

이명현

천문학자, 과학저술가


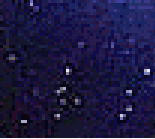
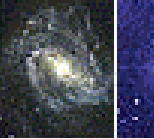
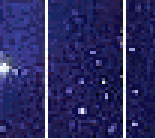
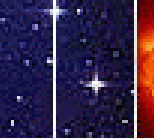
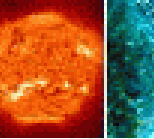
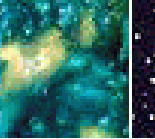
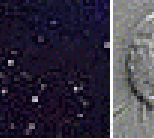













| January   | February  | March   | April   | May  | June  | July  | August  | September   | October   | November  |
|---|---|---|---|--|---|---|---|---|---|---|
|  |  |  |  |  |  |  |  |  |  |  |
| New Year's Day: The Big Bang  |   | Milky Way forms   |   |  | Sun and planets form  |   | Oldest known life (single celled).  |   | First multi-cellular organisms  |   |

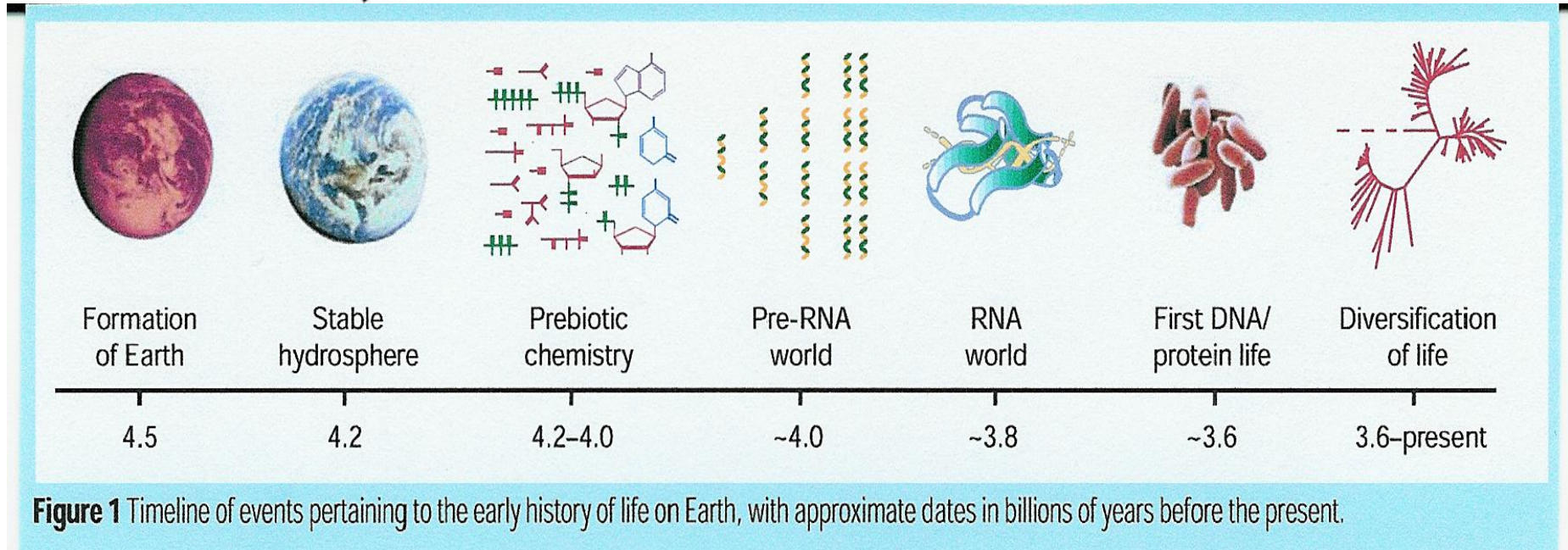
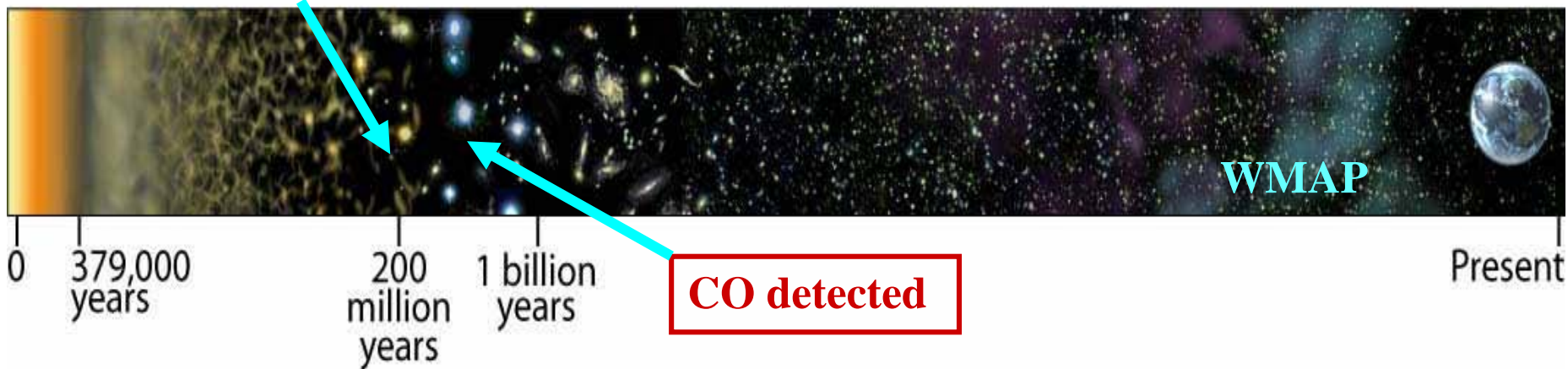
| December                                     |    |                                |    |                         |    |  |    |                                      |    |                                   |    |
|--|----|--------------------------------|----|-------------------------|----|--|----|--------------------------------------|----|-----------------------------------|----|
| 1  | 2  | 3                              | 4  | 5                       | 6  | 7  | 8  | 9                                    | 10 | 11                                | 12 |
| 13   | 14 | 15                             | 16 | 17                      | 18 | 19   | 20 | 21                                   | 22 | 23                                | 24 |
