more than its total annual energy consumption.

Besides, it is a renewable and clean energy source. Taking both environmental and economic cost, solar energy works cheaper than fossil fuel resources. Once we master techniques to harness solar energy, it can be a vital source of power on all planets.

Solar energy can be a viable source of power generation for the next 1000 crore years. There are many technologies available for conversion of solar energy into solar power. For instance, solar photovoltaic (SPV) technology, photo galvanic cells, solar steam generators (solar concentrating power), solar tower or solar chimney, radio micrometers and thermopile are some of them.

Electric motors

Imagining a future where clean air is no longer a dream and our cities are not smog filled concrete jungles, this could well become a reality in the coming years if the world begins to increasingly adopt the use of cleaner options like alternate-fuel vehicles.

The rise in economic activity and the burgeoning population have led to a tremendous demand in the transport sector, especially in urban India. By 2020,

India's urban population is expected to grow five fold to a staggering 200 million while pollution is expected to grow seven times. With this tremendous growth has emerged a very critical issue of keeping air and noise pollution in urban areas under control.

If we can have three lakh electric vehicles (EVs) on the roads by 2020 including three wheelers, cars and scooters, we would have reduced pollution by 16 lakh metric tones, saved ₹ 3700 crores in foreign exchange earnings and substantially reduced healthcare costs.

Small electric buses, three wheelers and electric scooters are ideal for city mobility in India but it could take between 5-10 years before they become viable for commercial use.

The electric vehicle uses electric energy which is stored in batteries that feed the electric motor. Driving an electric vehicle is easier and more relaxing than a traditional one because it has no speed-gear and functioning noise. It is enough to turn the key and press the acceleration pedal; you need only two driving pedals- accelerator and brake.

The need to reduce air pollution along with the availability of new advanced batteries have allowed EVs to reappear as a clean alternative to internal combustion vehicles. Electric drive systems are virtually non-polluting and extremely energy efficient. While internal combustion vehicles can convert about 20% of the chemical energy in gasoline into useful work, 75% or more of the energy from a battery has productive power in an electric vehicle.

Electric motors can also provide power at almost any engine speed. While internal combustion engines must be revved up to high rpm to achieve maximum power, electric motors provide nearly peak power even at low speeds. This gives electric vehicles strong acceleration performance from the start.

The emergence of newer batteries has driven the cost and performance of EVs. There are several major types of automotive batteries available and under development, from advanced lead acid batteries like those that start our internal combustion engines to lithium polymer batteries. Although recharging could be considered as a matter of concern, home recharging systems are available giving

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EVs an added advantage.

Apart from being environment-and -user friendly, there are several other reasons for alternate fuel cars to flourish in India. Firstly, electricity for EVs can be produced from various sources for which India has natural resources and does not need to depend on the import of oil. Although EVs will not replace LPG, CNG or petrol and diesel for intercity use, the infrastructure required for EVs in the form of electricity distribution infrastructure, is already available in all the major cities and minimum costs are required to install additional capacity.

EVs are zero polluting, easy to handle and have low maintenance costs. EVs do not degrade with time and they are always zero polluting unlike conventional vehicles where the pollution increases with engine degradation, poor maintenance and adulterated fuel. India also has the maximum market potential for EVs owing to an established auto component infrastructure, low manufacturing and R&D cost, mechanical hardware availability, high urban congection and the presence of domestic market. The industry has significantly gained from rising exports since 2010, and with appropriate government support, can transform the landscape of urban India by reducing pollution, improving public health, creating employment opportunities and impacting society.

In order to do that, a holistic approach involving the government, public and auto majors is needed to promote EVs in India. Appropriate government policies during the next five years and adequate support from business houses and institutions, for instance, purchasing a fixed percentage of vehicles for their fleets and offering subsidies and tax exemptions, will go a long way in promoting the industry in India.

Finally, people have to become more informed about these technologies. The media must play its role in educating the public about alternate fuel vehicles and their advantages.

A.3 Now go back to A.1 and complete column (B). How much did you know already before you read the article?

A.4. Complete the following blanks with information from the passage:

- a. India receives 5000 trillion KWH/year which means.....
- b. The advantages of using solar energy instead of fossil fuels is that it is.....
- c. It is important to find means of keeping air and noise pollution in urban areas under control because.....
- d. Tax exemptions and subsidies are required to.....
- e. The media can help by.....

