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*f.* calvescens *(Fern.) C.F. Reed in Phytologia*, 67(6): 451 (1989): Andropogon scoparius f. calvescens.
*var.* polycladum *(Scribn. & Ball) C.F. Reed in Phytologia*, 63(5): 410 (1987): Andropogon scoparius var. polycladus.
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anatolicum *O.M. Hilliard in Notes Roy. Bot. Gard. Edinburgh*, 45(2): 182 (1988 publ. 1989)—South Africa (Cape Province).
rubigi[illegible]osum *O.M. Hilliard in Notes Roy. Bot. Gard. Edinburgh*, 45(2): 182 (1988 publ. 1989)—South Africa (Natal).

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hydrangeoides
*f.* mollis *(Honda) Hara ex H. Ohba in J. Jap. Bot.*, 64(11): 325 (1989): S. hydrangeoides var. mollis

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pellucidum *D. Frame in R. McVa Galiciana*, 15: 272 (1989)—Mexico
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181 (1986). *CYPERACEAE*.
oligocephalus *(W.M. Curtis) O. Seber* 16(1): 182 (1986): Oreobolus oligo

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×kuekenthalianus *(Junge) D.H. Ke* 18(2): 213 (1990): Scirpus × kuek
lacustris
*subsp.* validus *(Vahl) T. Koyama Occas. Pap.*, 29: 128 (1989): Sci

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eberhardtii *(Finet) L.V. Aver'yanov* 73(1): 107 (1988): Saccolabium eb
endertii *(J.J. Smith) E.A. Christenso Lindleyana*, 5(2): 101 (1990): Rob

**SCHOENOXIPHIUM** (Cyperac.).
altum *I. Kukkonen in Notes R Edinburgh*, 43(3): 365 (1986)—So Province).
bracteosum *I. Kukkonen in Notes Edinburgh*, 43(3): 365 (1986)—So Province, Natal), Lesotho.
burttii *I. Kukkonen in Notes Edinburgh*, 43(3): 365 (1986) (Natal).
molle *I. Kukkonen in Notes Edinburgh*, 43(3): 366 (1986) (Natal).
strictum *I. Kukkonen in Notes Edinburgh*, 43(3): 366 (1986) (Natal).

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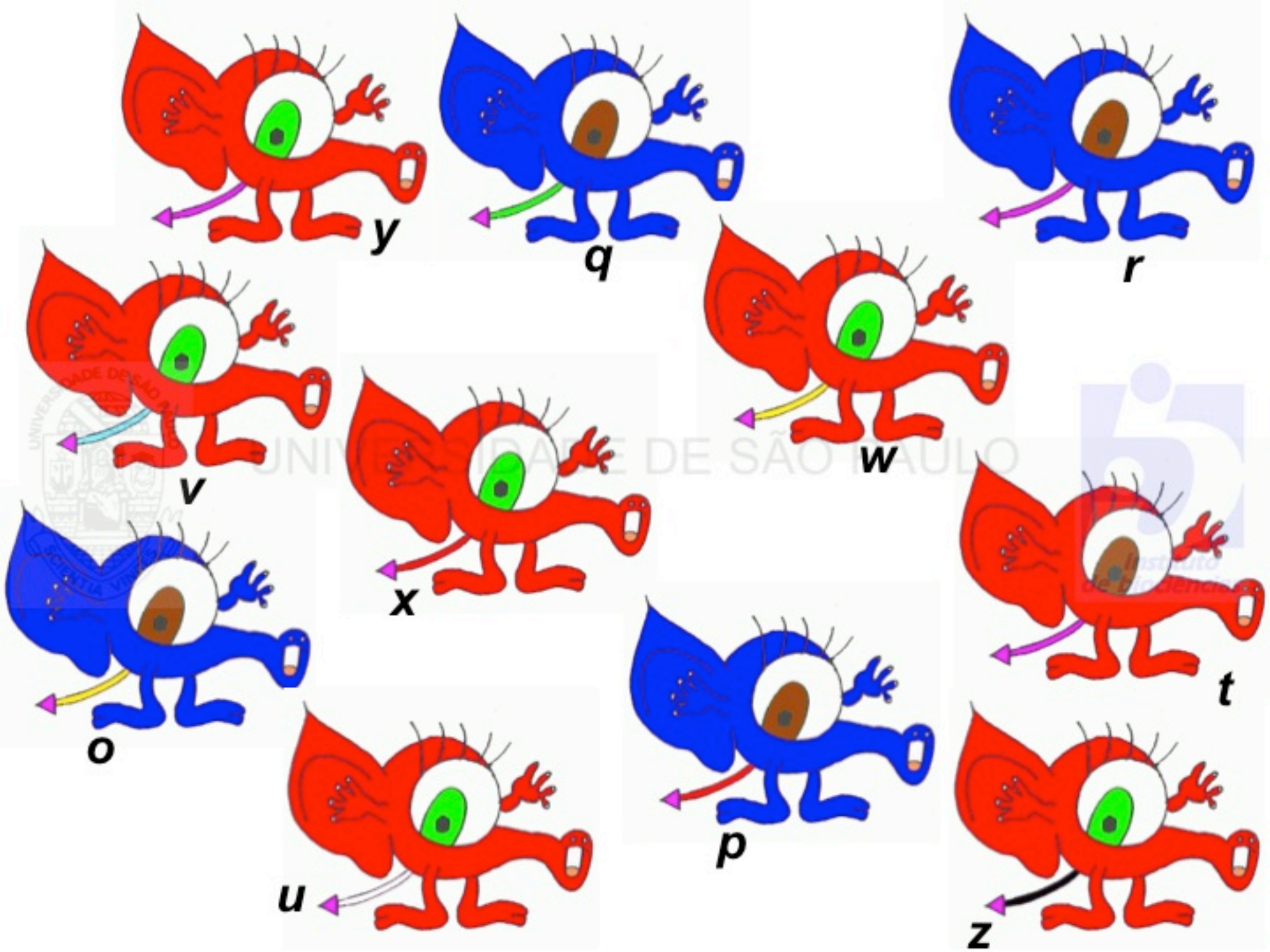
clarkii *J.A. Steyermark in Ann. Mi* 75(3): 1061 (1988)—Venezuela.

# Grupos *mono*, *para* e *polifiléticos*. Afinal, isto existe?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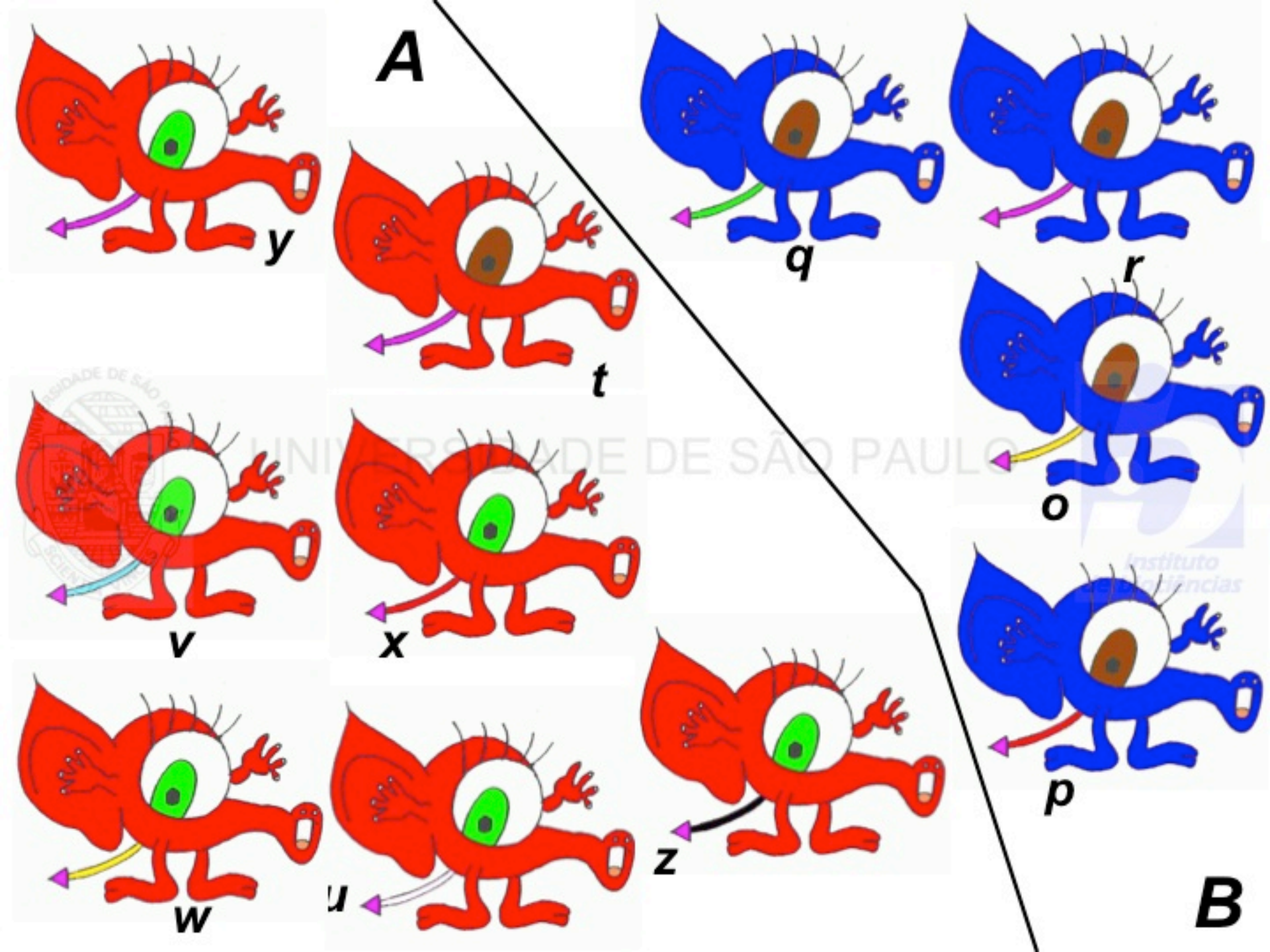
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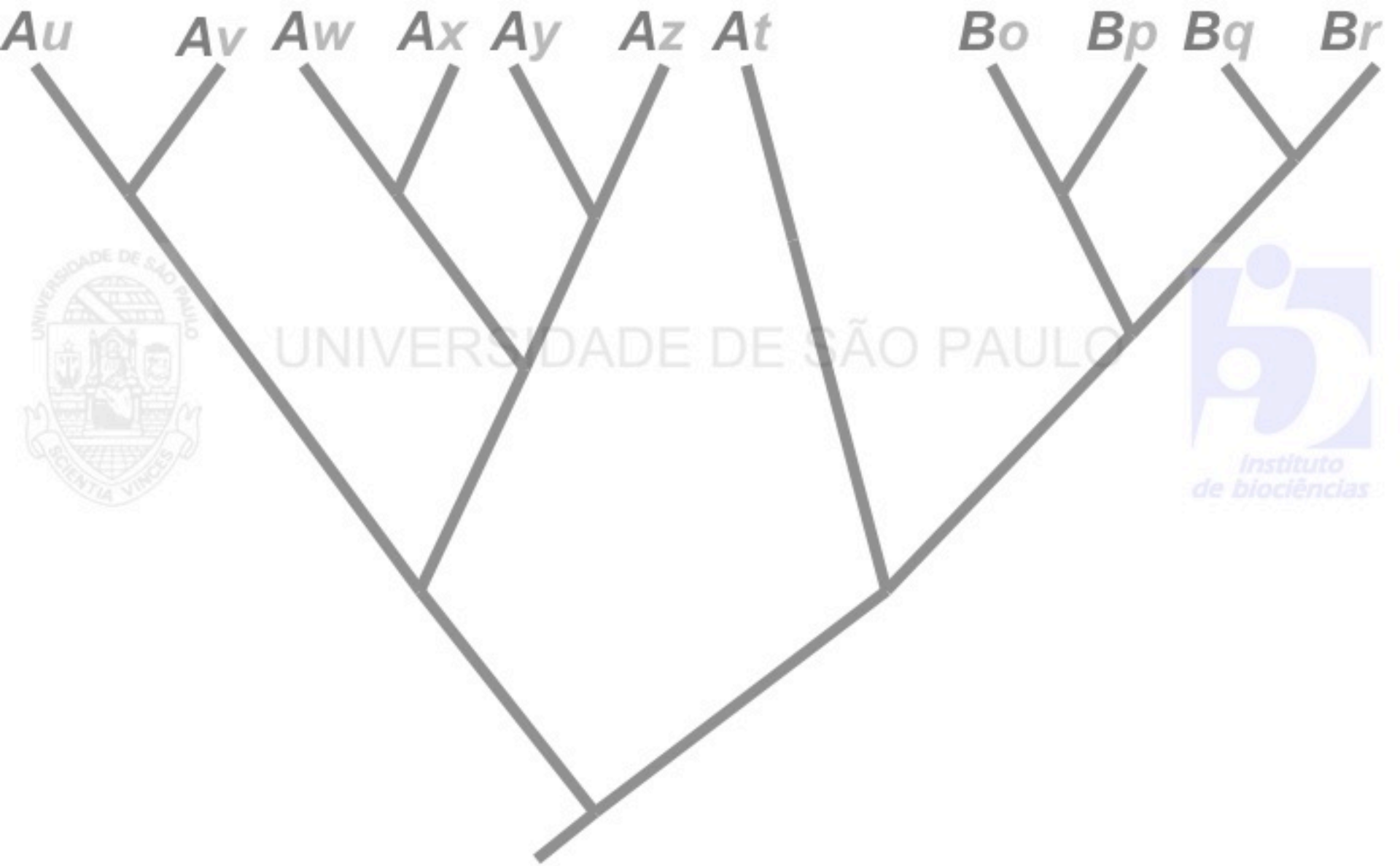

