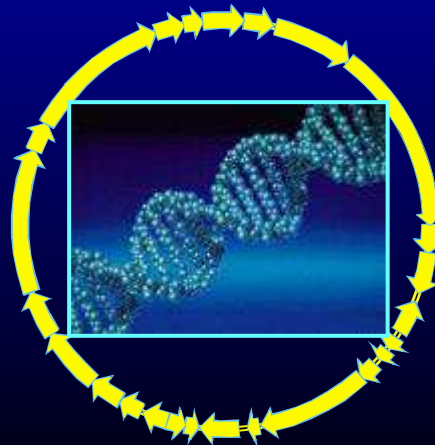


# Genomic analysis of PAV1, the first virus of the hyperthermophilic archaeon *Pyrococcus abyssi*

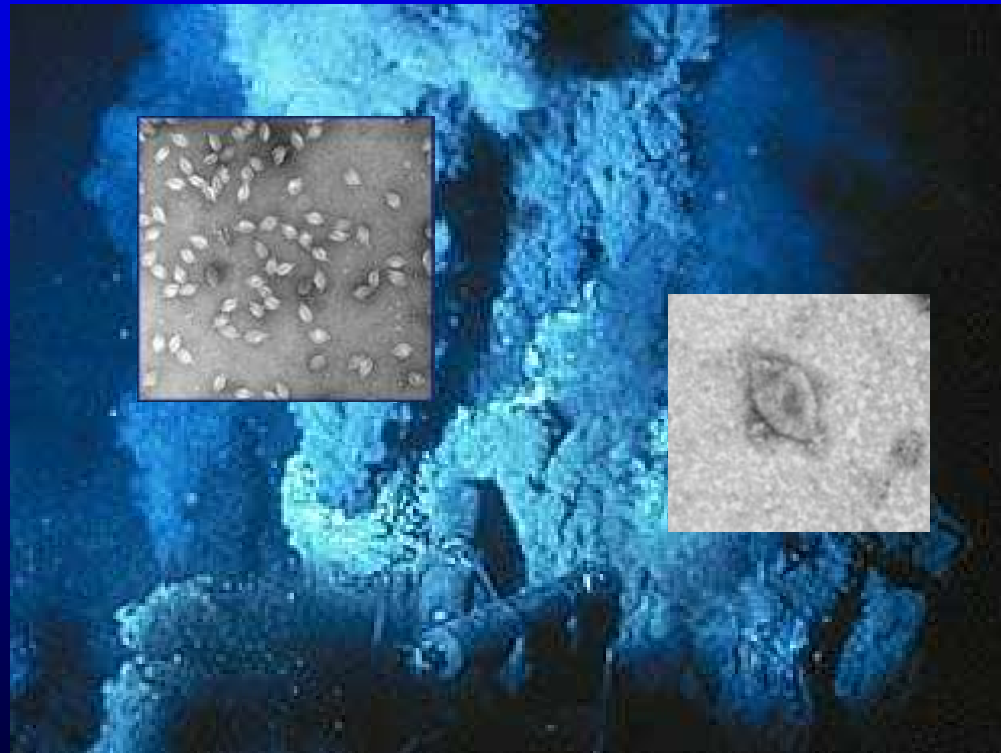
Claire GESLIN, Mélusine GAILLARD, Gaël ERAUSO, Didier FLAMENT, Karen ROUAULT,  
Marc LE ROMANCER et Daniel PRIEUR

Laboratoire de Microbiologie des Environnements Extrêmes  
CNRS / Ifremer / University of Western Brittany  
Brest, FRANCE



I

PAV1, the first hyperthermophilic virus  
isolated from marine environment



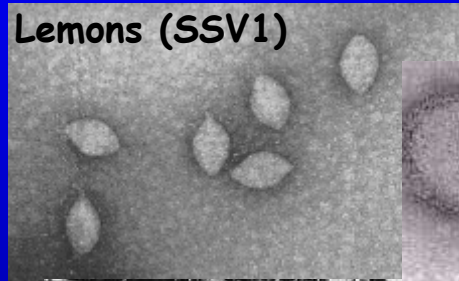
PAV1, the first hyperthermophilic virus isolated from marine environment

# PAV1, the first hyperthermophilic virus isolated from marine environment

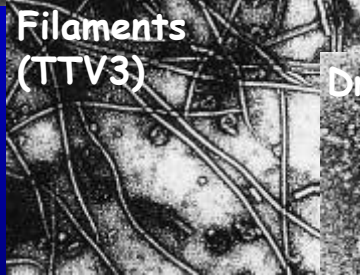
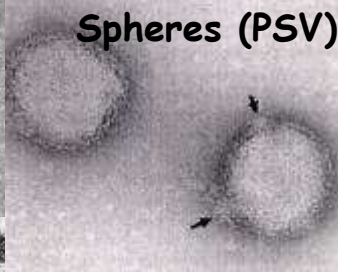
About 20 viruses described with various shapes

Only 1 virus described : PAV1

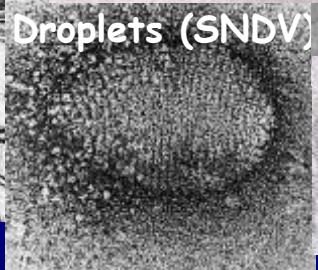
Geslin et al., 2003, J. Bacteriol.