A.5 Copy and complete the following table with the required information from the passage

Points of comparison	Internal Combustion Engine	Electric Motors
1. Pollution		
2. Engine efficiency		
3. Peak power generation		
4. Recharging		
5. Maintenance		

A.6 Based on your reading of the passage say whether the following statements are True or False:

- a. EV's have the potential to flourish in India
- b. EVs degrade with time
- c. EVs can create health hazards
- d. EVs cannot drive fast because they have only two pedals
- e. Solar power will not last for a very long time in our country
- f. Establishing Solar Power generating units is too expensive

A.7 From page no. 244, your teacher will read out about a presenter discussing three new inventions-The Solerickshaw, the Green Phone and the Solar Water Purifier. As you listen complete the notes given below:

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Solar Powered Inventions

I. Solerickshaws

1. Features
 - i.
 - ii.
 - iii.
 - iv.
2. Designed and developed by

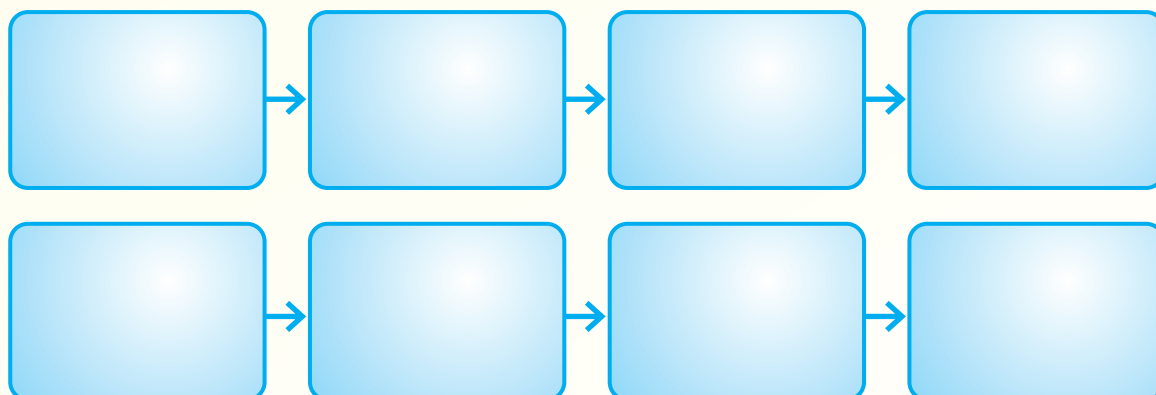
II. Green Phones

1. Blue Earth developed by.....
 - i. back with.....
 - ii. made from.....
 - iii. CO₂ emissions monitored by.....
 - iv. fits into.....
2. Coral 200
 - i. powered by.....
 - ii. fits.....
 - iii. made by
 - iv. talk time..... for everyof sunlight
3. LG
 - i.mins. of talk time forof sunlight
 - ii. Bluetooth solar car kit called.....
 - iii. features
 - i.
 - ii.

III. Solar water purifier

1. first type features
 - i.
 - ii.
2. second type features
 - i.
 - ii.
 - iii. process of distillation
 - a. water heated by.....
 - b. water condenses on.....
 - c. impurities collected in
 - d. water collected in.....
 - e. from trough into.....
 - f. germs and bacteria killed by.....

A.8 You have listened to a presentation on three new inventions. one of them is solar water purifier. The stages of water purifier can be set in a flow-chart. Copy and complete the following flow chart with the stages in their correct order.



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- * impurities of water remain in the box
- * sun rays heat the water
- * box filled with unpurified water
- * solar panel is placed on top of a rectangular shaped box
- * water condenses on the underside of the solar power
- * slope of the panel allows water to be collected in the trough.
- * bottles collect water from trough

A.9. Now read that portion of the listening text describing the solar distillation system:

The solar distillation system has a solar panel placed on top of a rectangular shaped box. At first the box is filled with unpurified water. Next, it is exposed to the sun rays which heats this water. Then the pure water droplets condense on the underside of the solar panel leaving the impurities in the box. The pure water now runs into a trough which is connected to collection bottles. Additionally, the ultra violet rays from the sun kill the germs and the bacteria in the water.

You will notice that each sentence is connected with the next one and when we describe a process we use sequence markers like- *at first; next; then; now; additionally;*

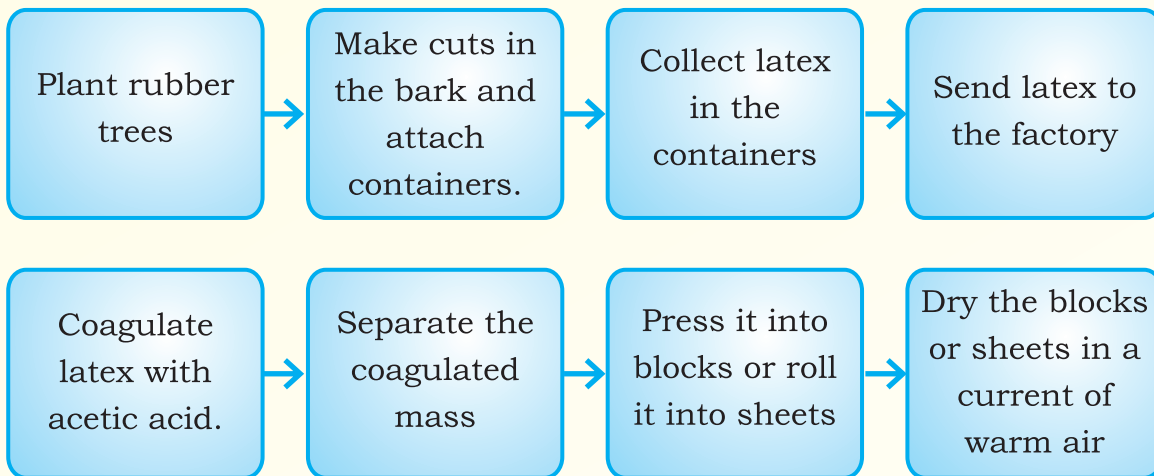
The other commonly used sequence markers are

- * first, second, third----
- * at the same time, simultaneously—
- * finally, lastly, in the end, to conclude—

You may also have observed that the writer has used a combination of Active forms (e.g. the water droplets condense on the underside of the solar panels) to emphasize the 'doer' of the action and Passive forms (e.g. the box is filled with unpurified water) when he wants to stress that the action '*is filled*'.