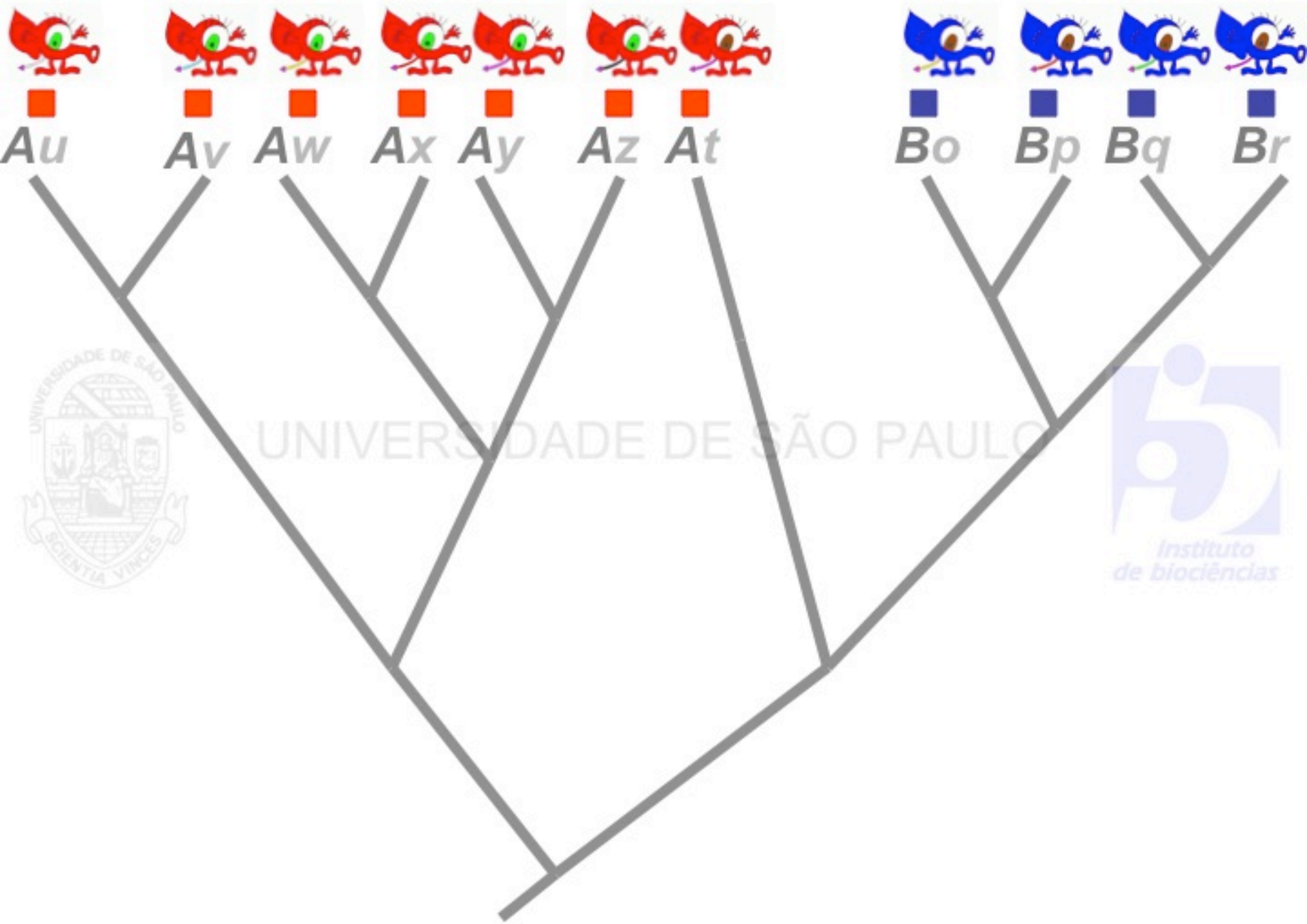

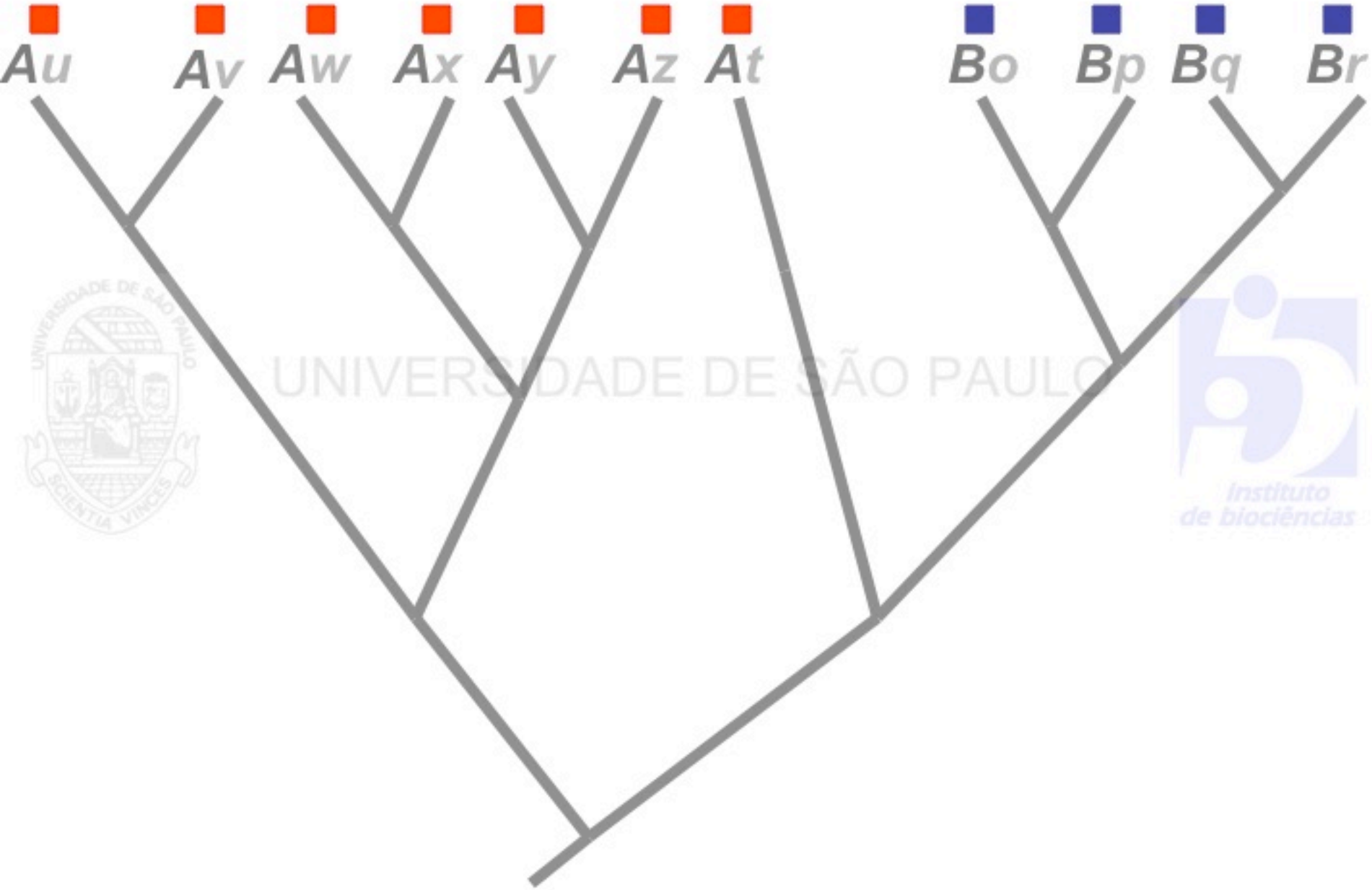

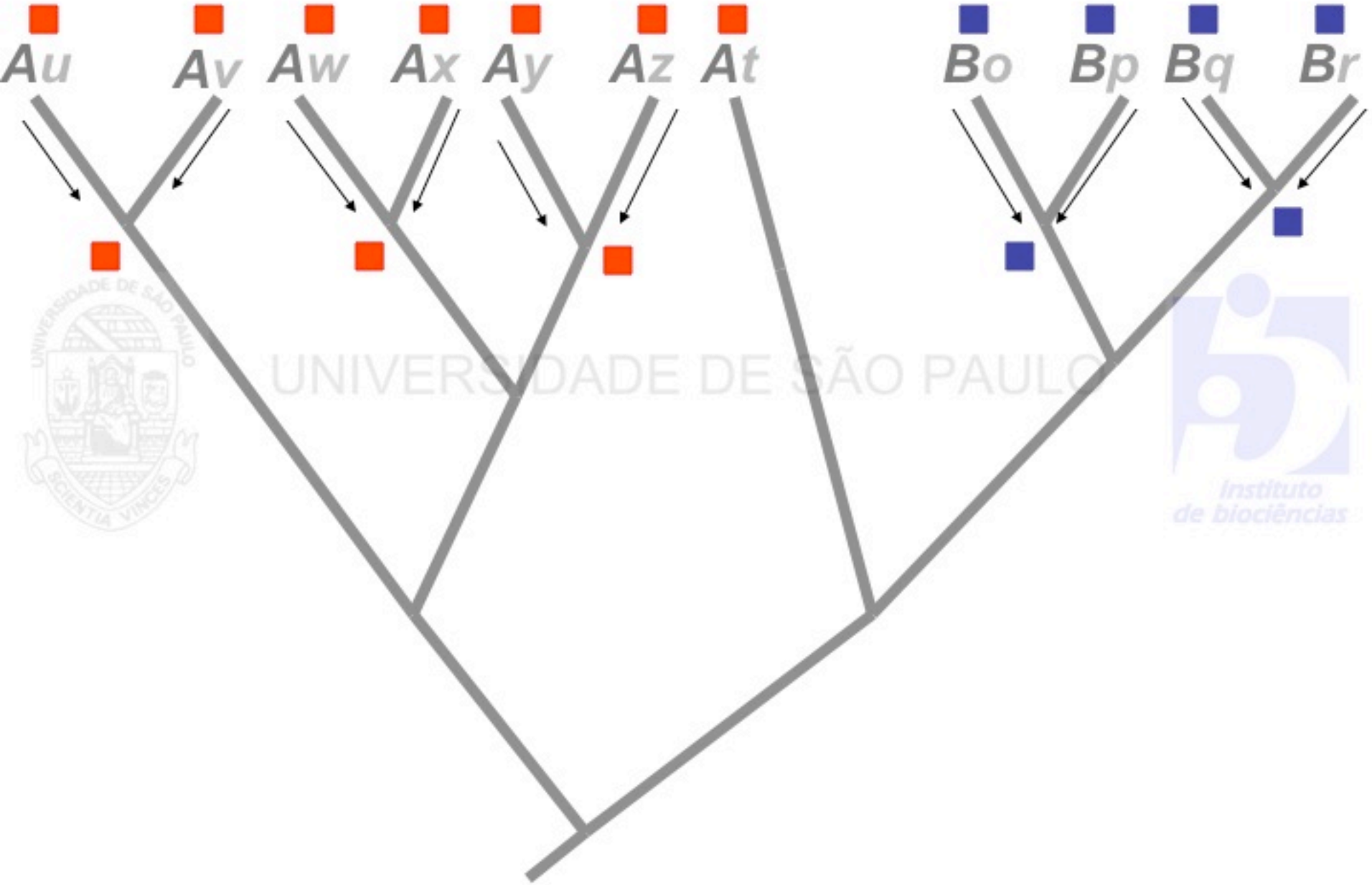