| 25   | 26 | 27                             | 28 | 29                      | 30 | 31   |    |                                      |    |                                   |    |
| Cambrian Explosion (burst of new life forms) |    | Emergence of first vertebrates |    | Early land plants       |    | First four-limbed animals                                |    | Variety of insects begin to flourish |    | First dinosaurs appear            |    |
| First mammalian ancestors appear             |    | First known birds              |    | Apes appear             |    | First human ancestors to walk upright                    |    | Homo erectus appears                 |    | Anatomically modern humans appear |    |
| Dinosaurs wiped out by asteroid or comet     |    | Invention of writing           |    | Pyramids built in Egypt |    | 1 second before midnight: Voyage of Christopher Columbus |    |                                      |    |                                   |    |



**First stars**

# Time Since the Big Bang

**13.7 billion years**



**Figure 1** Timeline of events pertaining to the early history of life on Earth, with approximate dates in billions of years before the present.





이름이 들어갈 수 있는 공간이 없습니다. 이미 들어간 이름이 있습니다.



# THE SCIENTISTS

과학자 밴드



- 우리가 지구 생명의 본질을 알려고 노력하고 외계 생물의 존재를 확인하려고 애쓰는 것은 실은 하나의 질문을 해결하기 위한 두 개의 방편이다. 그 질문은 바로 ‘우리는 과연 누구란 말인가?’이다.
- 생명의 기원과 진화는 시간만 충분히 주어진다면 하나의 우주적 필연인 것이다.