Another feature of a process description is that the writer normally uses the simple present tense, because he describes what always happens in the particular process.

- A.10. Below is a flow chart describing the process of making rubber. With its help complete the process description that follows it. Remember to use the simple present tense, a mixture of actives and passives, and to add sequence markers where you see***



First rubber trees in deep soil.*. when the trees ..., fully, the bark of the tree and containers The latex and is to the factory. Here it by treating it with acetic acid* the coagulated mass It is then into blocks or into sheets. * in a current of warm air.

Check: What tense did you use? Did you use sequence markers? Did you use a mixture of actives and passives?

- A11. You have been gifted a new cell phone which is powered by solar energy. Write an email to your friend describing the phone and all its exciting features. You may use the notes that you have made in A.7**

B. Plugging into future

- B1. In this section you will read about the old gizmos, which your father or grandfather would have used. Try to compare these gizmos with the ones you have been using. Work in pairs and discuss the change.**

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Sunday Times of India, New Delhi, January 02-2011

(Article by B. Pradeep Nair)

Yesterday's gizmo is today's junk

More things have changed in the last few decades than in any other period of time. Many common-place utility gadgets have been dying off faster than one would have imagined. In fact, in the past few decades, a number of technologies have become so obsolete that it is difficult to even imagine we were, once upon a time, so contended with them.

Here are five of those which have vanished without a trace:

Floppy disks: Computer CPUs had a slot where this could be inserted. Text and pictures could be copied on it and carried. It was notorious for its susceptibility to get infected by viruses that got passed on to PCs when it was inserted. The most common 3-1/2 disk had a storage capacity of 1.44MB. Now, these have been replaced by CDs DVDs and pen-drives that have higher capacity to carry. Of course, with cloud computing catching on at a fast pace, even these face extinction.

Pager: The user had a number to which someone could send a short message via the paging company. It became very popular in the 1990s because it was the first portable communication device for the ordinary consumer. Typically the message sent on pagers were like. "call me on (some landline number)" or "reached home" etc. Pagers soon lost out to mobile phones once they became affordable.

Valve radio: One 'got stations' by turning the tuning knobs. The concept of fine tuning never existed. Like a refrigerator, a radio had its place in a house; it was too big to be portable. Often the radio used to be switched on right in the morning and switched off only when it was realized that no one was paying any attention to it. The radio also functioned as a clock - people timed their schedules with the beginning or end of popular programmes.

Gramophone plate: There was a stick-like lever that one kept over the disk so that the tiny needle at the end of that lever made contact with the invisible grooves on the disk. It then produced the favourite Mohd. Rafi and Kishore Kumar numbers.

There were different disks depending upon the speed of revolution (RPM for revolution per minute). The plates had their amusing offerings as well. One often heard singers mysteriously repeating the same line of a song many times, until someone realized that the needle had got stuck on the same track. So much for getting lost in a tune!

TV antennas: They were also status symbols so much so that it didn't matter if you had a cheap black and white TV or an expensive colour one. You had graduated into the next rung of the social ladder if you had one of those antennae sticking out of your roof. It was important to get its position right. And there were no sophisticated ways to do that: there was one guy on the rooftop, and another monitoring the reception in the living room; and through a sequence of 'yes-no', the final position was arrived at.

- B.2 Work in groups of four and give a one minute presentation on the latest gadgets that you have been using or your parents are using at home. Write any two advantages and disadvantages the new gadget has over the old one.**
- B.3 Here is a list of innovative inventions. Read them and match them with the visuals by writing the correct numbers in the blanks given by the side of the visuals.**

1. If you're looking to uncover a hidden treasure, then put your conventional metal detector to the side, and replace it with this pair of metal detecting sandals. Not exactly a trend setter, but a lot more practical than carrying a large pole around with you. The sandals are attached to a small black box, which can be strapped around one of your legs, concealed under your trouser leg.

The right sandal has an inbuilt copper coil, which is powered by the battery pack, which straps around your leg. Once the sandals approach within 2 inches of a metal object, you will be alerted in one of two possible ways. A light is flashed, and then either a vibration or a buzzing noise is emitted. The metal detecting sandals require a 9V battery, which does not come included, but which will supply 6 hours of detecting time. The sandals come in different sizes, to fit both men and women

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2. Occasionally a product comes along that simply blows our minds. We get to see a lot of crazy and sometimes brilliant inventions, but Laser Cosmos is without a doubt the most superb one we've seen. There is no product out there that comes even close to the sheer excellence of this galactic wonder - sorry to sound quite so effusive, but really, it's staggering.