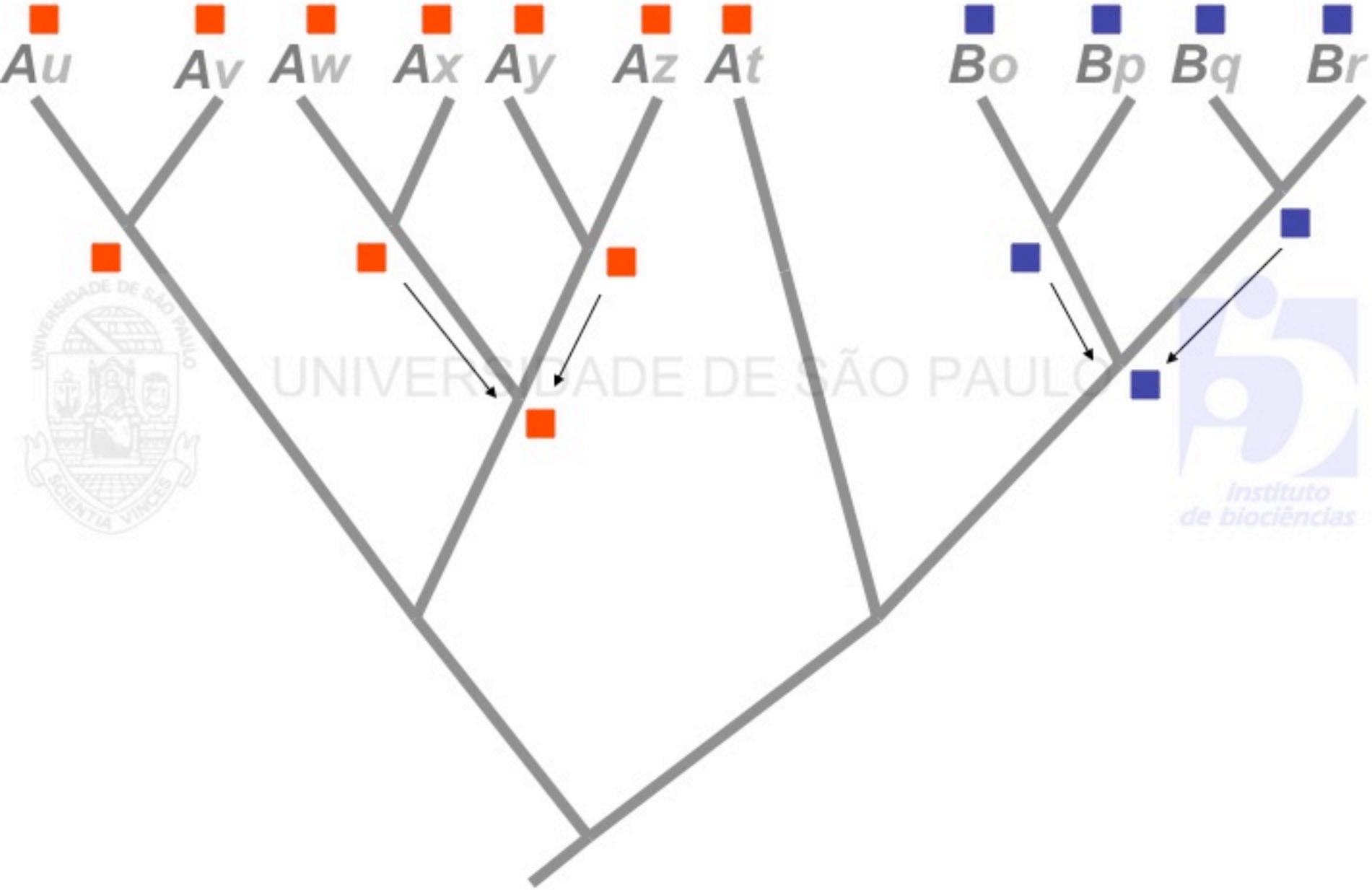

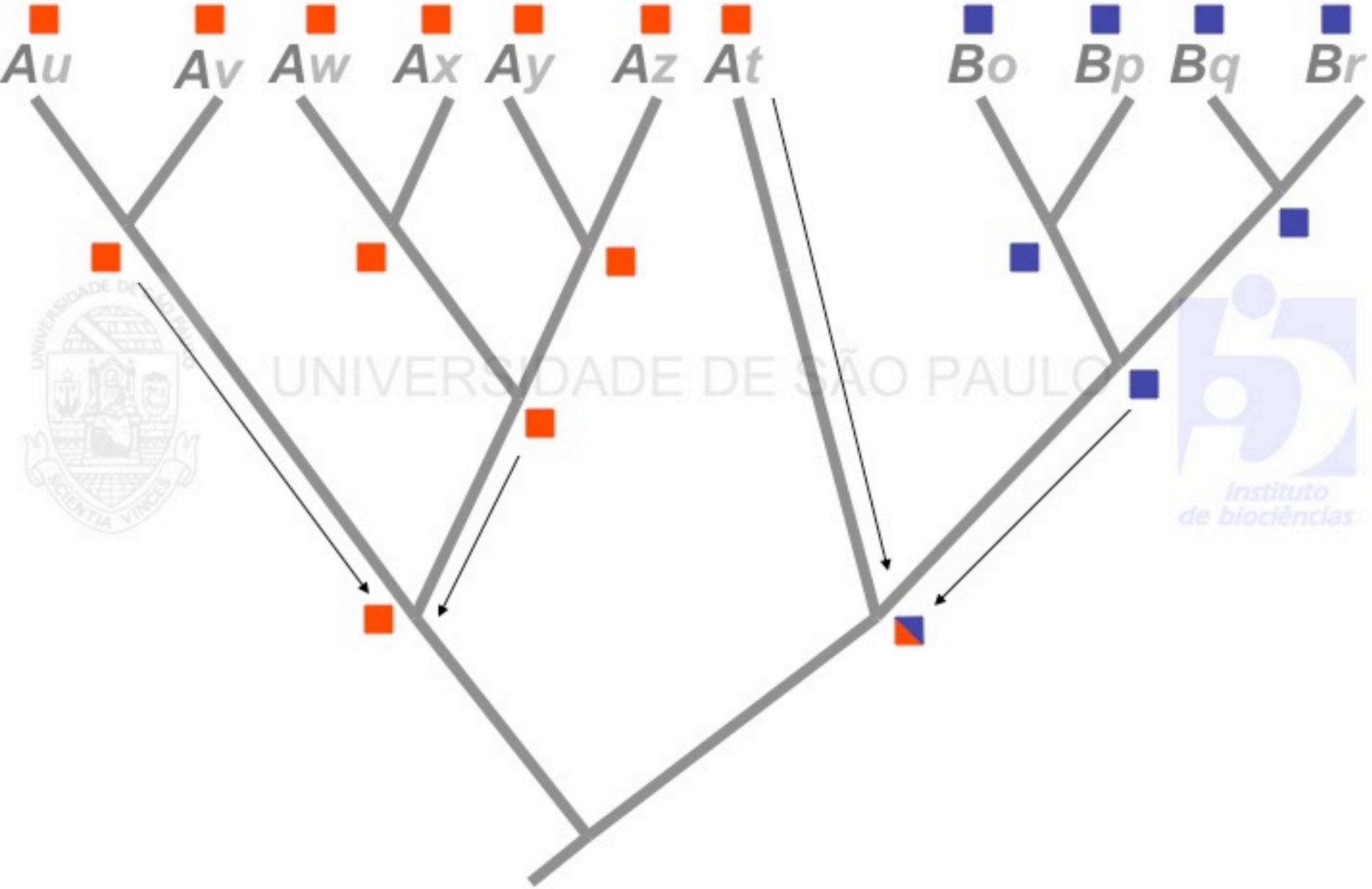

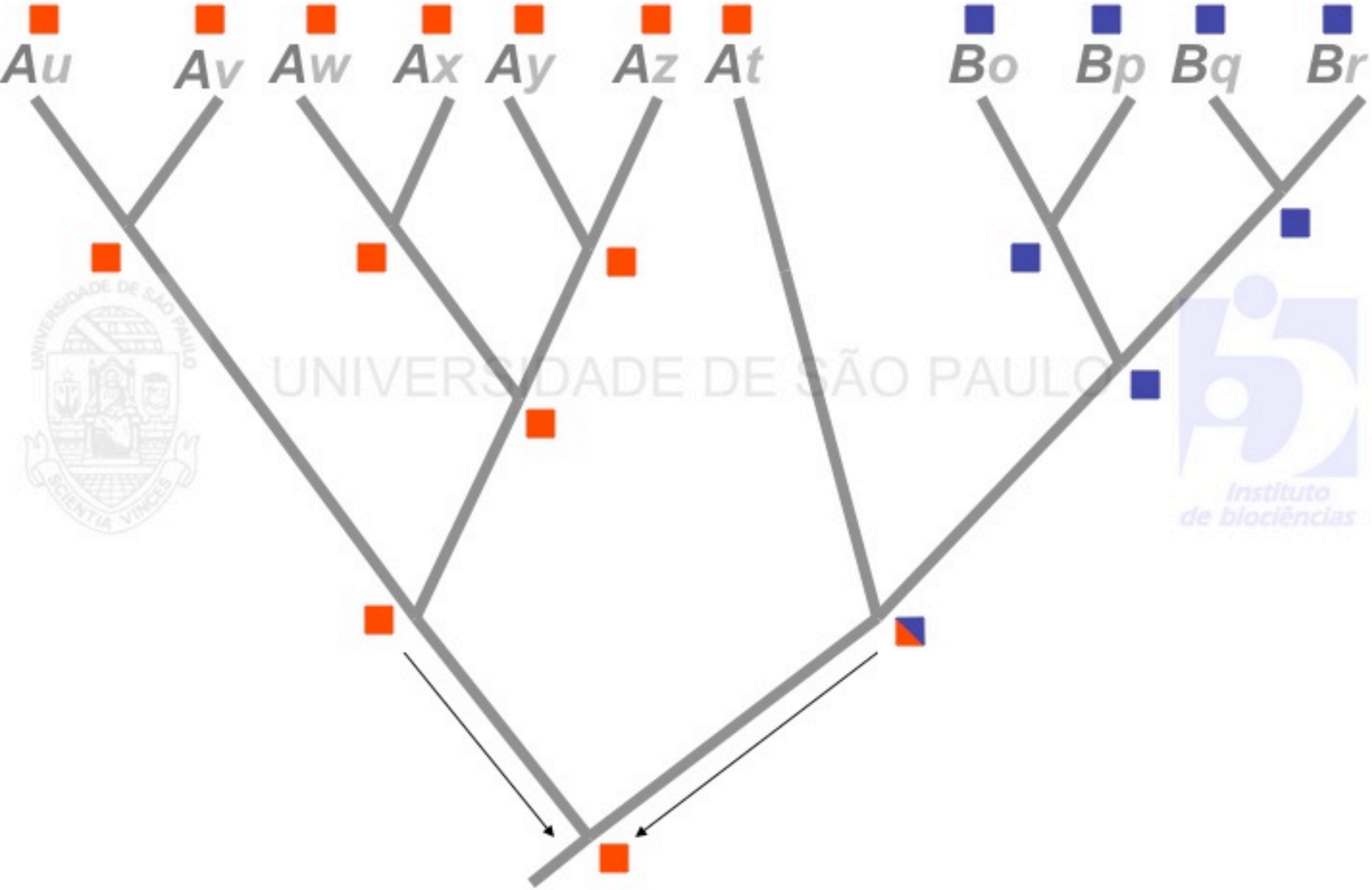

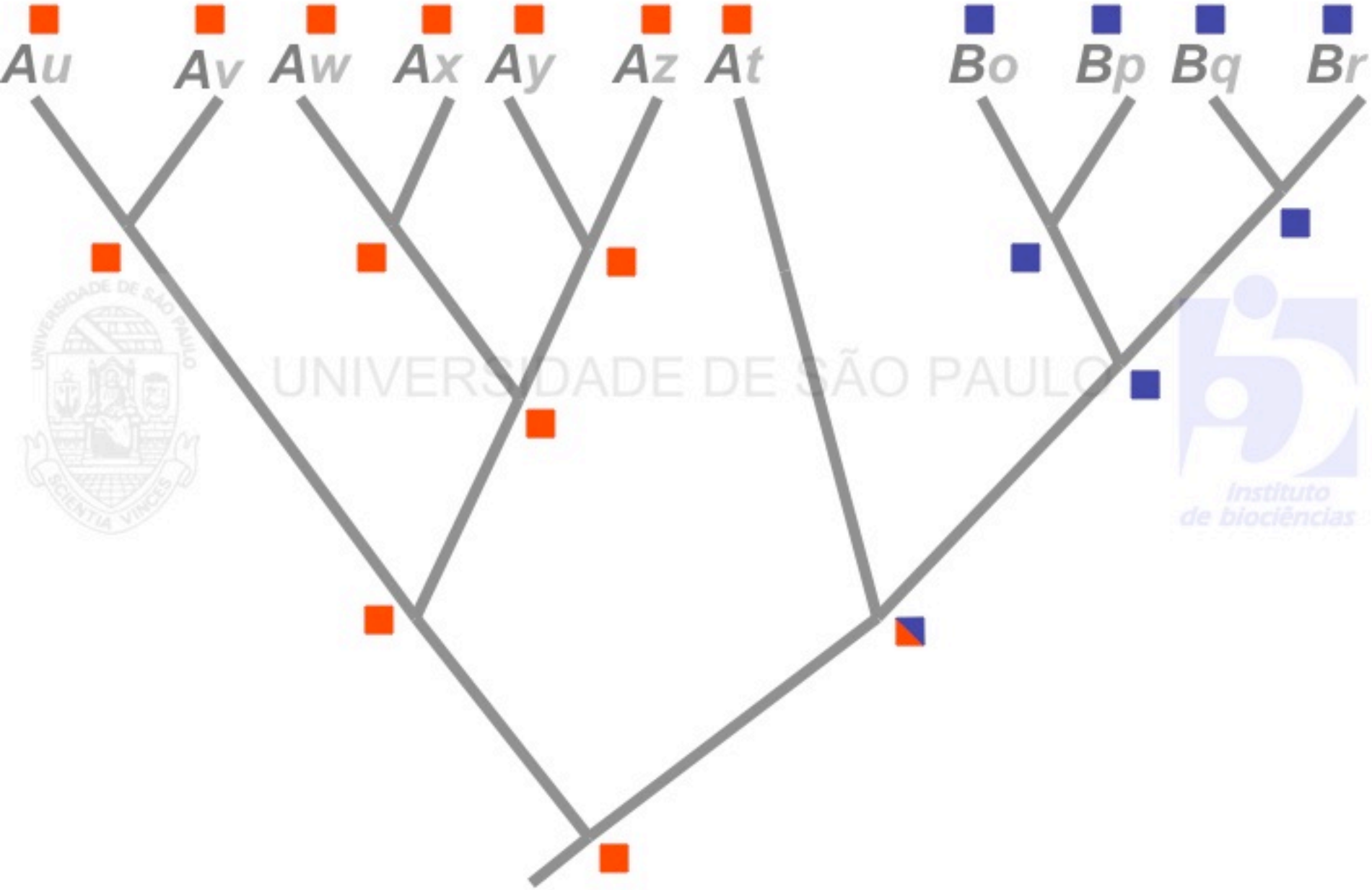