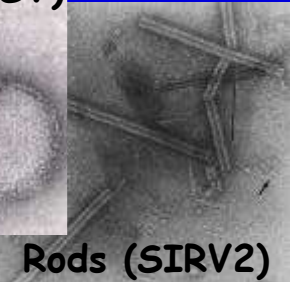
Spheres (PSV)



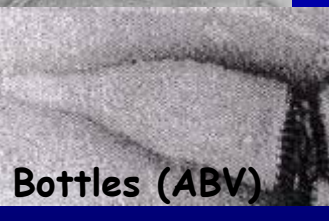
Filaments (TTV3)



Droplets (SNDV)

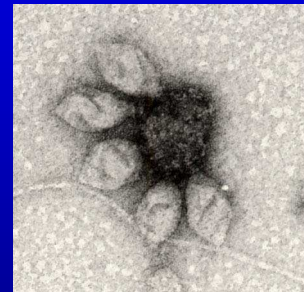


Rods (SIRV2)



Bottles (ABV)

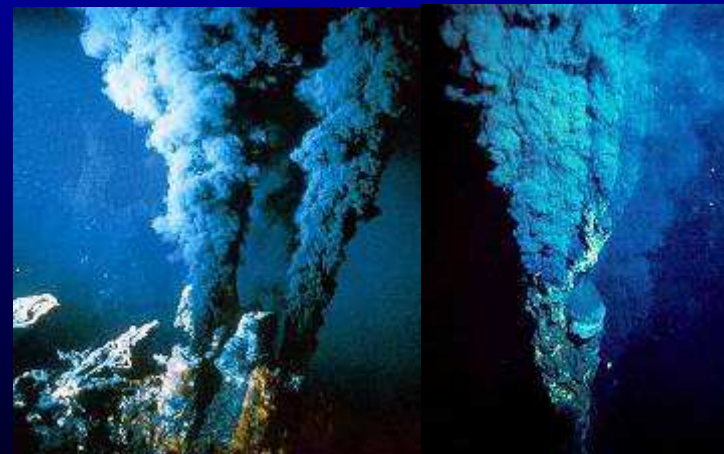
PAV1



Its host :  
*Pyrococcus abyssi*  
strain GE23



Hot terrestrial environments



Hot marine environments

PAV1, the first hyperthermophilic virus isolated from marine environment

## PAV1 features

Envelope :  
proteins + hosts lipids

Proteinase K treatment



Chloroform treatment

Morphology

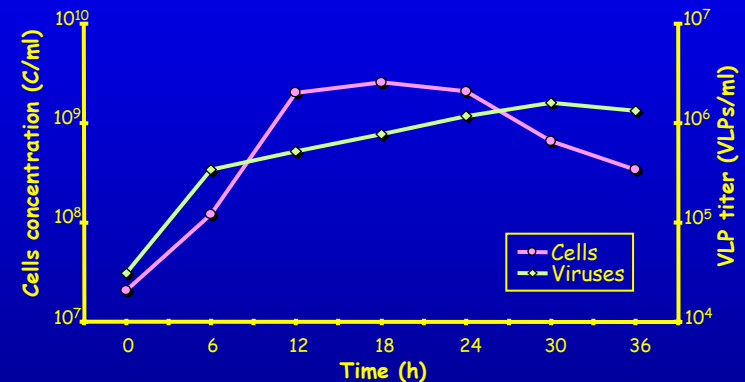


Lemon-shaped virus

Caudal fibres

120 nm x 80 nm

Host-virus relationship :  
"Carrier state"



Genome :