Imagine lying in your room, and having the ceiling whipped away to reveal the vast outreaches of the cosmos whirling overhead, complete with misty blue nebulae (which you can turn on and off!) and the occasional shooting star. Fully adjustable and requiring no set up, this super powerful space projector scatters a random panoply of sparkling green stars that will fill any room from the tiniest bedroom to the largest warehouse with a crystal clear animated star display. What's so clever about this (apart from everything of course) is that it seems so three-dimensional, that the varying brightness of different stars makes some seem closer and others appear as if from distant galaxies.

Created from powerful green laser and holographic technology, such bright and clear display has never been available before. It's utterly mesmerising, and had us transfixed for hours (literally). Whether you're zoning out to music, throwing a party or just chilling, this stunning cosmic light show is like nothing we've ever seen before. Truly one of the most amazing light shows you will see anywhere.

3. Power naps are fantastic, and also proven to rejuvenate a person during the day. We all long for these power naps, but unfortunately there is never a bed around at the time, especially in the work place that leaves you nodding off with your nose pressed hard down against the desk. Did you ever dream of a portable bed which you could quickly assemble and then catch up on some much needed sleep? Well, the solution to such problems has finally arrived.

A German study which was undertaken in 2004 concluded that a daily power nap can be beneficial in the workplace as it would improve efficiency as well as the morale. Designed by four students to demonstrate these findings, the Nappak was invented. The Nappak is essentially an inflatable bed which comes complete with an air compressor and rollers, but it is at this moment merely a concept.

Adding such beds into the workplace will be rewarding for both the employees and employers, if these findings are correct - since efficiency and morale are the basis of any successful business organisation. Now if you'll excuse me, I'm off to take power nap.

4. Introducing the new LED umbrella. This new device comes equipped with a built in LED light which illuminates in the dark. At the touch of a button the light shines into action offering a safe and secure passage to your destination. The light is embedded inside the handle to lighten the area under the umbrella hood.

Be it day or night, this gadget has got you covered despite looking like a Star Wars light saber.

So for those of you who can't handle a long walk home in the dark, this LED umbrella is sure to make that walk a little bit brighter.

5. This alarm clock will be sure to wake even the heaviest of sleepers. The idea is simple; when the alarm is triggered, part of the alarm will fly and land at some random location in your room. Only when the an object is placed back on the stationary alarm piece will the alarm cease.

The flying piece takes to the air via rotating propeller blades which allows it to take off. The only way to silence the alarm is to physically find the propeller and position it back on the alarm, thus forcing the scope of bed.

A strange concept, but one which might just prove helpful to those who find it difficult on those Monday mornings.

6. Dragging your luggage around with you is a mundane and painful task, especially on the way back from an action-packed, or relaxing holiday. Well now you can stop pulling around your luggage and wheeling it back home, thanks to this new invention. This luggage bag is also a mini scooter, allowing you to scoot around with your luggage safely tucked away.

Just imagine a scenario when everyone else is carrying around their luggage, whilst you just jump on your scooter and pass them by, shortening your trip back home, and also making it a lot more fun. It's a simple idea, but an

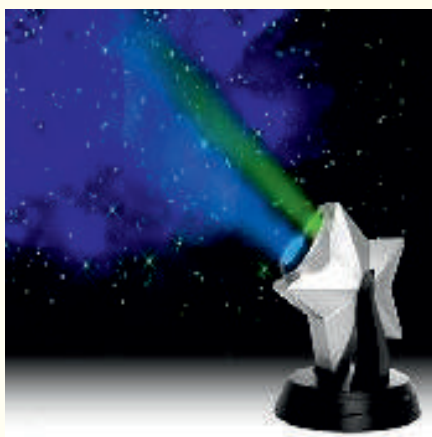
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extremely effective product, which we think will be immensely popular in the future, so look out in airports near you for scooters gliding past you from all directions.

The scooter also folds up, allowing you to use it as a normal luggage carrier, but why minimise the fun? The bag itself is rather small, so you may very well be able to use this for your on-board luggage bag.

Details about where this product is available and how much is it going to cost are currently unknown, but expect them to hit the market pretty soon.















B. 4 Your teacher will divide you into groups of four. Pick up any one of the inventions that you read above and create an advertisement for it. Remember to:

- * create a slogan
- * highlight its advantages
- * offer some discount/discounts

Now present the advertisement to the rest of the class as if you are promoting the product.

B. 5 In groups of four describe an innovative invention that you could make to lighten your burden at home or in school and present it to your class.

C. Space Travel

C.1. In this section you will read about the experiences of four women astronauts in space. Your teacher will divide the class into groups of four and ask each of the group members to read about one of the astronauts. In the end each of the group members will complete the table given below by exchanging information within the group.

