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Scientists make molecule-sized electric motor

<http://www.breakingnewsenglish.com/1109/110907-nanotechnology.html>

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7th September, 2011

THE ARTICLE

From <http://www.BreakingNewsEnglish.com/1109/110907-nanotechnology.html>

Scientists have made the smallest electric motor ever created. It is a feat of scientific genius that most of us could never even try to understand. Dr. Charles Sykes and his team from America's Tufts University created the motor from a single molecule just a billionth of a metre wide. Dr Sykes is in contact with the Guinness Book of World Records to have his motor recognised as the smallest ever. The current world-record holder is a 200-nanometre-long nano-tube made from carbon. Dr Sykes' creation is an incredible 200 times smaller. Naturally, the researchers hope their creation has uses for mankind. It will be used to power the tiniest machines ever built, and be used by doctors in nano-surgery and robotic surgery.

It is the first time an electric motor has been made from a single molecule. Scientists can make molecules convert energy from light and chemical reactions into movement, but Dr Sykes' invention is the first to be classed as a motor – something that can continually generate power. There is some mind-boggling science behind Sykes' device. A combination of chemicals and metals produces the miniscule motor that rotates 50 times a second. Dr Sykes was excited about the future of his discovery, saying: "The next thing to do is to get the thing to do work that we can measure - to [link] it to other molecules, lining them up next to one another so they're like miniature cog-wheels."

WARM-UPS

1. NANOTECHNOLOGY: Walk around the class and talk to other students about nanotechnology. Change partners often.

2. CHAT: In pairs / groups, decide which of these topics or words from the article are most interesting and which are most boring.

scientists / genius / molecules / billionth / world-record holder / carbon / surgery / electric motor / convert energy / chemical reactions / mind-boggling / miniscule

Have a chat about the topics you liked. Change topics and partners frequently.

3. NANO-: What could we do with these nano-sized things? Complete this table with your partner(s). Change partners and share what you wrote. Change and share again.

	A good idea (why / not)?	Uses
Camera		
Apples		
Television		
Voice recorders		
Money		
Medicine		

4. SCIENCE: Students A **strongly** believe scientists will solve all of the world's problems one day; Students B **strongly** believe they won't. Change partners again and talk about your conversations.

5. NANO-MOTOR: What are the best uses for it? Rank these and share your rankings with your partner. Put the best at the top. Change partners and share your rankings again.

- Surgery
- More powerful computers
- Weapons
- Miniaturization of household goods
- Space travel
- e-Commerce and shopping
- Transport
- Robots

6. GENIUS: Spend one minute writing down all of the different words you associate with the word 'genius'. Share your words with your partner(s) and talk about them. Together, put the words into different categories.

BEFORE READING / LISTENING

From <http://www.BreakingNewsEnglish.com/1109/110907-nanotechnology.html>

1. TRUE / FALSE: Read the headline. Guess if a-h below are true (T) or false (F).

- | | |
|--|-------|
| a. Scientists have made the second-smallest motor ever invented. | T / F |
| b. The motor was made with just a single molecule. | T / F |
| c. The molecule in the motor has a width of a millionth of a metre. | T / F |
| d. The motor is 200 times smaller than the current world-record holder. | T / F |
| e. Scientists can also make molecules create movement from light. | T / F |
| f. Sykes' creation is the third molecule device to be accepted as a motor. | T / F |
| g. Dr Sykes' molecule motor spins at a rate of 50 times a second. | T / F |
| h. Next, Dr Sykes will make cog wheels for the world's smallest watch. | T / F |

2. SYNONYM MATCH: Match the following synonyms from the article.

- | | |
|---------------|-----------------|
| 1. created | a. transform |
| 2. recognised | b. applications |
| 3. current | c. tiny |
| 4. uses | d. accepted |
| 5. surgery | e. made |
| 6. single | f. connect |
| 7. convert | g. present |
| 8. classed | h. operations |
| 9. miniscule | i. labelled |
| 10. link | j. sole |