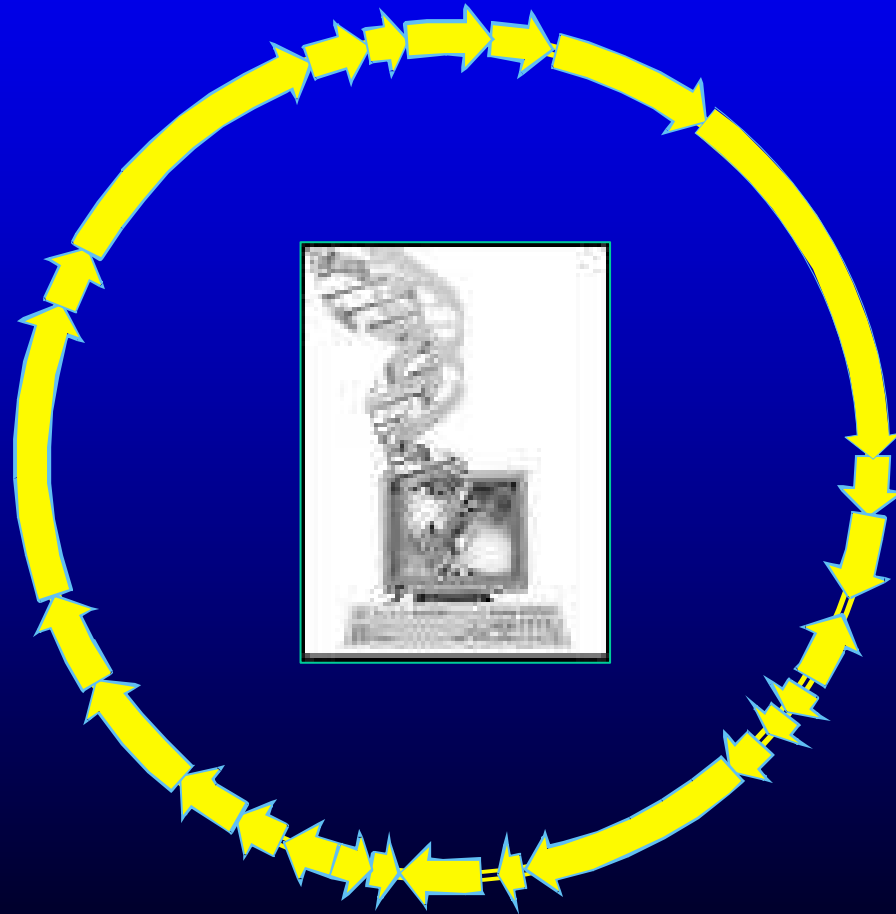
Circular double stranded DNA of 18 kpb

Not integrated in chromosome

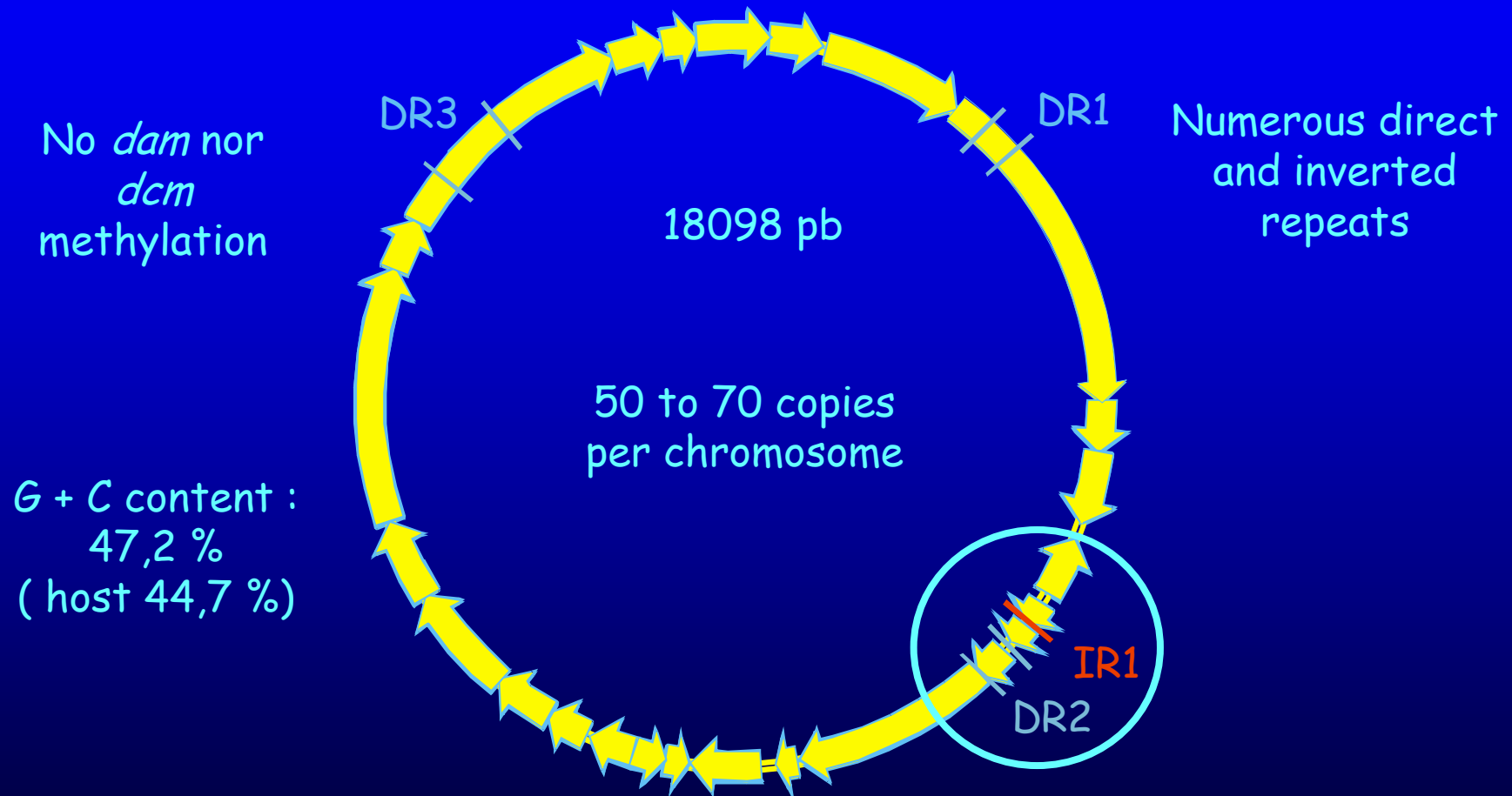
Plasmidic prophage

# II

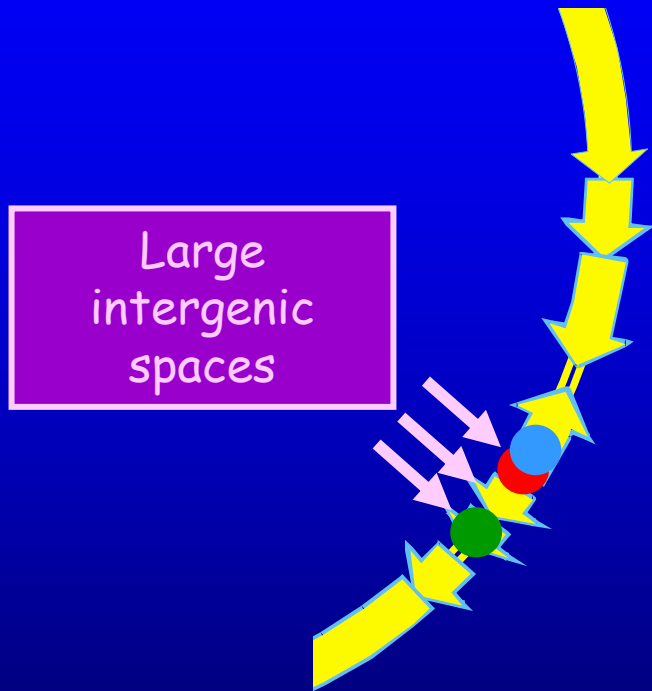
## Genomic analysis of PAV1



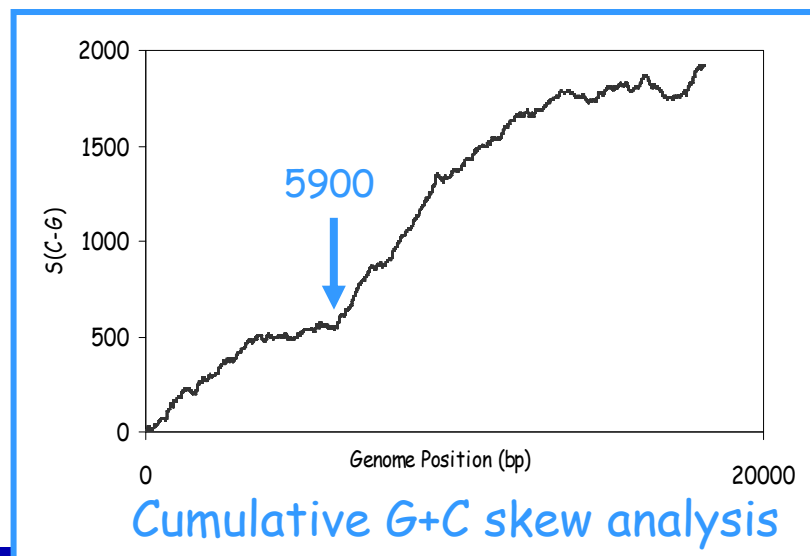
# General properties of PAV1 genome



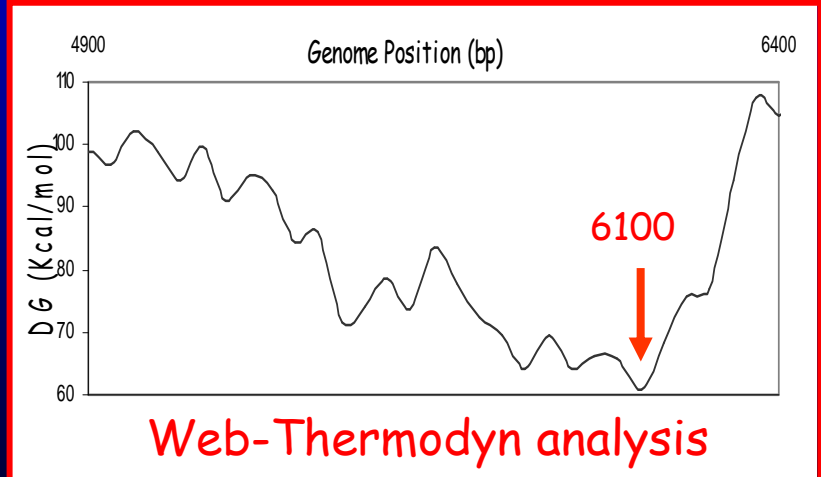
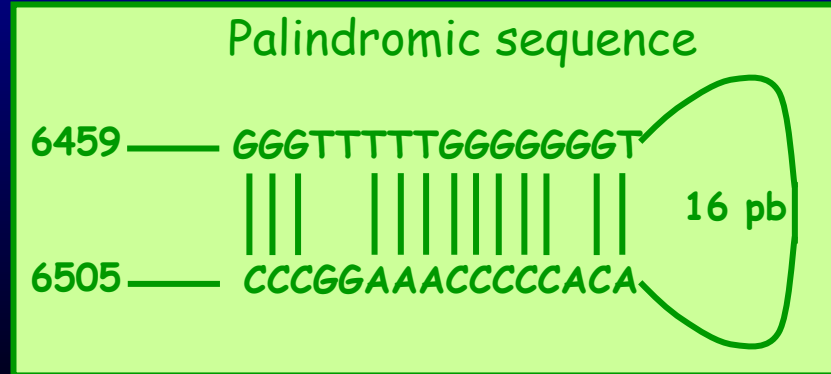
# Searching for replication origin



Large intergenic spaces



oriev, 1998, Nucleic acids research