C.2. Read the article:

4 Women Astronauts Talk About Space Exploration

By Julie Bain

Peggy Whitson

Age: 48

Astronaut since: 1996

Space time: Two six-month tours on the International Space Station, in 2002 and 2007-2008



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Imagine being in a confined space for six months with no easy means of escape and only a cosmonaut or two to keep you company. Peggy Whitson did it-twice, the second time as the first woman commander. The former Iowa farm girl racked up 377 days in space on two of her missions, more than any other U.S. astronaut. Her space walks totaled to nearly 40 hours, more than any other woman astronaut. She's now a walking laboratory for the long-term effects of zero gravity (zero-g) on the human body. And hers, by the way, is ripped like an Olympic athlete's.

Getting used to zero-g: "Fitness is a lot more important than strength. So is your ability to think in 3-D and intuit how to move objects in a different way than on earth. The second time I went to the station, it felt like coming home. I adapted and got comfortable much quicker."

The best zero-g side effect: "It's a nice plus that without the effects of gravity, everything is lifted while you're up there, so you look younger!"

Staying in shape: "With no gravity for resistance, muscles and bones deteriorate quickly up there, so every day we do an hour of cardio on a specially designed cycle or treadmill and an hour of resistance training. You need strength for space walks, as every motion works against the pressure of the space suits we wear, and it's very fatiguing. Exercising always made me feel more positive and upbeat afterward too."

Poetic moment: "As we orbited every 90 minutes, the view of the earth's curvature was incredible. You could see the layers of atmosphere extend beyond the surface to meet with the blackness of space beyond. It seemed impossibly thin, yet it carried all the shades of blue: closest to the planet a glowing blue, like sunlit water over white sand, extending to the deepest blue-purple mixture that holds the blackness at bay."

Returning to gravity: "At first, being back on earth is not pleasant. My agility and quick motions, like playing basketball and the timing to dribble and do a layup, were severely hindered. But I had my physical fitness assessment about a month after my return, and I'm back to preflight norm, which I'm really happy about."

Inspiration: "Exploration is a very important part of who we are, and if we want to literally expand our horizons, we have to keep doing it. Construction of the

International Space Station shows we can expand those horizons culturally as well."

Pamela Melroy

Age: 47

Astronaut since: 1995

Space time: Three shuttle missions, in 2000, 2002, and 2007

After Pam Melroy flew the shuttle into a tricky backflip within 600 feet of the space station to photograph the belly of the craft for damage, thereafter, she performed the pinpoint-precision feat of docking it with the station. The retired Air Force test pilot (and combat veteran) and her crew came on board to shouts and hugs from Whitson and her crew. It was a historic moment: the first time two women were in charge of two spacecrafts at the same time.



Melroy's mettle as commander was tested when, during deployment of a solar wing at the station, a guide wire snapped, tearing the wing and keeping it from providing full power. The world watched as fellow astronaut Scott Parazynski, MD, rode a boom for an hour and a half to reach the damaged area. He then performed a kind of delicate surgery for seven hours to cut the snagged wire and fix the torn parts. It worked.

On managing a crisis: "The night before the space walk to repair the solar wing, we were all gathered to go over the final list of issues. The whole crew was giving their input, and everyone was firing on all cylinders. I realized I didn't need to say anything. I kind of floated away and observed them. They were doing what they

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were supposed to do, pulling together, without needing to be guided in any way. That was the best moment for me."

On gender: "Twenty-five years ago, it would have been almost impossible to imagine that two women would be commanding two spacecraft at the same time. But Peggy and I just try to relax and have fun with it. The most important part for us is that we're good friends and we really enjoyed working together."

What she misses most: "The physical sensation of zero-g. It's magic. I do occasionally dream about it. It happens a lot within the first week or two of landing, and it can be profoundly disorienting, especially when you wake up and you're not sure where you are, in gravity or not. It is fun to go back and visit, though."

The value of the space station: "The immediate payoff is in industrial and medical applications from the sheer act of sending humans into this extremely hostile environment. The medium outcomes are working with other countries on long-term, complicated technological projects. We'll need that to go to Mars and the moon. Then the long-term payoff is the science of understanding how the human body operates in space and other developments that we may not understand or value till later."

Sunita Williams

Age: 43

Astronaut since: 1998

Space time: Six months on the space station in 2006-2007, including more than 29 hours of space walks

With her 195 days in space, Sunita Williams broke Shannon Lucid's previous endurance record-until Peggy Whitson broke both the women's records in 2008. Williams, a naval aviator and test pilot who grew up in the Boston area, also "ran" the Boston Marathon from the station



treadmill, with an unofficial time of 4 hours and 24 minutes (during which the International Space Station orbited the earth about three times).

On being a rookie: "Yes, it's unusual to stay in space for six months on a first flight. And yes, it's a little shift that you're going to be locked in a can with a couple of guys. But I embraced the idea. I mean, I prepared for almost eight years! All the training was definitely beneficial for living up there. And with my Navy background, I'd gone on deployments before, so I wasn't worried about leaving home for six months. The cosmonauts were very professional, and we all had mutual respect and understanding."