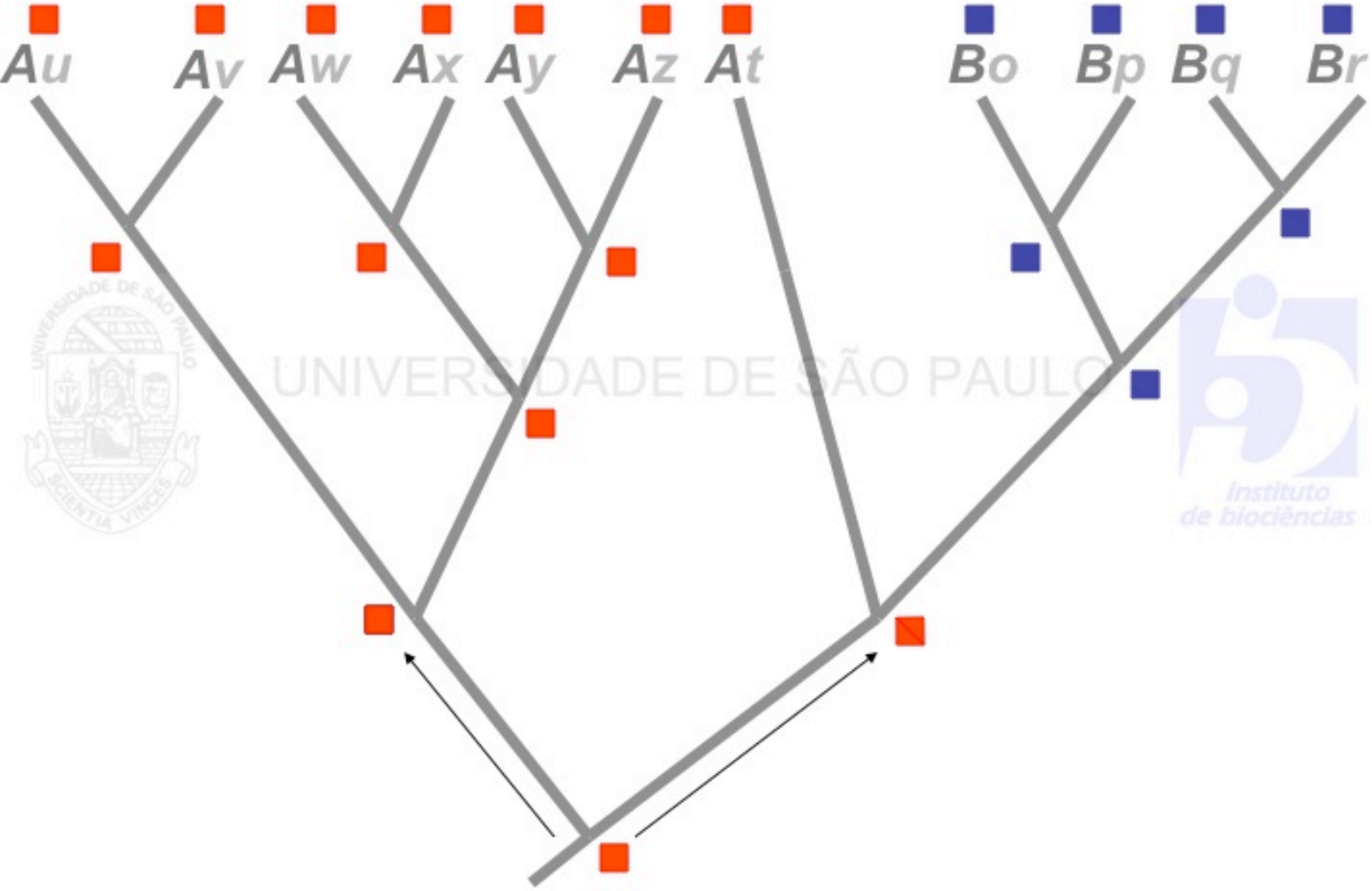

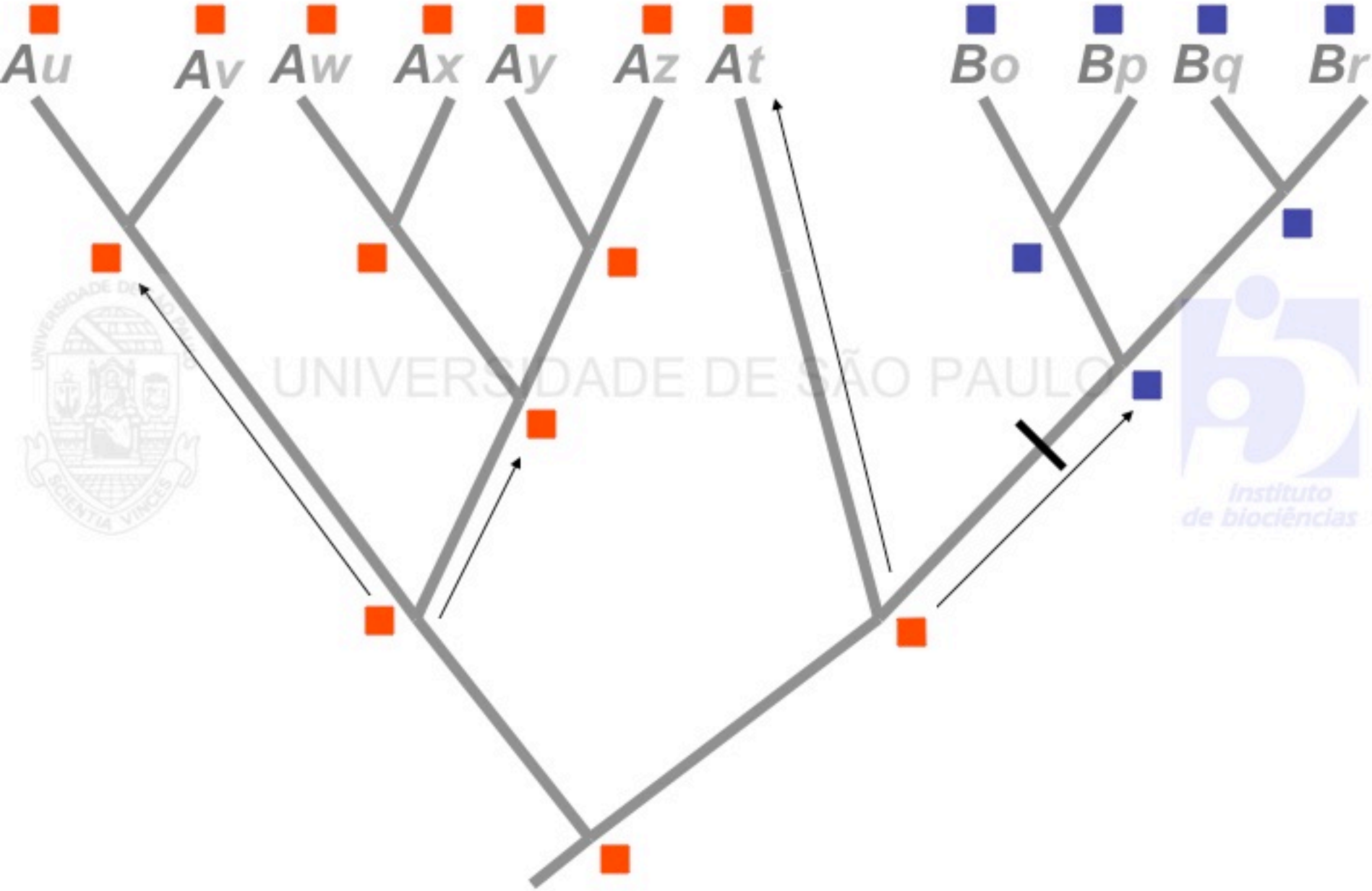

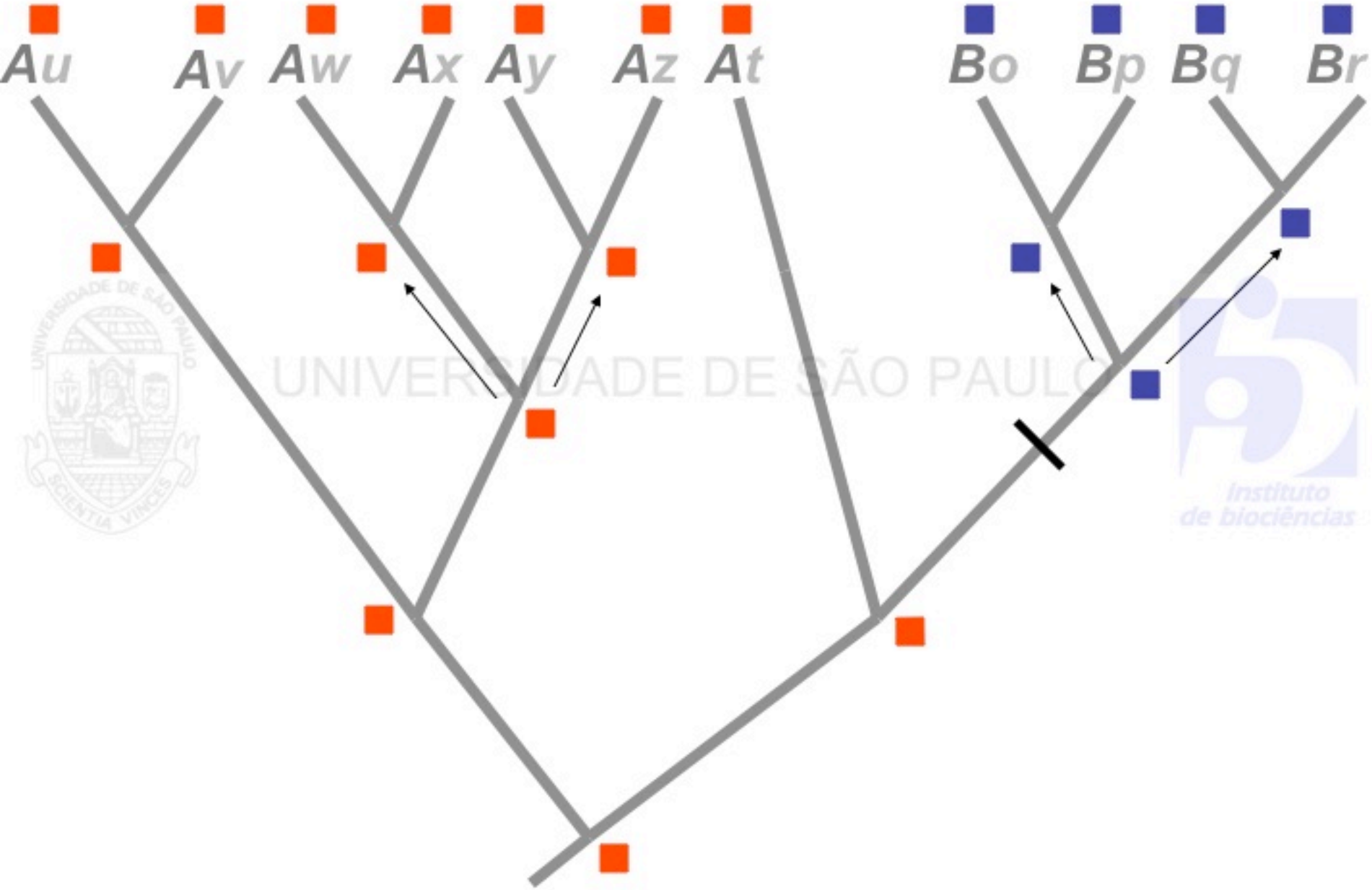