자연선택  
인위선택  
?????





Clever computers

# The dawn of artificial intelligence

Powerful computers will reshape humanity's future. How to ensure the promise outweighs the perils

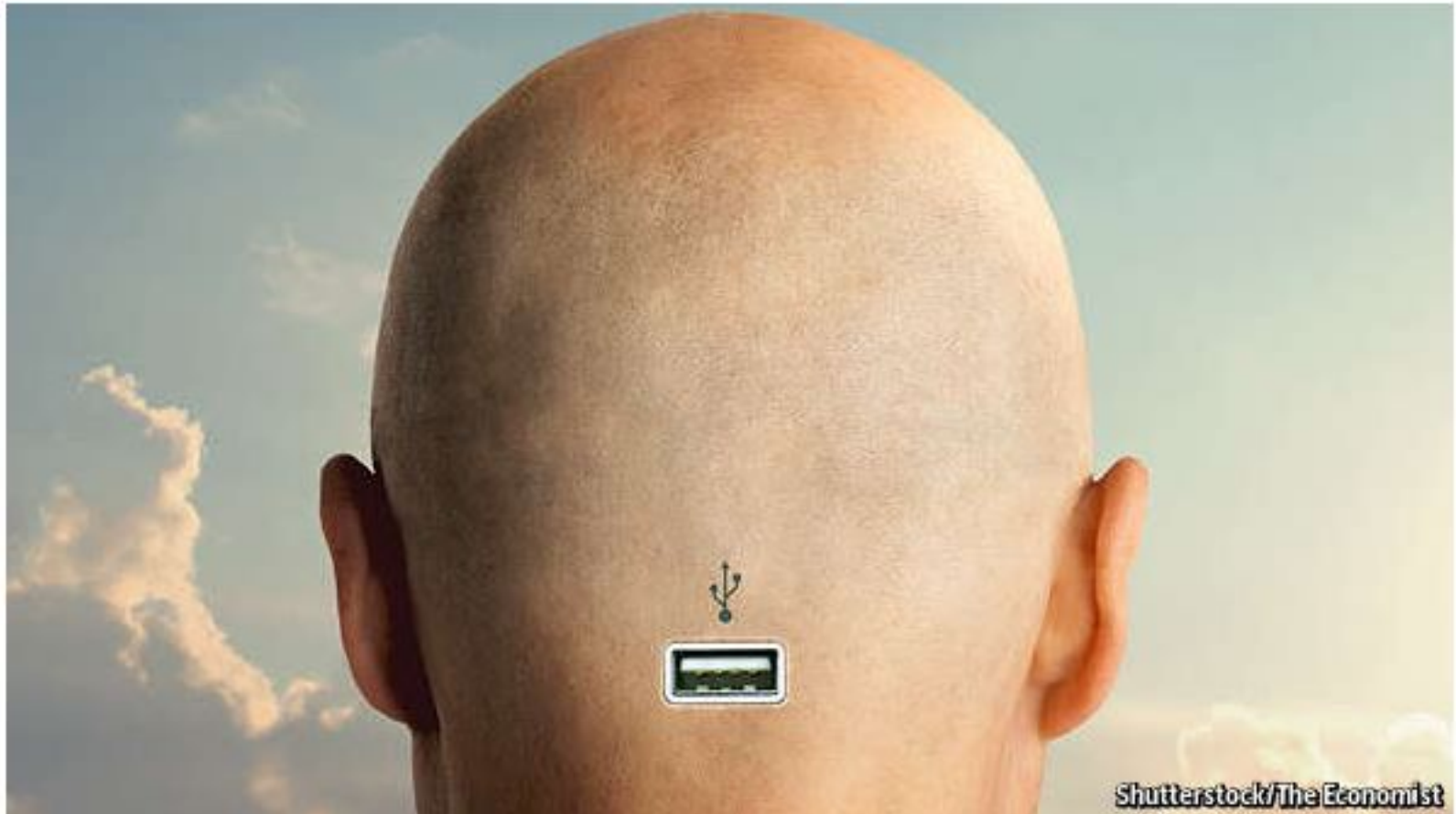