Huang & Kowalski, 2003, Nucleic acids research

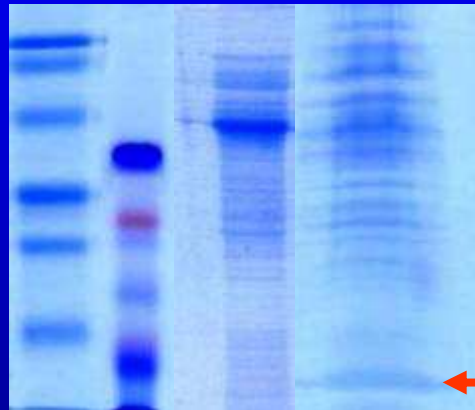




# Preliminary studies of viral proteins

## SDS-PAGE electrophoresis

Ladders Host Virions



Major constituent of virion envelope

15 kDa

Major protein

Hypothetical matured protein?

N-terminal sequencing and comparison with PAV1 genome ORF 121

Predicted transmembrane domains

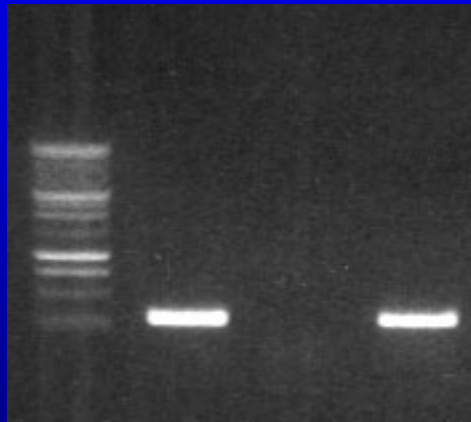
Predicted sequence : M-T-V-V-V-Y-A-P-T-S-G-W-N-F-R-G-V-W-Q-W-L-N-E-E-D-A-A-M-M-D-A-L-E-D-V-----  
Real sequence : M-M-D-A-L-E-D-V-----