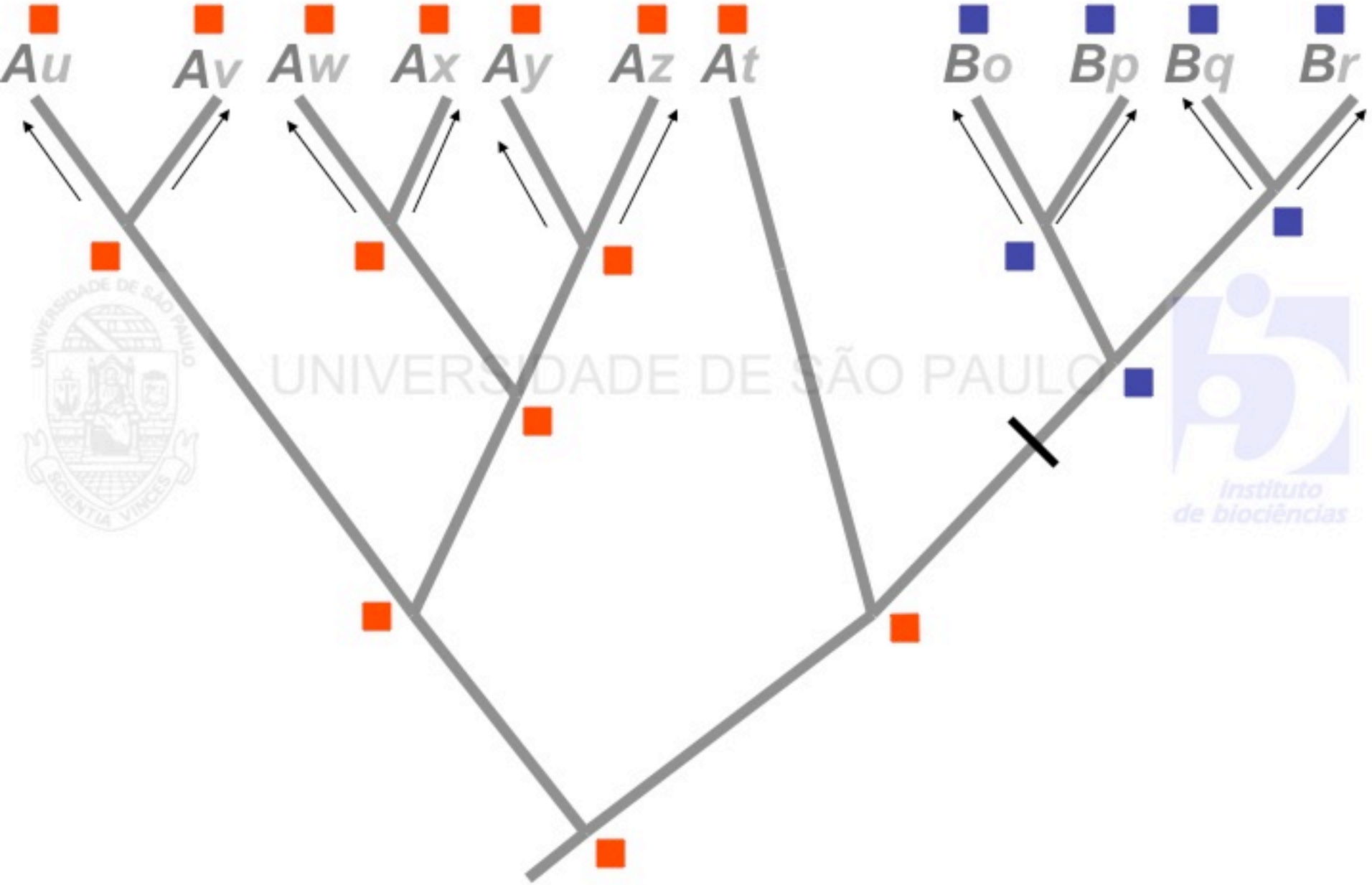

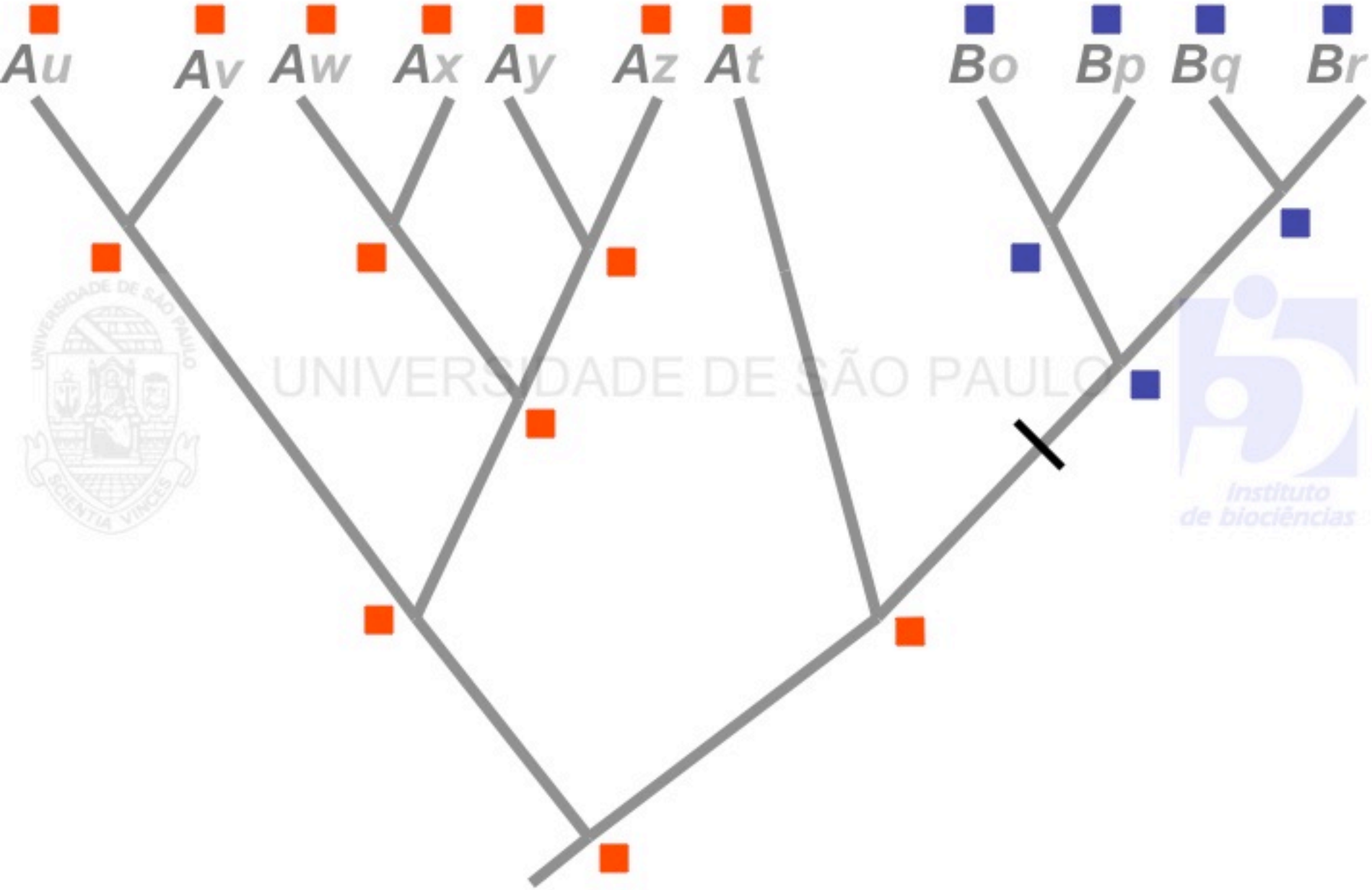

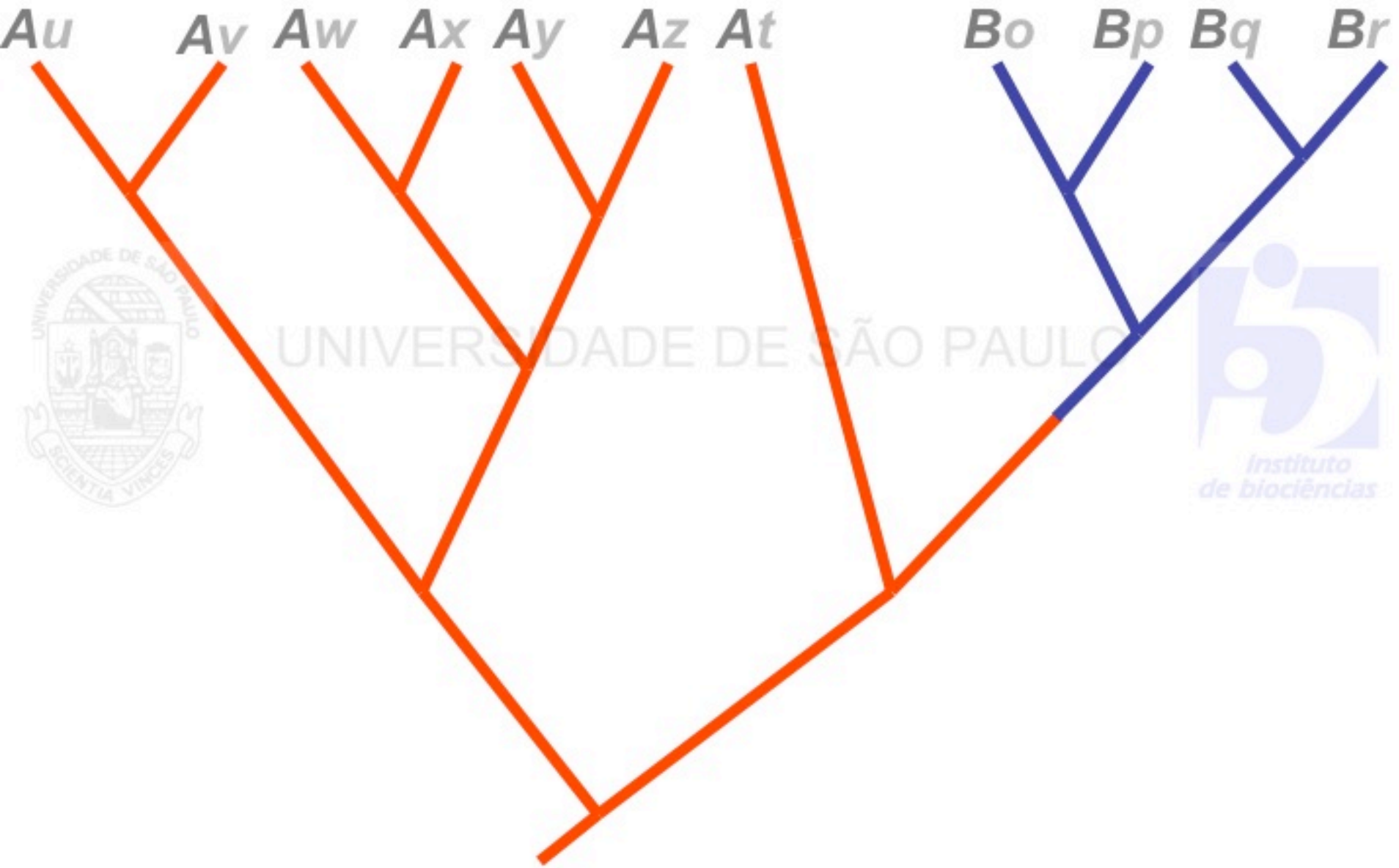

