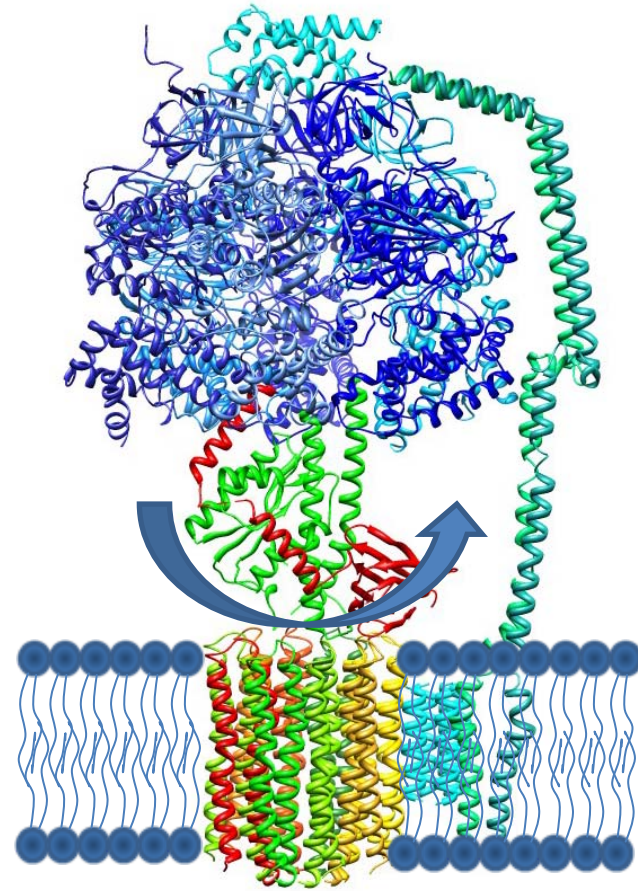
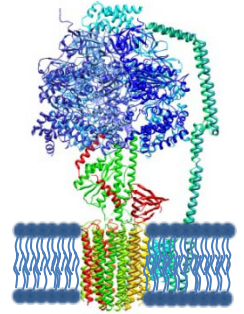


**Why does the
H⁺-ATPase
rotate?**



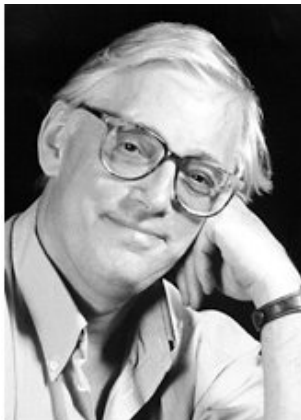
Why does the H⁺-ATPase rotate?



Paul D. Boyer

PAUL D. BOYER

Rotational catalysis is the only way that all three catalytic sites could proceed sequentially and identically with modulation by one single copy subunit.



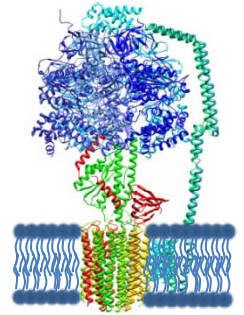
John E. Walker

JOHN E. WALKER

A poem by Robert Frost gives a short and appropriate description:

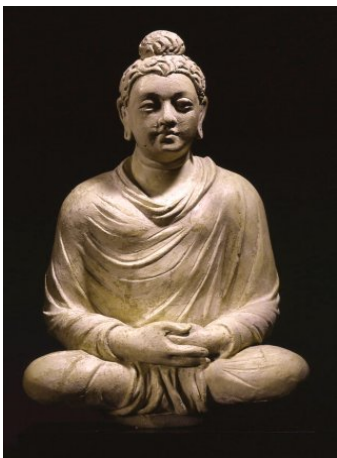
We dance round in a ring and suppose
The secret sits in the middle and knows

Why does the H⁺-ATPase rotate?



MOSES

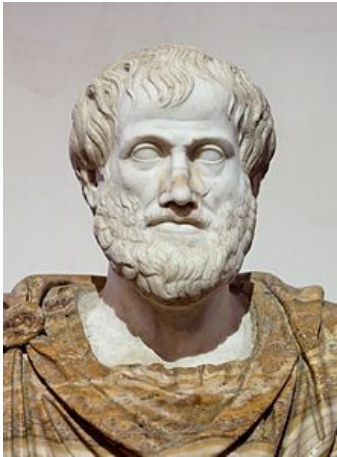
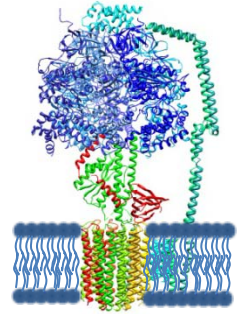
And the LORD came down from the Heaven and HE said to the H⁺-ATPase : "Thou shalt rotate". And the H⁺-ATPase started to rotate and there was much rejoicing.



BUDDHA

Asking this question denies your own rotational nature.

Why does the H⁺-ATPase rotate?