# Transcripts analysis

## Transcripts map

### RT-PCR

L RT-PCR - +

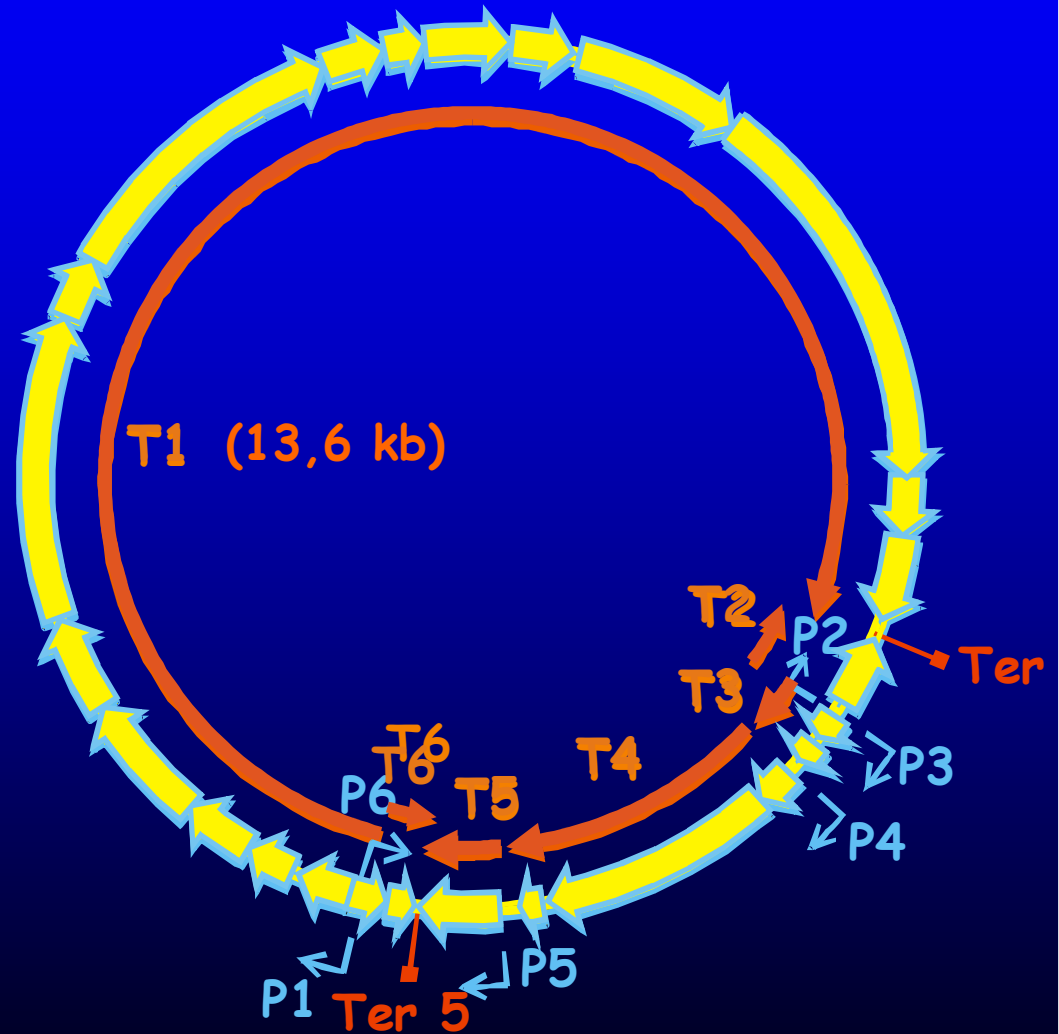


- : RT-PCR without RTase  
+ : only PCR with DNA

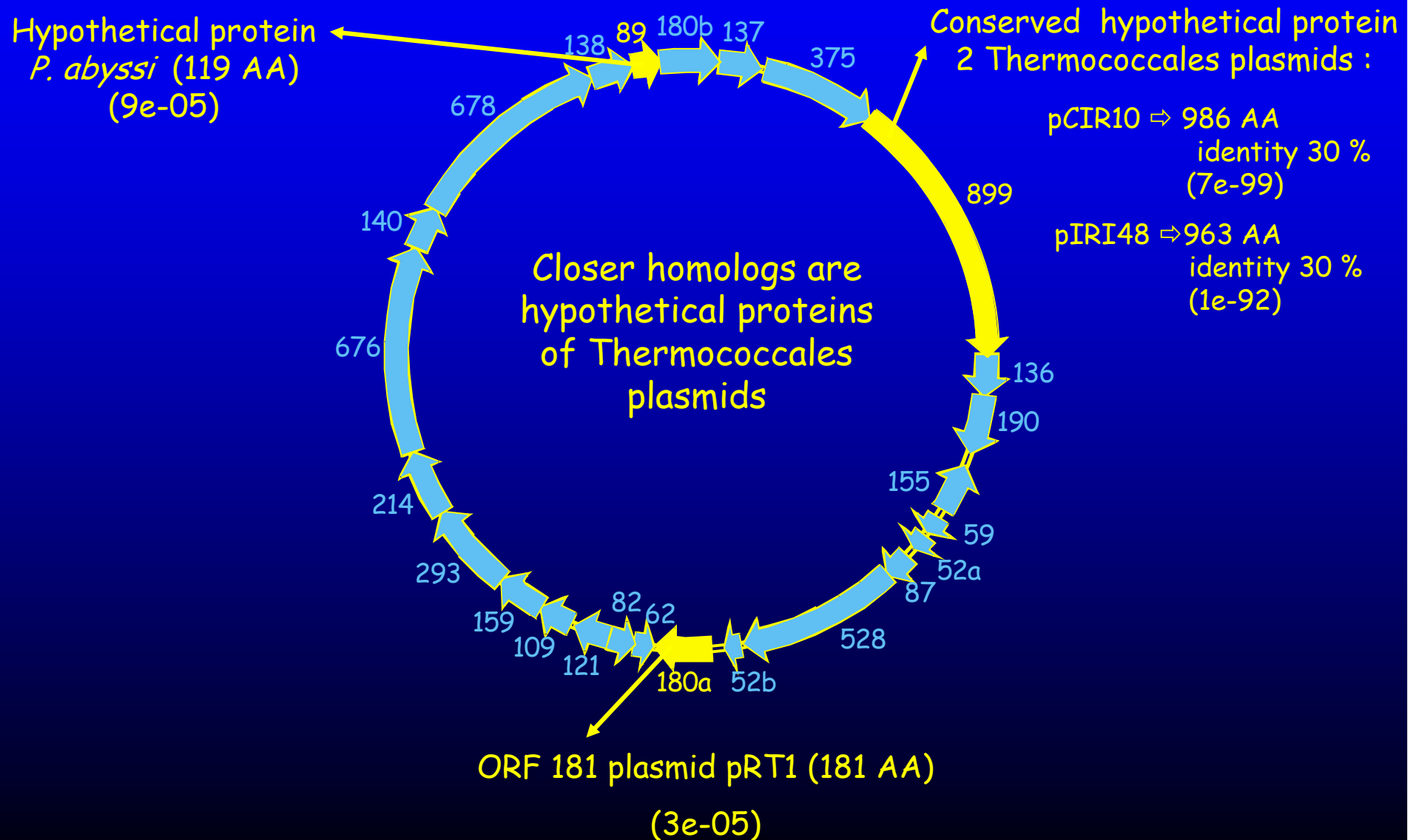