May 9th 2015 | From the print edition



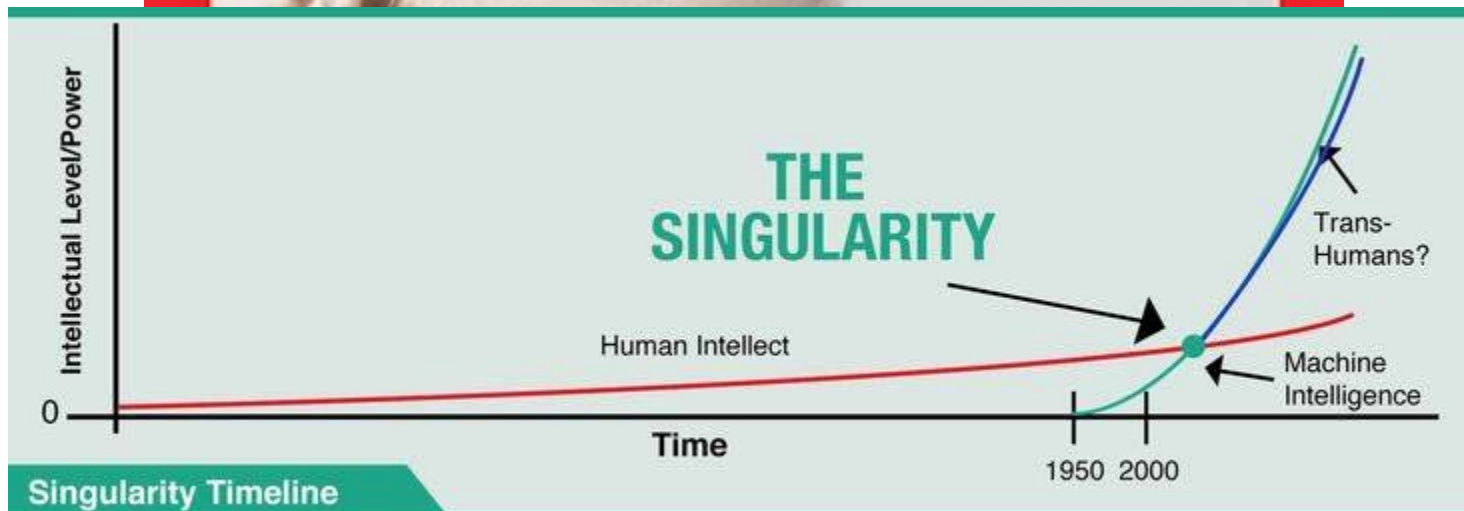
17k



842







### Singularity Timeline

Rise in human intellect could be driven by integrating with machines in the future