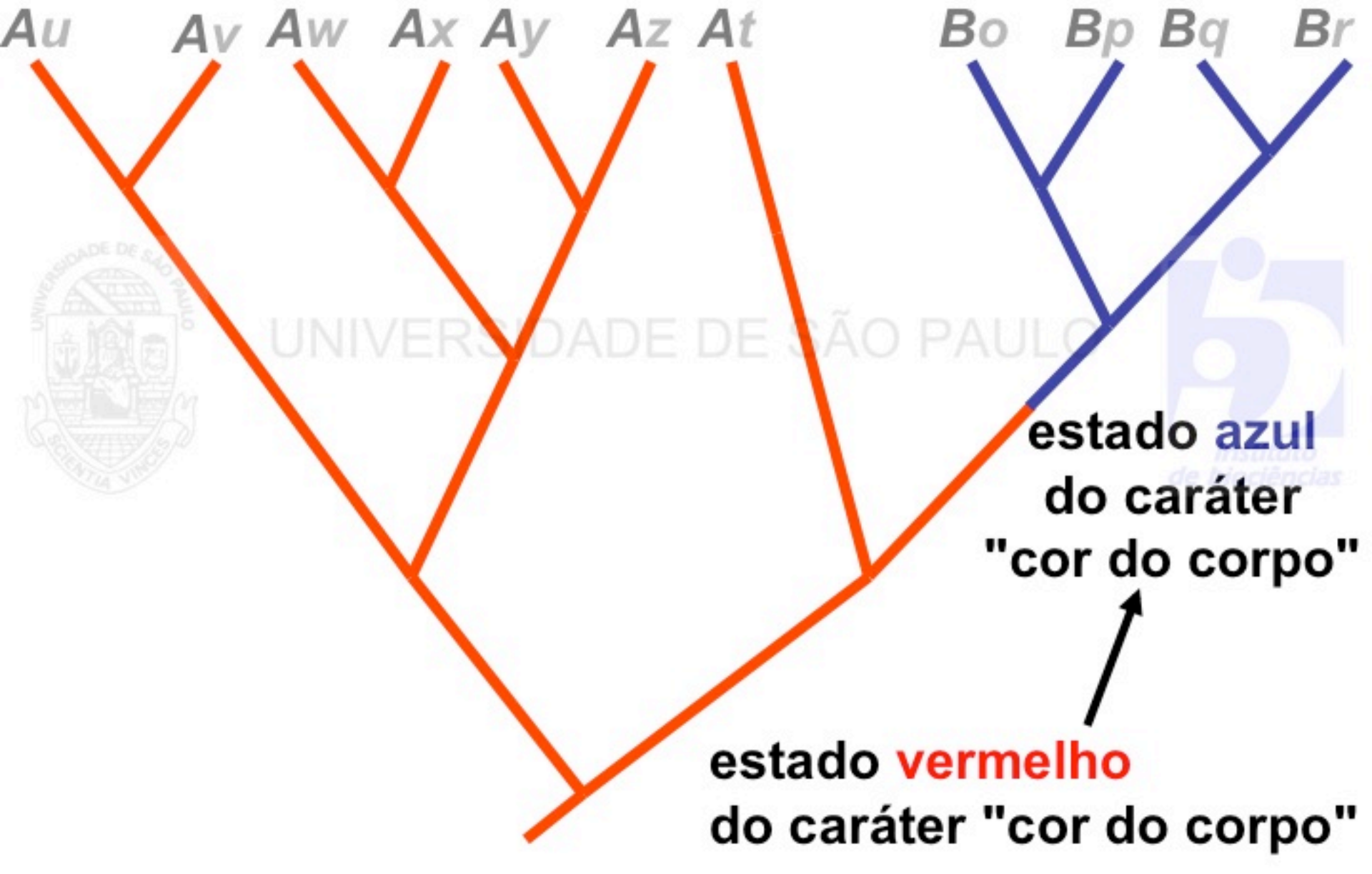
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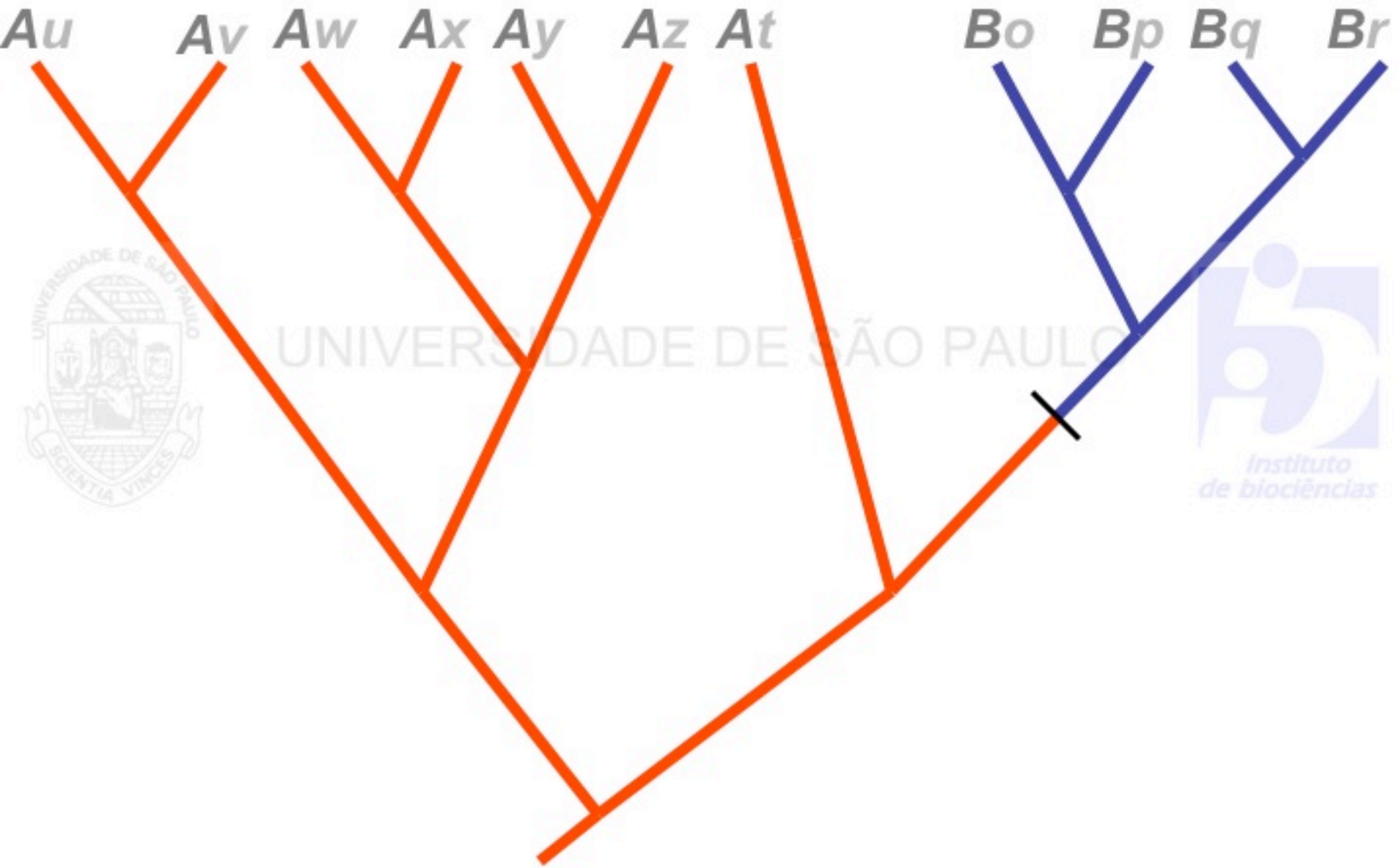