## 5' terminus of mRNAs

### Primer extension

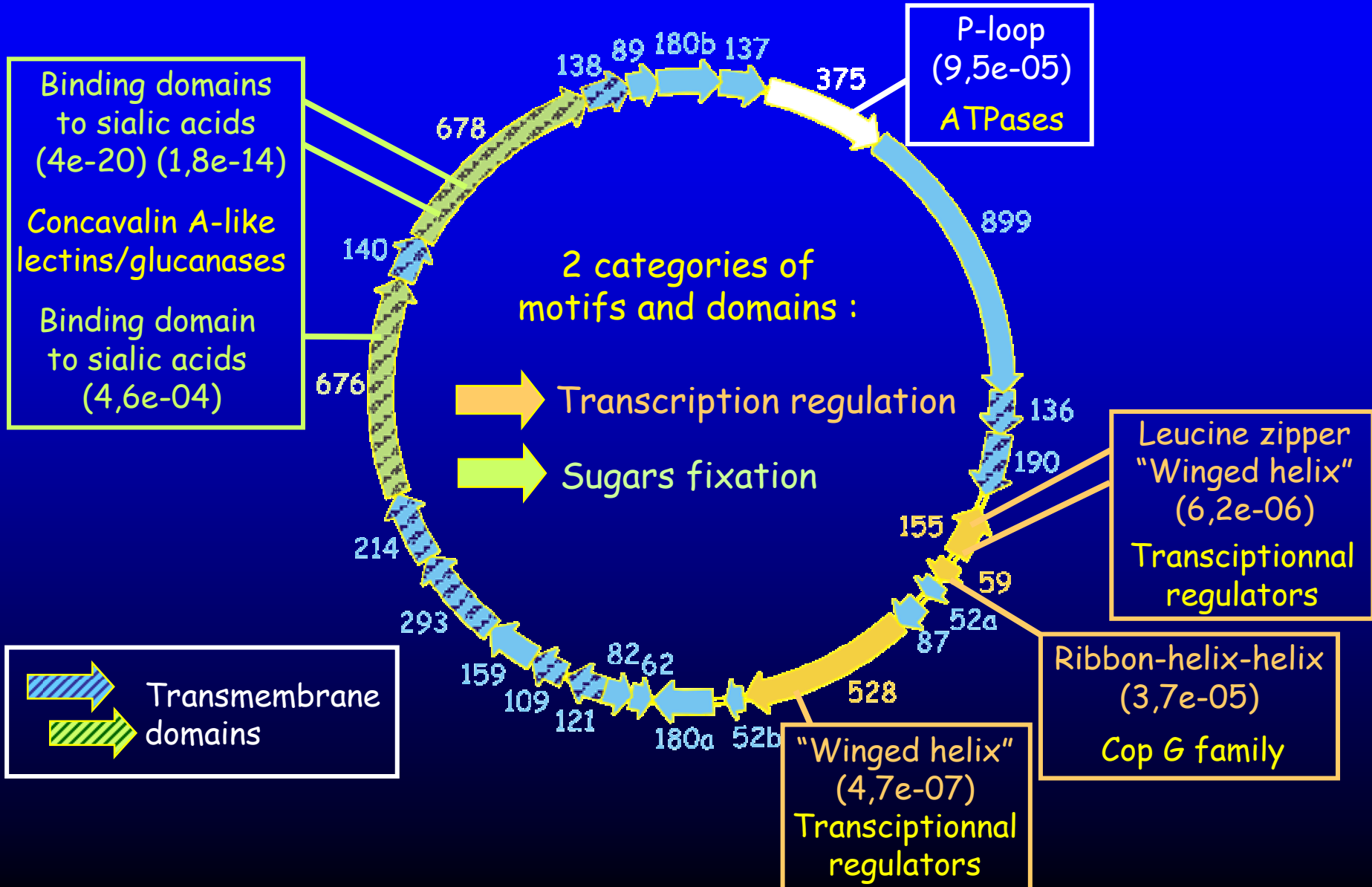
Work in progress ...



# Sequence similarities of predicted proteins



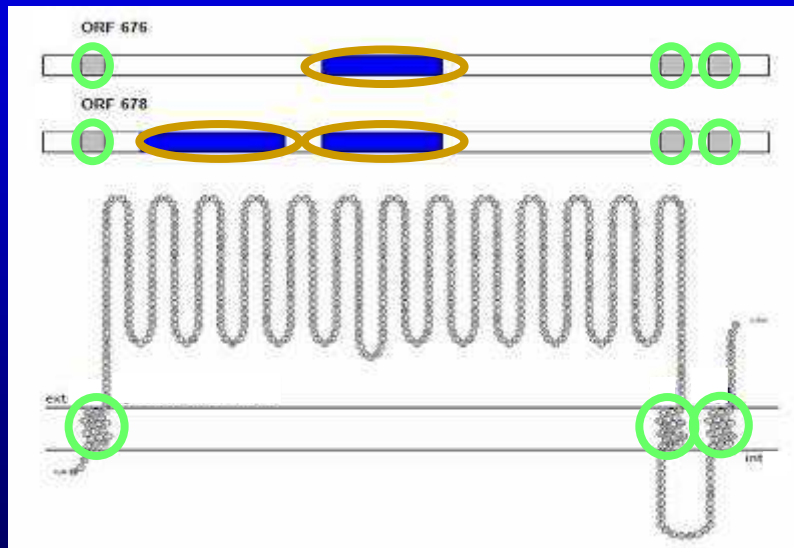
# Conserved motifs and domains of predicted proteins