호모 사피엔스 → (호모) 사이보그

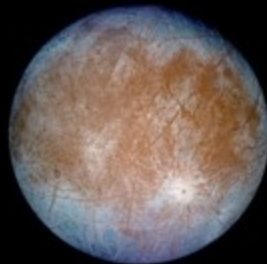


# Other worlds with liquids

Mars



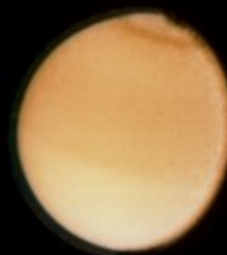
Europa



Enceladus



Titan

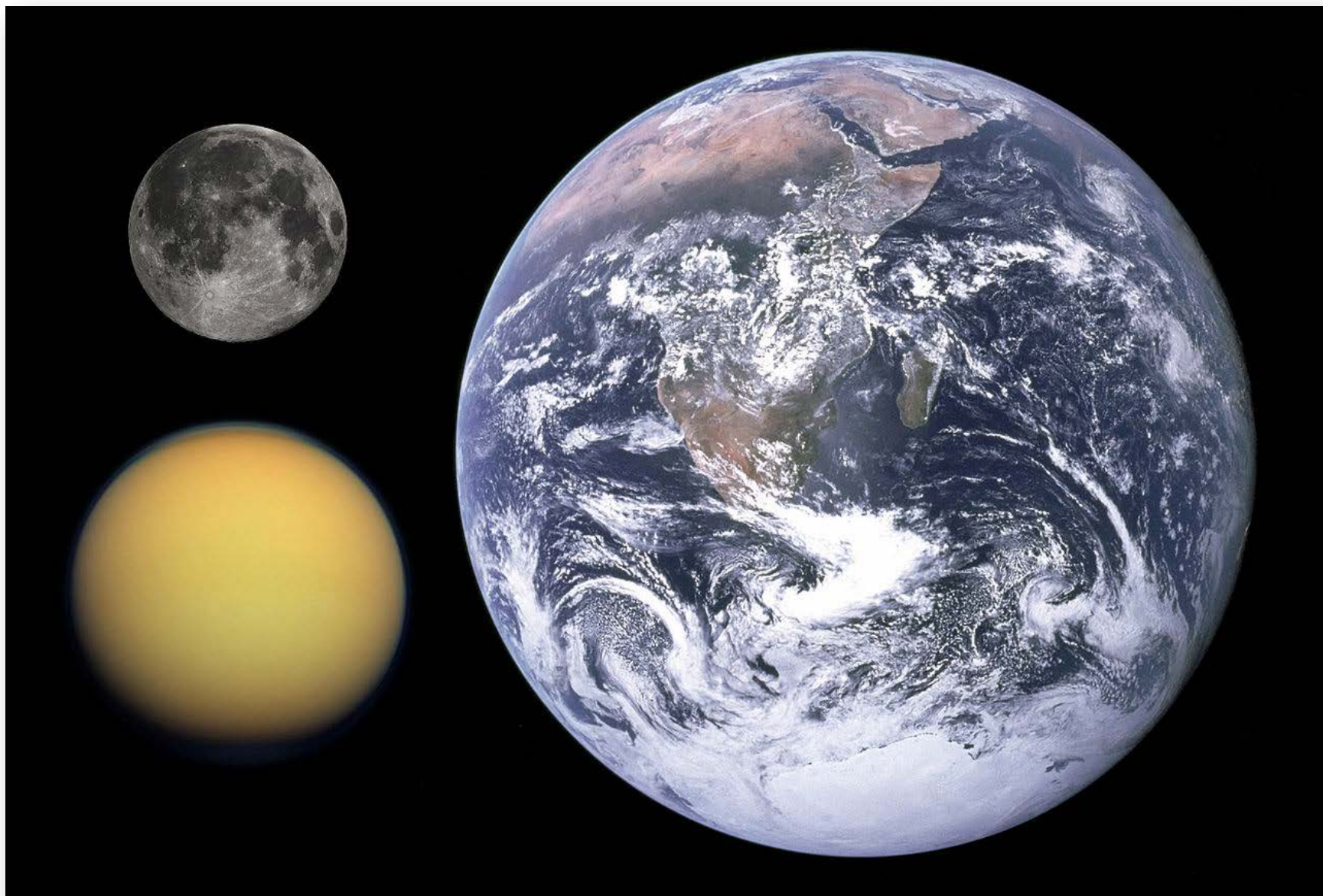


Past water  
CO<sub>2</sub> and N<sub>2</sub>  
Cold  
preservation  
Organics?