3. PHRASE MATCH: (Sometimes more than one choice is possible.)

- | | |
|---------------------------------|-------------------------|
| 1. the smallest electric | a. behind Sykes' device |
| 2. a feat of scientific | b. record holder |
| 3. just a billionth of | c. the tiniest machines |
| 4. The current world- | d. of his discovery |
| 5. used to power | e. genius |
| 6. chemical | f. wheels |
| 7. some mind-boggling science | g. motor ever created |
| 8. excited about the future | h. to one another |
| 9. lining them up next | i. a metre wide |
| 10. they're like miniature cog- | j. reactions |

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WHILE READING / LISTENING

From <http://www.BreakingNewsEnglish.com/1109/110907-nanotechnology.html>

GAP FILL: Put the words into the gaps in the text.

Scientists have made the smallest electric motor (1) _____ created. It is a feat of scientific (2) _____ that most of us could never even try to understand. Dr. Charles Sykes and his team from America's Tufts University created the motor from a single molecule (3) _____ a billionth of a metre wide. Dr Sykes is in (4) _____ with the Guinness Book of World Records to have his motor recognised as the smallest ever. The current world-record (5) _____ is a 200-nanometre-long nano-tube made from carbon. Dr Sykes' creation is an (6) _____ 200 times smaller. Naturally, the researchers hope their creation has uses for (7) _____. It will be used to power the tiniest machines ever built, and be used by doctors in nano-surgery and (8) _____ surgery.

contact
mankind
genius
robotic
holder
ever
just
incredible

It is the first time an electric motor has been made from a single molecule. Scientists can make molecules (9) _____ energy from light and chemical (10) _____ into movement, but Dr Sykes' invention is the first to be (11) _____ as a motor – something that can continually generate power. There is some (12) _____ -boggling science behind Sykes' device. A combination of chemicals and metals produces the miniscule motor that (13) _____ 50 times a second. Dr Sykes was excited about the future of his (14) _____, saying: "The next thing to do is to get the thing to do work that we can (15) _____ - to [link] it to other molecules, lining them up next to one another so they're like miniature (16) _____-wheels."

discovery
classed
rotates
convert
cog
reactions
measure
mind

LISTENING – Listen and fill in the gaps

From <http://www.BreakingNewsEnglish.com/1109/110907-nanotechnology.html>

Scientists have made the smallest electric motor ever created. _____ genius that most of us could never even try to understand. Dr. Charles Sykes and his team from America's Tufts University created the motor from a single molecule _____ metre wide. Dr Sykes is in contact with the Guinness Book of World Records to _____ as the smallest ever. The current world-record holder is a 200-nanometre-long nano-tube made from carbon. Dr Sykes' creation is an _____. Naturally, the researchers hope their creation _____. It will be used to power the tiniest machines ever built, and be used by doctors in _____ surgery.

It is the first time an electric motor has _____ molecule. Scientists can make molecules _____ and chemical reactions into movement, but Dr Sykes' invention is the first to be classed as a motor – something that can _____. There is some mind-boggling science behind Sykes' device. A combination of chemicals and metals produces the _____ 50 times a second. Dr Sykes was excited about the future of his discovery, saying: "The next thing to do is to get the thing to do work _____ - to [link] it to other molecules, lining them up next to one another so they're _____."

AFTER READING / LISTENING

From <http://www.BreakingNewsEnglish.com/1109/110907-nanotechnology.html>

1. WORD SEARCH: Look in your dictionary / computer to find collocates, other meanings, information, synonyms ... for the words 'electric' and 'motor'.

electric	motor

- Share your findings with your partners.
- Make questions using the words you found.
- Ask your partner / group your questions.

2. ARTICLE QUESTIONS: Look back at the article and write down some questions you would like to ask the class about the text.

- Share your questions with other classmates / groups.
- Ask your partner / group your questions.

3. GAP FILL: In pairs / groups, compare your answers to this exercise. Check your answers. Talk about the words from the activity. Were they new, interesting, worth learning...?

4. VOCABULARY: Circle any words you do not understand. In groups, pool unknown words and use dictionaries to find their meanings.