# Proteins involved in host-virus recognition ?

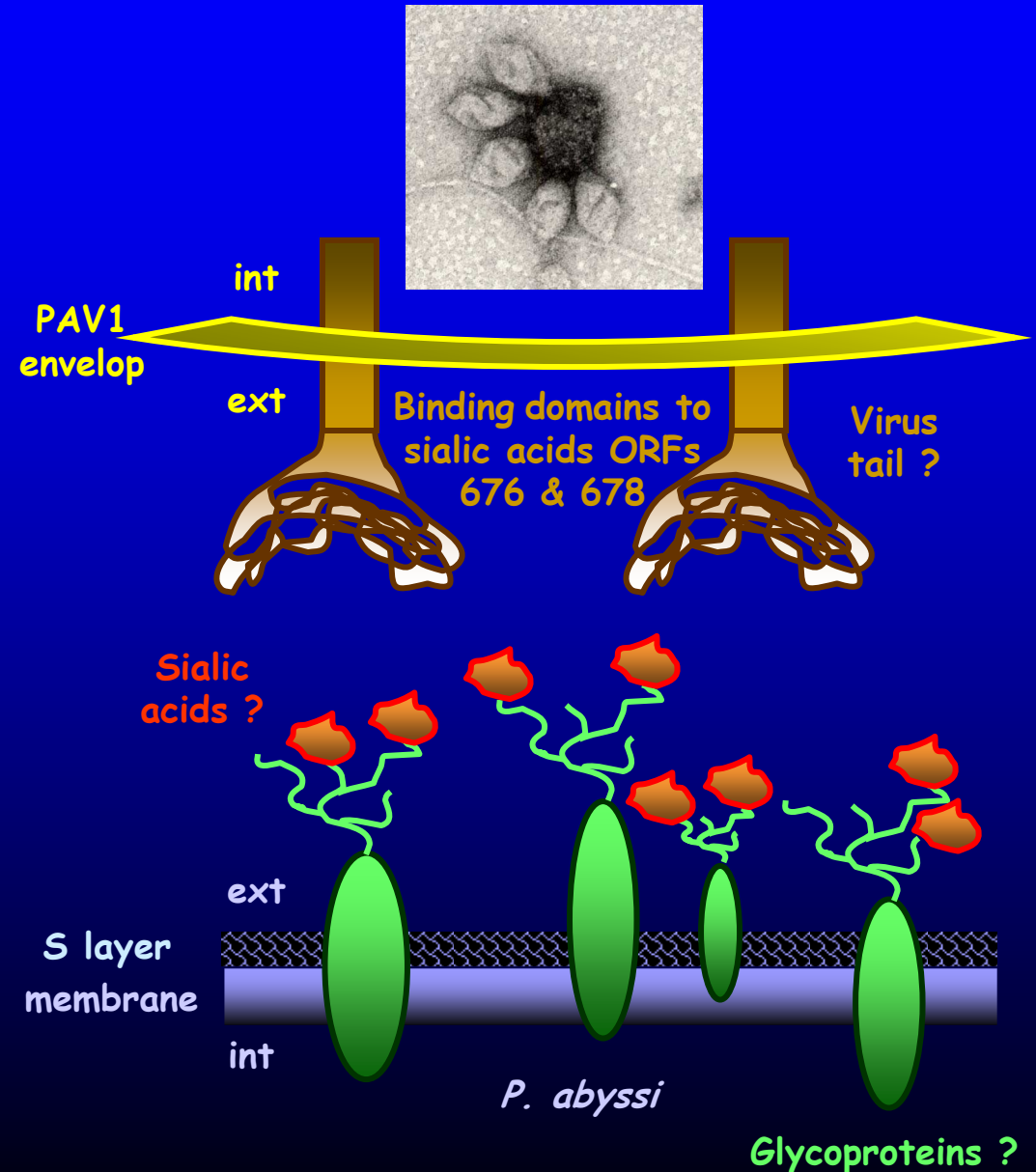
1 or 2 binding domains  
to sialic acids