Flying versus walking: "I learned after about a week how to fly gracefully without going too fast or jerking around. I had a hard time remembering how to walk. I prefer flying!"

Daily exercise: "The treadmill harness is a little uncomfortable and takes some getting used to. I really like running outside and having the wind blow on you, even if it's hot and humid like in Houston. But I got into a routine. If you're healthy, your body can adapt to anything."

Her haircut: "Long hair can be troublesome in space. It sticks to everything, and I didn't want to have my hair floating all around the space station. So I decided to cut it as we were preparing to dock."

"I've had some friends who've had cancer and had to go through chemo. I know how traumatic that is, so I thought the least I could do was donate my hair. A friend's 12-year-old daughter had given her own hair to Locks of Love. So I put my hair in a plastic bag, sent it home on the space shuttle, and asked that someone give it to her. She donated it for me."

Tranquil view: "When you have that perspective of being far away and looking back at the planet, you don't see the hustle and bustle or the borders. You see a very peaceful place. Gandhi tried to instill the feeling of oneness in all of us. Seeing our planet from space, you understand that."

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Barbara Morgan**Age:** 56**Astronaut since:** 1985**Space time:** One shuttle mission in 2007

Biology teacher Barbara Morgan waited a long time for her shuttle mission: 21 years. Originally chosen as a backup for the NASA Teacher in Space Program in the 1980s, she trained with Christa McAuliffe before the tragic Challenger accident in 1986. Afterward, Morgan returned to teaching elementary school in Idaho but remained hopeful that, as NASA's Teacher in Space Designee, she'd get to fulfill McAuliffe's mission someday. Finally, in August of 2007, she blasted off in the shuttle Endeavour for a 13-day mission, even operating the space station's robotic arms during space walks. Although a worrisome puncture in the heat shield diverted some of the crew's attention for a while, Morgan was able to teach lessons via onboard video about life in space. She left NASA in August this year to become an educator at Boise State University in Idaho.



The biggest surprise: "No matter how I was situated the first day, my body felt like it was upside down. That might've been because all your fluids shift up to your head. And what memory do we have of being in that situation? It's like when we're kids, hanging upside down."

Another surprise: "I slept really well, even on the first night. On earth, when my mind is going, it's hard to relax and go to sleep. But I was amazed on orbit because the minute I strapped myself in, I fell asleep right away. The next thing I knew, I was waking up to the alarm."

The power of food: "Food gave us teachable moments to show Newton's laws and properties of liquids. It was fun. My favorite thing to eat was beef Stroganoff. The Russians shared some of their beef and lamb dishes, caviar, and cheeses, and that was very nice."

Gut reactions: "I found that for the first couple of days, I was staying hydrated and I wasn't very hungry. My gastrointestinal system seems to rely on gravity to a certain extent, and it sort of shut down. But the body adjusts."

Bodily functions: "Kids always want to know about the toilet. It looks similar to what we have on earth, but there are bars you put over your thighs to hold yourself down, and it uses fans that pull body waste away. There's a hose with a personal funnel attachment for male or female anatomy. The trick is to keep it tightly sealed so that things don't get away and float around. When we get asked, 'How do you go to the bathroom?' the answer is 'Very carefully.'"

C.3. Copy and complete the following table with information from the passage:

Name	Age	Year of becoming an astronaut	No. of space Journeys	Experience with zero gravity	Ways of staying fit	Memorable moments	What one has learnt from the travels
1. Peggy Whitson							
2. Pamela Melroy							
3. Sunita Williams							
4. Barbara Morgan							

C.4. Complete the following sentences with information given in the passage above:

- Peggy Whitson has been described as a 'walking laboratory' because
- Peggy feels that returning to earth is not a pleasant experience as
- Pam Melroy and her crew members were applauded when
- The historic moment during Pam Melroy's space flight was
- According to Melroy the space station is important because

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6. 'Being a rookie' means
7. Sunita Williams donated her hair because.....
8. Sunita Williams broke the record of.....
9. Barbara had to wait for her turn to go into space because.....
10. Morgan's work on the space shuttle was to.....

C.5. In your groups, find out about the famous Indian astronauts and their achievements. Is there any woman astronaut in India? Report your findings to the rest of the class.

C.6. You are very impressed by the achievements of the women astronauts and decide to give a speech on how Indian girls should also make a mark in this field. Write the speech. The following points may help you make your speech interesting:

- Start with a suitable salutation (Good morning.....)
- Think of an impressive introduction (a quote/a humorous story/questions, etc;)
- List out the points that appealed to you in the article
- List out the reasons why there are hardly any women in the Indian space programmes
- Think of ways in which this can be changed
- Think of an interesting conclusion

D. LETTERS FROM THE PLANET AURIGAE II

D.1 Have you read novels or short stories about life on other planets? What is this type of writing called?

Read the following extract from a letter received by someone on Earth from another planet.

Planet Aurigae II

Dear Pen Pal,

When I received your letter from the interstellar correspondence club, my first impulse was to ignore it. However, your description of Earth sounds exciting. I would like to live there for a while, and I have...