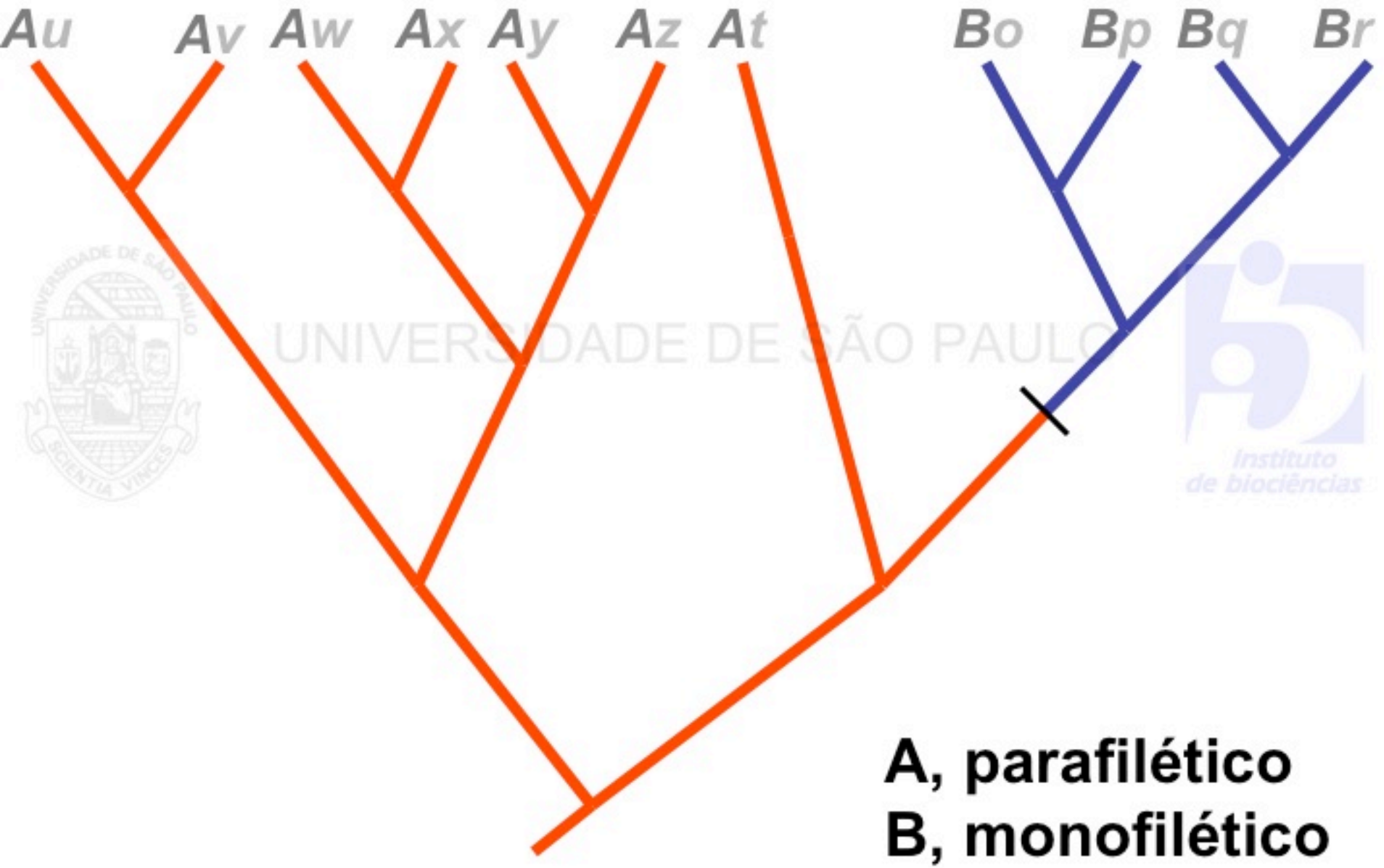
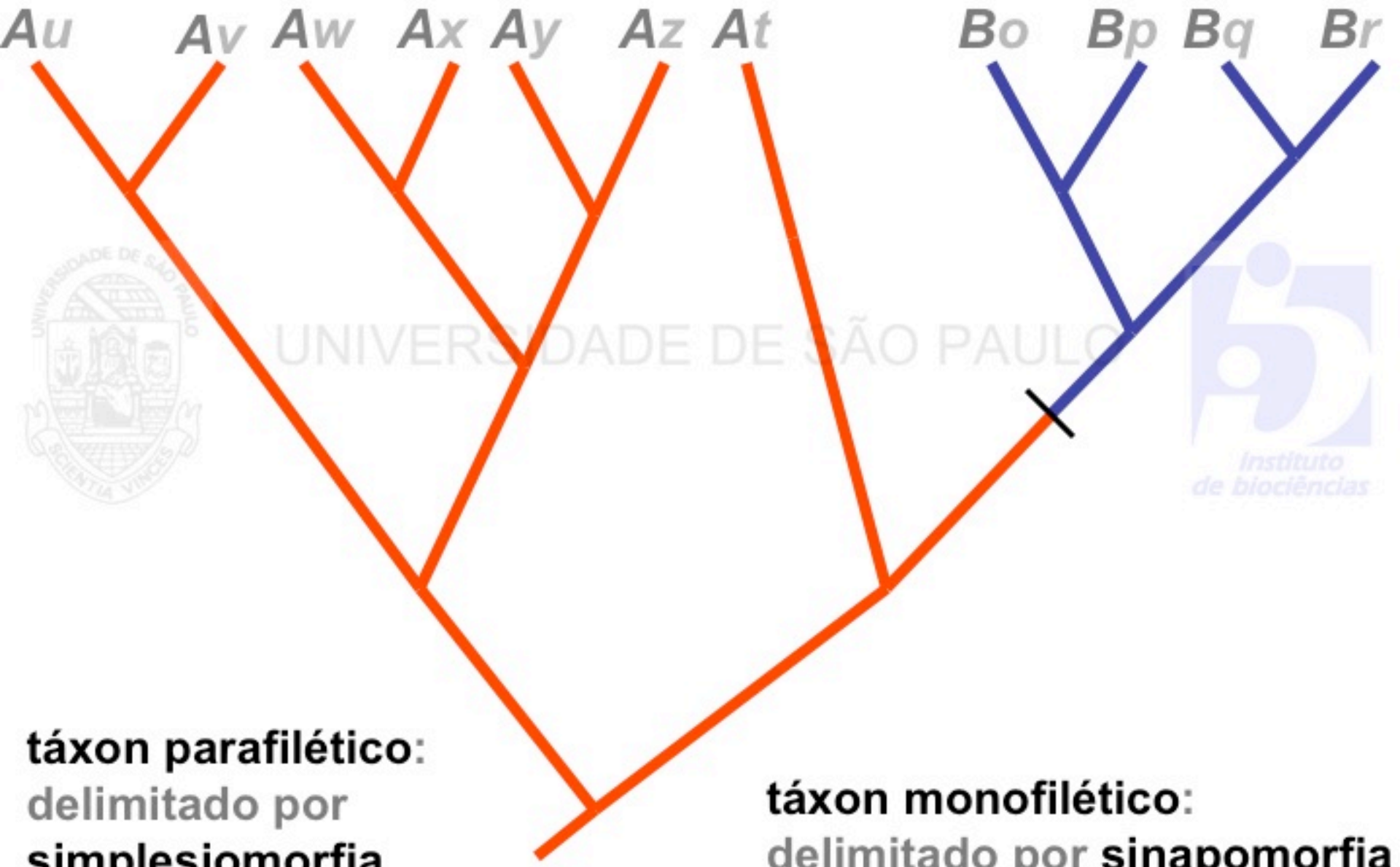
do caráter
"cor do corpo"
estado vermelho
do caráter "cor do corpo"