◆ virus recognition and adhesion



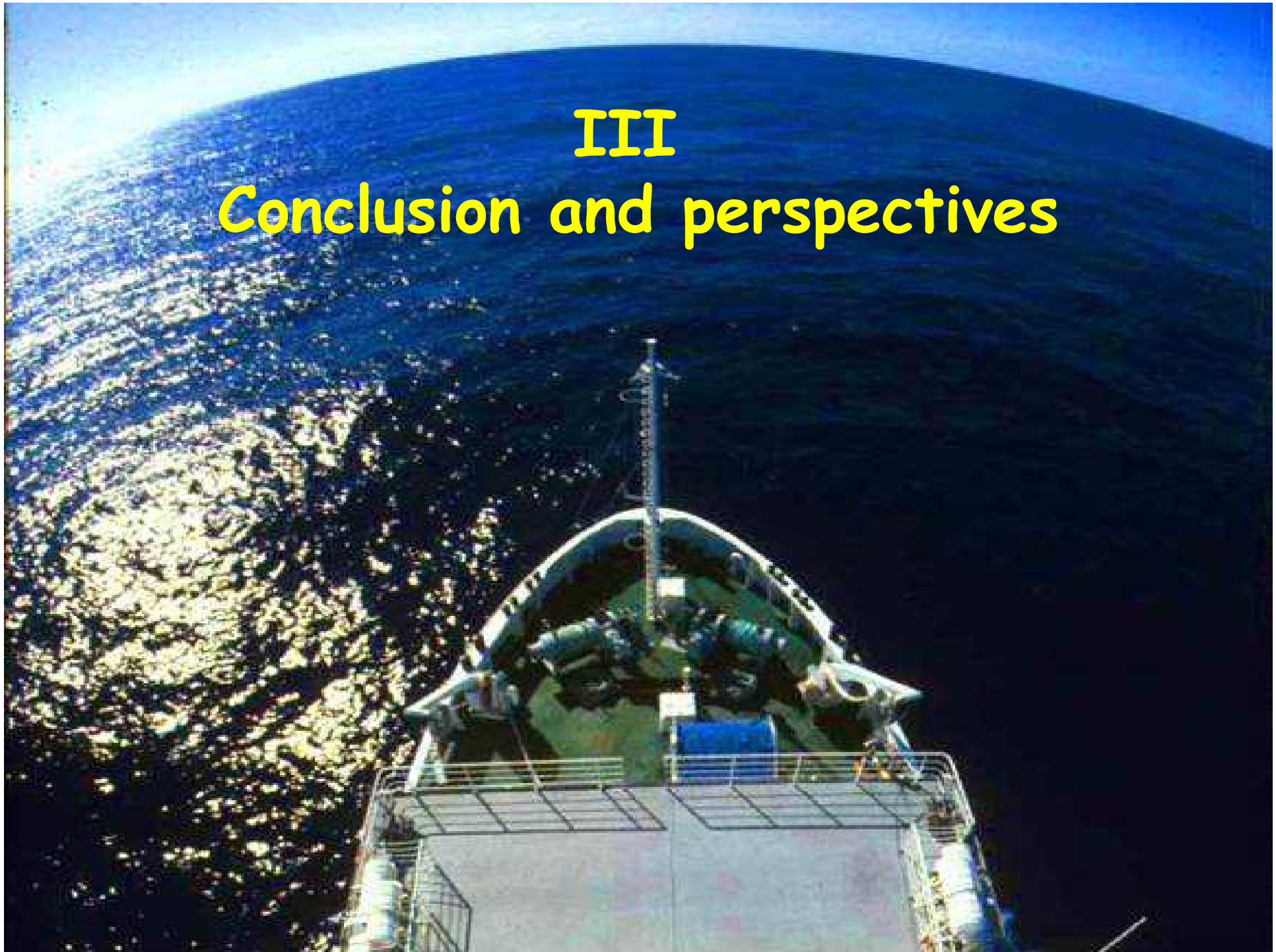
3 transmembrane domains

◆ anchoring to virus envelope



# III

## Conclusion and perspectives

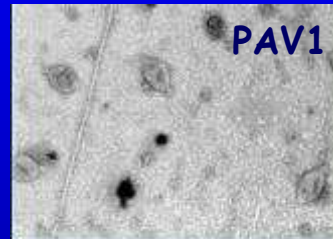
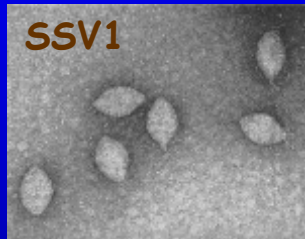


# Conclusion

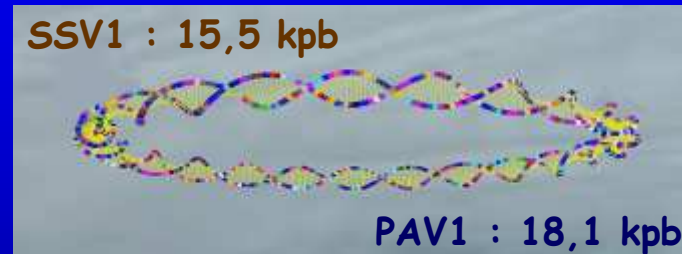
What about the taxonomic status of PAV1 ?

Common features with viruses of the *Fuselloviridae* family ...

Same morphology  
Lemon shaped



Same nucleic acid type  
Circular double stranded DNA

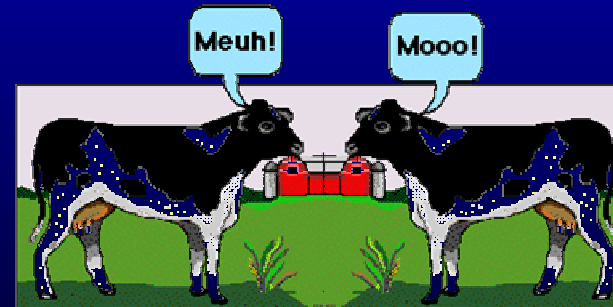


... but important differences ...

Different hot environments



No sequence similarities



Creation of a new genus or a new family ?

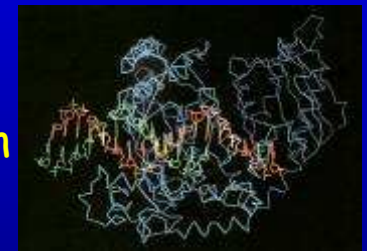
# Perspectives

## Experimental confirmations of hypotheses

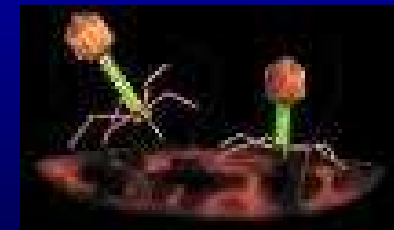
Determination of replication origin and its mechanism



Search for proteins involved in replication and its regulation



Elucidation of the host-virus recognition system





# Acknowledgements ...

...to my colleagues involved in  
this study for their confidence !!



Claire GESLIN



Didier FLAMENT



Karen ROUAULT



Gaël ERAUSO



Marc  
LE ROMANCER



Daniel PRIEUR

**Thank you very much  
for your attention !!**