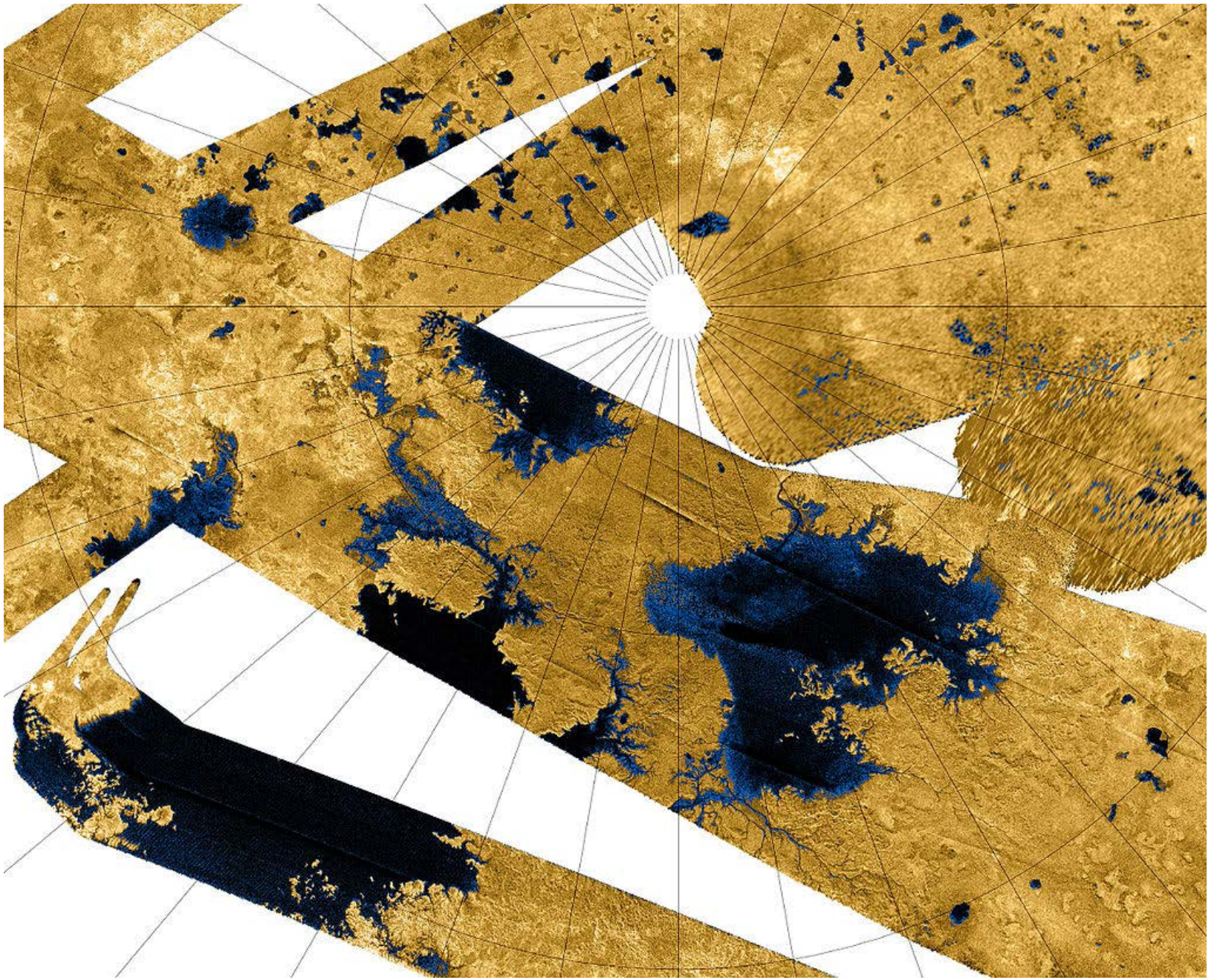
Ocean under ice  
Surface organics?

H<sub>2</sub>O jet  
Organics  
N<sub>2</sub>  
Energy  
Liquid water?

Liquid CH<sub>4</sub>  
Organics  
Energy  
Active cycles  
Life?