5. TEST EACH OTHER: Look at the words below. With your partner, try to recall how they were used in the text:

<ul style="list-style-type: none">• feat• team• just• carbon• 200• built	<ul style="list-style-type: none">• time• convert• classed• 50• measure• wheels
---	--

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STUDENT NANOTECHNOLOGY SURVEY

From <http://www.BreakingNewsEnglish.com/1109/110907-nanotechnology.html>

Write five GOOD questions about nanotechnology in the table. Do this in pairs. Each student must write the questions on his / her own paper. When you have finished, interview other students. Write down their answers.

	STUDENT 1 _____	STUDENT 2 _____	STUDENT 3 _____
Q.1.			
Q.2.			
Q.3.			
Q.4.			
Q.5.			

- Now return to your original partner and share and talk about what you found out. Change partners often.
- Make mini-presentations to other groups on your findings.

NANOTECHNOLOGY DISCUSSION

STUDENT A's QUESTIONS (Do not show these to student B)

- a) What did you think when you read the headline?
- b) What springs to mind when you hear the word 'nanotechnology'?
- c) What do you think about what you read?
- d) Do you think the molecule motor is a feat of scientific genius?
- e) How do you think scientists can work with and make things that are a billionth of a metre wide?
- f) What is nanotechnology? Do you know of any examples of it?
- g) What uses do you think the motor will have for mankind?
- h) When do you think nanotechnology will be a widely used part of our life?
- i) How might nanotechnology help medicine?
- j) Why do you think people are interested in nanotechnology?

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NANOTECHNOLOGY DISCUSSION

STUDENT B's QUESTIONS (Do not show these to student A)

- a) Did you like reading this article?
- b) What three adjectives would you use to describe this article?
- c) How is it possible a single molecule can make a motor?
- d) What would the inventors of the first motors over a hundred years ago think of a nanotechnology motor?
- e) What things do you find mind-boggling?
- f) What would you like nanotechnology (the tech of the future) to do?
- g) Do you think it's possible to get smaller than nano?
- h) How might nanotechnology change things like computers and iPads?
- i) How excited are you about the future?
- j) What questions would you like to ask Dr. Charles Sykes?

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LANGUAGE – MULTIPLE CHOICE

From <http://www.BreakingNewsEnglish.com/1109/110907-nanotechnology.html>

Scientists have made the smallest electric motor ever created. It is a (1) ____ of scientific genius that most of us could never even try to understand. Dr. Charles Sykes and his team from America's Tufts University created the motor from a single molecule (2) ____ a billionth of a metre wide. Dr Sykes is (3) ____ contact with the Guinness Book of World Records to have his motor recognised as the smallest ever. The current world-record holder is a 200-nanometre-(4) ____ nano-tube made from carbon. Dr Sykes' creation is an incredible 200 times smaller. Naturally, the researchers hope their creation has uses for (5) _____. It will be used to (6) _____ the tiniest machines ever built, and be used by doctors in nano-surgery and robotic surgery.

It is the first time an electric motor has been made from a single molecule. Scientists can make molecules (7) _____ energy from light and chemical reactions into movement, but Dr Sykes' invention is the first to be (8) _____ as a motor – something that can continually generate power. There is some (9) _____-boggling science behind Sykes' device. A combination (10) _____ chemicals and metals produces the miniscule motor that rotates 50 times a second. Dr Sykes was excited about the future of his discovery, (11) _____: "The next thing to do is to get the thing to do work that we can measure - to [link] it to other molecules, lining them (12) _____ next to one another so they're like miniature cog-wheels."

Put the correct words from the table below in the above article.