ARISTOTELES

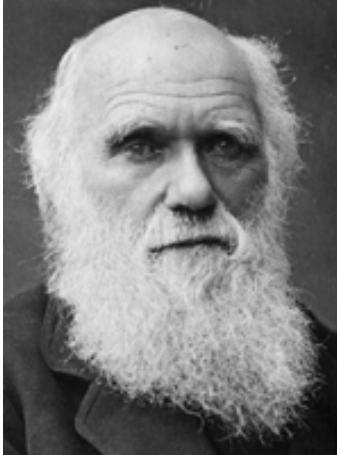
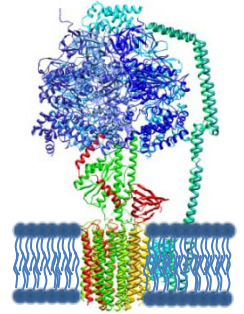
It is the nature of H⁺-ATPases to rotate.



MACHIABELLI

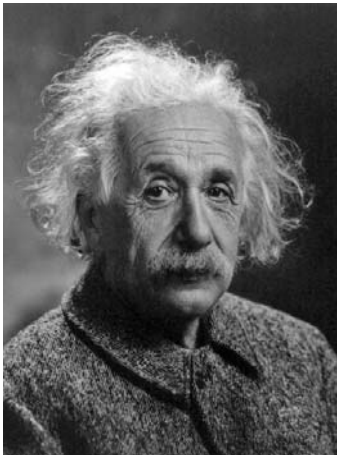
The important thing is the rotation of the H⁺-ATPase. Who cares why? The fact of rotation justifies any motivation.

Why does the H⁺-ATPase rotate?



CHARLES DARWIN

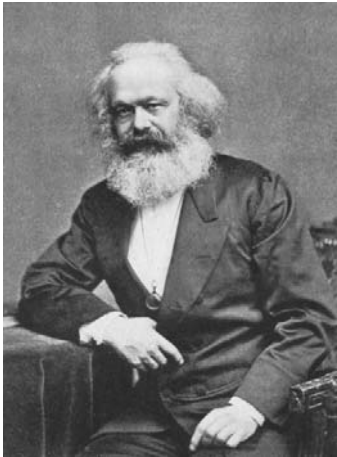
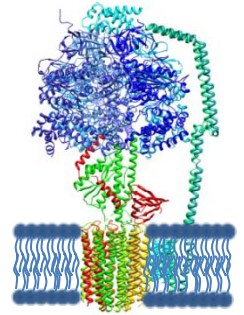
H⁺-ATPases have been selected by nature over a long period of time so that they are now genetically prepared to rotate.



ALBERT EINSTEIN

The question whether the H⁺-ATPase rotates or whether the membrane rotates depends on your reference system.

Why does the H⁺-ATPase rotate?



KARL MARX

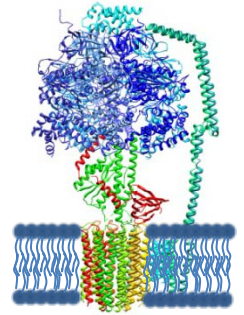
Historically, this was inevitable.



MARTIN LUTHER KING, JR.

I have a dream: I see a world where all H⁺-ATPases are free to rotate and nobody will ask about their motivations.

Why does the H⁺-ATPase rotate?



RICHARD M NIXON

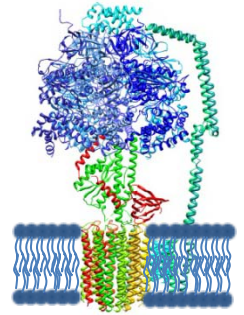
The H⁺-ATPase has not rotated. I repeat the H⁺-ATPase has NOT rotated.



ANGELA MERKEL

There is no alternative.

Why does the H⁺-ATPase rotate?



BILL CLINTON

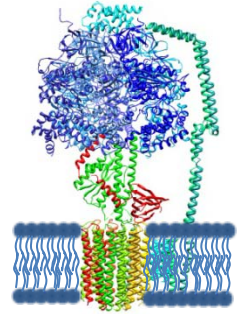
I never rotated this enzyme.



JOSEPH STALIN

I don't care. Catch it. I need the ATP.

Why does the H⁺-ATPase rotate?



RYUNOSUKE AKUTAGAWA

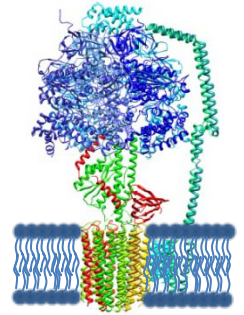
**This cannot be answered unequivocally.
Ask any of the parts involved in rotation:
Each one will give you a different
answer.**



ERNEST HEMINGWAY

To die. In the rain.

Why does the H⁺-ATPase rotate?



BILL GATES

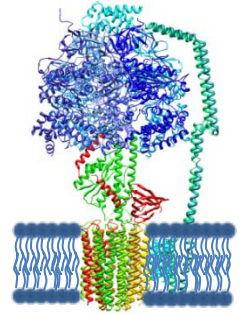
We just have released the new H⁺-ATPase Office 2012. This does not only rotate H⁺-ATPases but also all the programs and data in your computer.



CAPTAIN JAMES T KIRK

To boldly rotate where no H⁺-ATPase has rotated before.

Why does the H⁺-ATPase rotate?



**STUDENT OF
BIOCHEMISTRY**

To make ATP