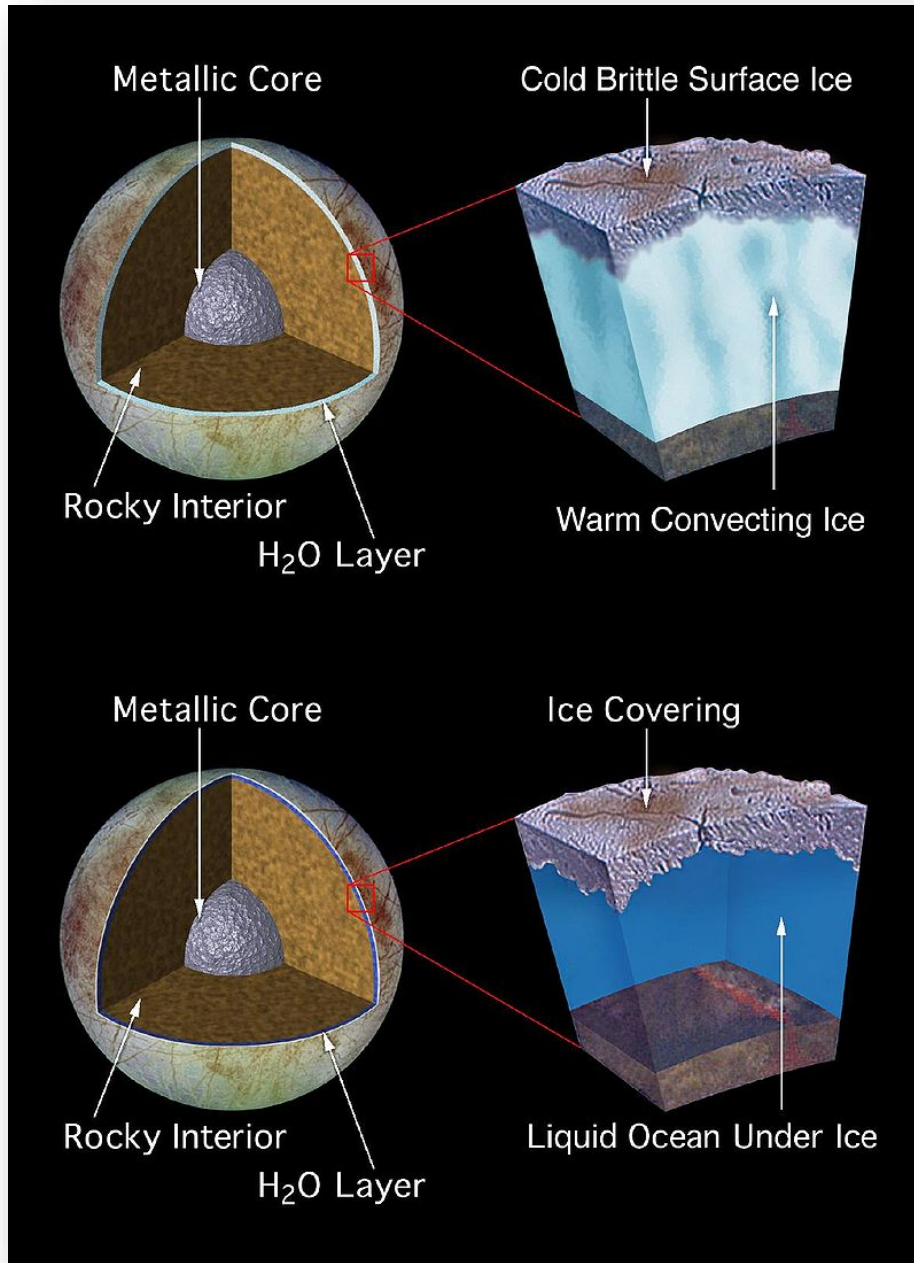












하나 → 둘 = 여럿 = 보편성