- | | | | | |
|-----|-------------|--------------|-------------|---------------|
| 1. | (a) feet | (b) foot | (c) fate | (d) feat |
| 2. | (a) solely | (b) right | (c) just | (d) so |
| 3. | (a) at | (b) in | (c) of | (d) by |
| 4. | (a) long | (b) length | (c) longest | (d) lengthy |
| 5. | (a) men | (b) human | (c) mankind | (d) we |
| 6. | (a) energy | (b) electric | (c) fund | (d) power |
| 7. | (a) revert | (b) convert | (c) invert | (d) divert |
| 8. | (a) classed | (b) clasped | (c) clashed | (d) collapsed |
| 9. | (a) brain | (b) mind | (c) head | (d) skull |
| 10. | (a) by | (b) at | (c) of | (d) on |
| 11. | (a) saying | (b) said | (c) says | (d) say |
| 12. | (a) down | (b) over | (c) in | (d) up |

HOMework

1. VOCABULARY EXTENSION: Choose several of the words from the text. Use a dictionary or Google's search field (or another search engine) to build up more associations / collocations of each word.

2. INTERNET: Search the Internet and find out more about Dr Sykes' nanotechnology device. Share what you discover with your partner(s) in the next lesson.

3. NANOTECHNOLOGY: Make a poster about nanotechnology. Show your work to your classmates in the next lesson. Did you all have similar things?

4. THE MOTOR: Write a magazine article about the nanotechnology motor. Include imaginary interviews with scientists who are excited about it.

Read what you wrote to your classmates in the next lesson. Write down any new words and expressions you hear from your partner(s).

5. LETTER: Write a letter to a nanotechnology expert. Ask him/her three questions about nanotechnology. Give him/her three ideas on what to make next. Read your letter to your partner(s) in your next lesson. Your partner(s) will answer your questions.

ANSWERS

TRUE / FALSE:

- a. F b. T c. F d. T e. T f. F g. T h. F

SYNONYM MATCH:

- | | |
|---------------|-----------------|
| 1. created | a. made |
| 2. recognised | b. accepted |
| 3. current | c. present |
| 4. uses | d. applications |
| 5. surgery | e. operations |
| 6. single | f. sole |
| 7. convert | g. transform |
| 8. classed | h. labelled |
| 9. miniscule | i. tiny |
| 10. link | j. connect |

PHRASE MATCH:

- | | |
|---------------------------------|-------------------------|
| 1. the smallest electric | a. motor ever created |
| 2. a feat of scientific | b. genius |
| 3. just a billionth of | c. a metre wide |
| 4. The current world- | d. record holder |
| 5. used to power | e. the tiniest machines |
| 6. chemical | f. reactions |
| 7. some mind-boggling science | g. behind Sykes' device |
| 8. excited about the future | h. of his discovery |
| 9. lining them up next | i. to one another |
| 10. they're like miniature cog- | j. wheels |

GAP FILL:

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Scientists have made the smallest electric motor (1) **ever** created. It is a feat of scientific (2) **genius** that most of us could never even try to understand. Dr. Charles Sykes and his team from America's Tufts University created the motor from a single molecule (3) **just** a billionth of a metre wide. Dr Sykes is in (4) **contact** with the Guinness Book of World Records to have his motor recognised as the smallest ever. The current world-record (5) **holder** is a 200-nanometre-long nano-tube made from carbon. Dr Sykes' creation is an (6) **incredible** 200 times smaller. Naturally, the researchers hope their creation has uses for (7) **mankind**. It will be used to power the tiniest machines ever built, and be used by doctors in nano-surgery and (8) **robotic** surgery.

It is the first time an electric motor has been made from a single molecule. Scientists can make molecules (9) **convert** energy from light and chemical (10) **reactions** into movement, but Dr Sykes' invention is the first to be (11) **classed** as a motor – something that can continually generate power. There is some (12) **mind-boggling** science behind Sykes' device. A combination of chemicals and metals produces the miniscule motor that (13) **rotates** 50 times a second. Dr Sykes was excited about the future of his (14) **discovery**, saying: "The next thing to do is to get the thing to do work that we can (15) **measure** - to [link] it to other molecules, lining them up next to one another so they're like miniature (16) **cog-wheels**."

LANGUAGE WORK

- 1 - d 2 - c 3 - b 4 - a 5 - c 6 - d 7 - b 8 - a 9 - b 10 - c 11 - a 12 - d

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