1. What does the letter suggest about its writer?
2. What do you think may happen between the writer and Pen Pal?

D.2 Now find out what happens, in this exciting Science Fiction story. The letter to Pen Pal continues.....

a.... suggestion in this connection, but I won't mention it till I have developed it further. I must introduce myself. I am a scientist on the Planet Aurigae* II. We have known for some centuries that there are other inhabited planets in the galaxy. Since I am allowed to experiment in my spare time, I have been amusing myself at communication with those planets. In fact, I have developed systems for intercepting communications between the planets in our galaxy, and have been able to draw your letter from the interstellar correspondence club.

You will have noticed the material on which this letter is written. It is a highly sensitive metal, very thin, very flexible, and I have enclosed several sheets of it for your use. Tungsten dipped in any strong acid makes an excellent mark on it. It is important to me that you write on it, as my fingers are too hot-literally-to hold your paper without damaging it. This is because the temperature on Aurigae II is more than 250 degrees Celsius. This must seem extremely hot to you, but (unlike you) we are not a hydrocarbon form of life, and we find 250 degrees Celsius very pleasant.

I'll say no more now. But before I close, I must tell you that I am a prisoner in the Aurigae jail. If you are still interested in writing to me, I shall be happy to continue the correspondence.

Skander.

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* pronounced "Our-ee-guy"

1. What does "a hydrocarbon form of life" mean?
2. What would a non-hydrocarbon form of life look like?
3. Why cannot Skander hold ordinary paper (from Earth)?
4. Why do you think Skander is in prison?

D.3

Planet AURIGAE II

Dear Pen Pal

Your prompt reply to my letter has made me very happy. I welcome your many questions, and I shall try to answer them all. However, I am not yet in a position to answer your question about how I plan to visit Earth, as my experiment has not yet proceeded far enough.

You are right in saying that it would be difficult for a being who lives at a temperature of 250 degrees Celsius to mingle freely with the people of Earth. This has never been my intention, so please relieve your mind. However, let us drop that subject for the time being.

I appreciate the delicate way in which you approach the subject of my imprisonment. But it is quite unnecessary. I have performed forbidden experiments upon my body in a way that is deemed to be dangerous to the public welfare, so charges have been laid against me. I have thirty more years to serve. It would be pleasant to leave my body behind and tour the universe-but as I said, we'll discuss that later.

I wouldn't say that we're a superior race. We have certain qualities which apparently your people don't have. We live longer - not because of any discoveries we've made about ourselves, but because our bodies are made of a more enduring element.

I am enclosing a photographic plate, properly cooled and chemicalized for your climate. I wonder if you would set it up and take a picture of yourself. All you have to do is arrange it properly on the basis of the laws of light-that

is, light travels in straight lines, so stand in front of it - and when you are ready think "Ready!" The picture will be automatically taken.

Would you do this for me? If you are interested, I will also send you a picture of myself, though, I must warn you: my appearance will probably shock you.

Skander

1. From the first two letters, what have we learned so far about Skander?
2. What have we learned about the Planet Aurigae II?
3. Why do you think that Skander has started this correspondence with Pen Pal?
4. What impression do you have of Skander?

D.4

Aurigae II

Dear Pen Pal,

You say you showed the photographic plate to one of the doctors at the hospital-I cannot picture what you mean by "doctor" or "hospital" but let that pass-and he took the problem up with government authorities. Problem? I don't understand. I thought we were having a pleasant correspondence, private and personal. I shall certainly appreciate your sending that picture of yourself.

Skander

D.5

Aurigae II

Dear Pen Pal,

I assure you that I am not annoyed at your action. It merely puzzled me, and I am sorry the plate has not been returned to you. Knowing what governments are, I can imagine that it will not be returned to you for some time, so I am taking the liberty of enclosing another plate.

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I cannot imagine why you should have been warned against continuing this correspondence. What do they expect me to do? - eat you up at long distance?

In any event, I would like your picture as a memento of our friendship, and I will send mine as soon as I have received yours.

Skander

D.6

Aurigae II

Dear Pen Pal,

Your last letter was so slow in coming that I thought you had decided to break off the correspondence. I was sorry to notice that you failed to enclose the photograph, puzzled by your reference to having a "relapse", and cheered by your statement that you would send it along as soon as you felt "better" - whatever that means. However, the important thing is that you did write.

Here I am in prison, doomed to spend the next thirty years tucked away from the main stream of life. Even the thought is hard on my restless spirit, though I know I have a long life ahead of me after my release.

In spite of your friendly letter, I won't feel that you have completely re-established contact with me until you send the photograph.

Skander

1. Why (D4) do you think Pen Pal showed Skander's photographic plate to a doctor at the hospital?
2. In all the last four letters, Skander is insistent that Pen Pal sends a photograph of himself. Why do you think Skander is so insistent?
3. Why (D5) do you think Pen Pal's government warned him against continuing the correspondence?

D.7

Aurigae II

Dear Pen Pal,

The photograph arrived. As you suggest, your appearance startled me. You'll notice that I've enclosed a photograph of myself, as I promised I would. Chunky, metallic looking chap, am I not, very different I'll wager than you expected. The various races with whom we have communicated become very wary of us when they discover we are highly radioactive, and that literally we are a radioactive form of life.

As you know, I have occasionally mentioned that I had hoped of escaping not only the deadly imprisonment to which I am subjected, but also from my body - which cannot easily escape. Perhaps you'll be interested in hearing about how far this idea has developed. The process involves an exchange of personalities with someone else. For this, it is necessary to get an impress of both individuals - of their mind and of their thoughts as well as their bodies. Since this phase is purely mechanical, it is simply a matter of taking complete photographs.

The next step is to make sure the two photographs are exchanged, that is, that each party has somewhere near him a complete photograph of the other. The third and final stage occurs when I activate the sub-space energy flow between the two photographic plates. (It is already too late, Pen Pal. I have already set the energy in motion!) Soon there will be an exchange of personalities - I will live in your body and you in mine.

You will take with you a complete memory of your life on Earth, and I will take along memory of my life on Aurigae. As soon as I grow tired of Earth, I will exchange bodies in the same way with a member of some other race. Thirty years hence, I will be happy to reclaim my body, and you can then have whatever body I last happened to occupy.

This should be a very happy arrangement for us both. You, with your short life expectancy, will have outlived all your contemporaries and will have had an interesting experience. I admit I expect to have the better of the

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exchange. By the time you reach this part of the letter it will be me reading it, not you. So long for now, Pen Pal. It's been nice having all those letters from you. I shall write to you from time to time to let you know how things are going with my tour.

Skander

1. What exactly did Skander do?
2. Why did he do this?
3. Might this ever be really possible, at some stage in the future?
4. Would there be advantages and/ or disadvantages in doing so?
5. Were there any clues in earlier letters that warned us of what Skander was planning to do?

D.8 The final letter

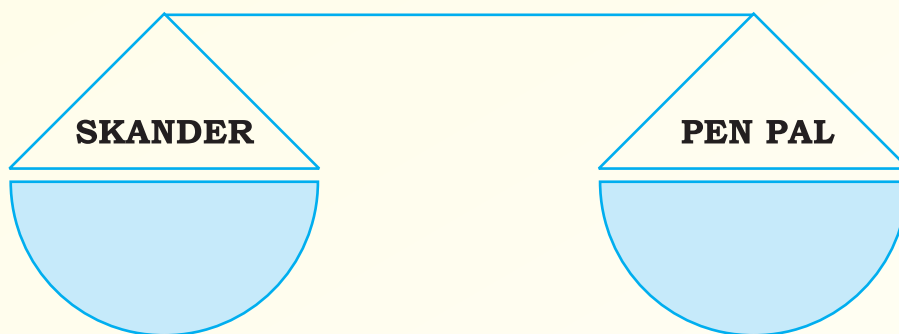
Dear Pen Pal,

Thanks a lot for forcing the issue. For a long time I hesitated about letting you play such a trick on yourself. You see, the government scientists analyzed the nature of that first photographic plate you sent me, and so the final decision was really up to me. I decided that anyone as eager as you were should be allowed to succeed. By this time you will have realized for yourself that a man who has been paralyzed since birth, and is subject to heart attacks, cannot expect a long life span. I am happy to tell you that your once lonely pen pal is enjoying himself, and I am happy to sign myself with a name to which I expect to become accustomed.

With best wishes

Skander

1. Who has written the letter? (Original Pen Pal? original Skander? "New Pen Pal")?
2. Which planet does he live on?
3. When Skander and Pen Pal exchanged bodies and personalities, each received certain benefits. Write words or phrases in the scales under their names, to indicate the advantages of each. Decide who profited most from the exchange. (Copy and complete.)

BODY EXCHANGE

4. Imagine that five years have passed since the last letter. Skander and Pen Pal are both still alive. Write another letter from Skander to Pen Pal, outlining what has happened in the intervening years. What is your present situation? What are your thoughts? What are your plans for the immediate future? (NB. Decide: Are you the "original Skander" or the "New Skander"?)

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D.9 Writing a science fiction story: Do you think life exists on other planets?

If there is life on other planets, what would these aliens look like? Draw your idea of an alien in the box below.



Write a story about the alien (s) you drew.

Before you write your story, you must think about

- The setting
- The Characters
- The plot

The Setting

Some science fiction stories are set here on Earth. Others may be set on a different planet.

The Characters

Your characters must include

- People from Earth
- Aliens

You must decide whether the aliens are friendly or unfriendly and whether the human beings are scared of the aliens or friends with them.

The Plot

The plot of your story must have

- **Introduction :** The characters and setting are described.
- **Conflict :** The problems human beings face
 - (i) on Earth when they are invaded by unfriendly aliens; or
 - (ii) on a different planet due to hostile environment/unfriendly aliens or both.
 - (iii) if the aliens are friendly, then how do they help earthlings and vice versa.
- **Climax :** The part of the story where the excitement is pushed to its limits.
- **Resolution** or the point where the conflict is resolved.