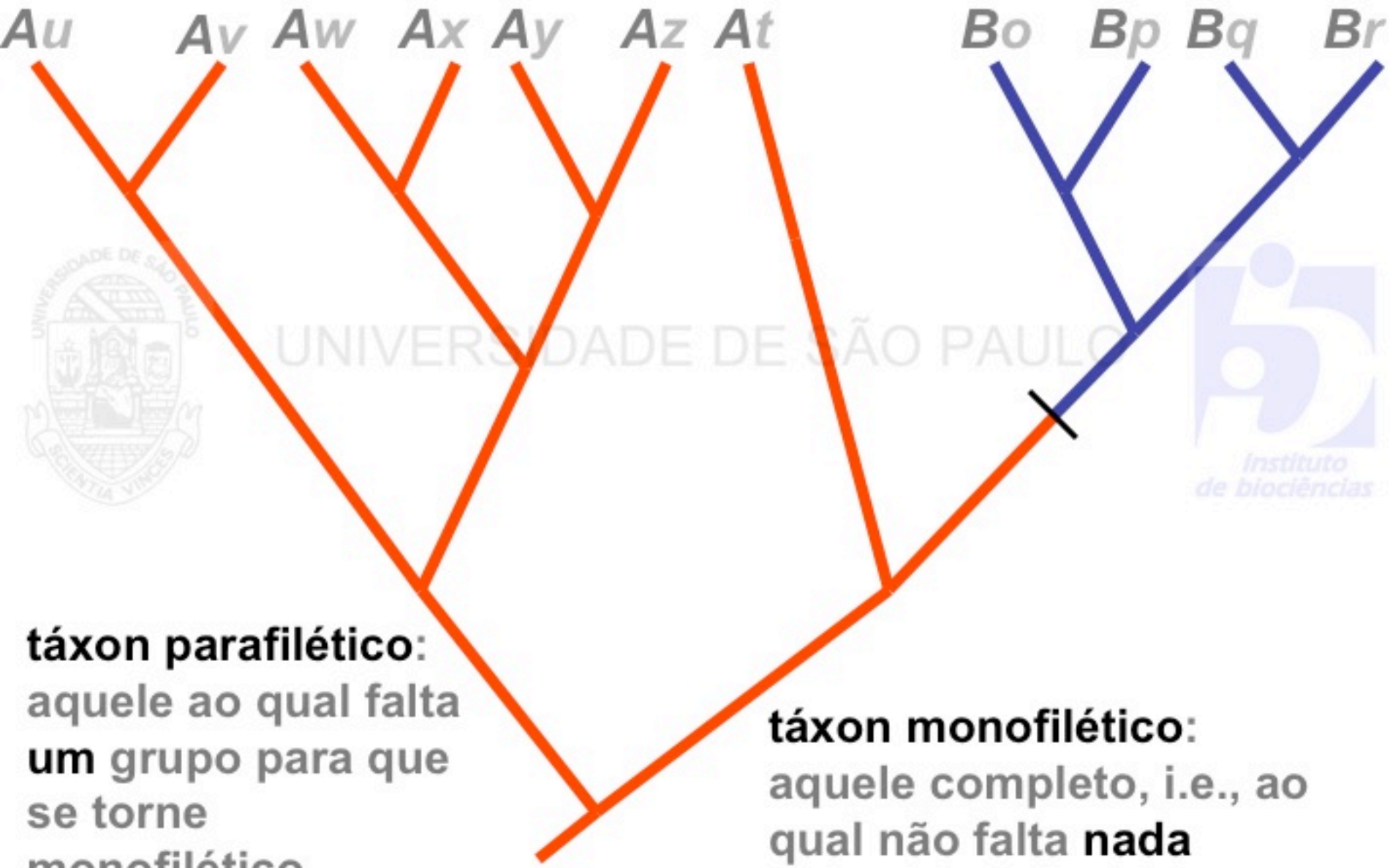

**A, parafilético**
**B, monofilético**






**táxon parafilético**: delimitado por **simplesiomorfia**

**táxon monofilético**: delimitado por **sinapomorfia**

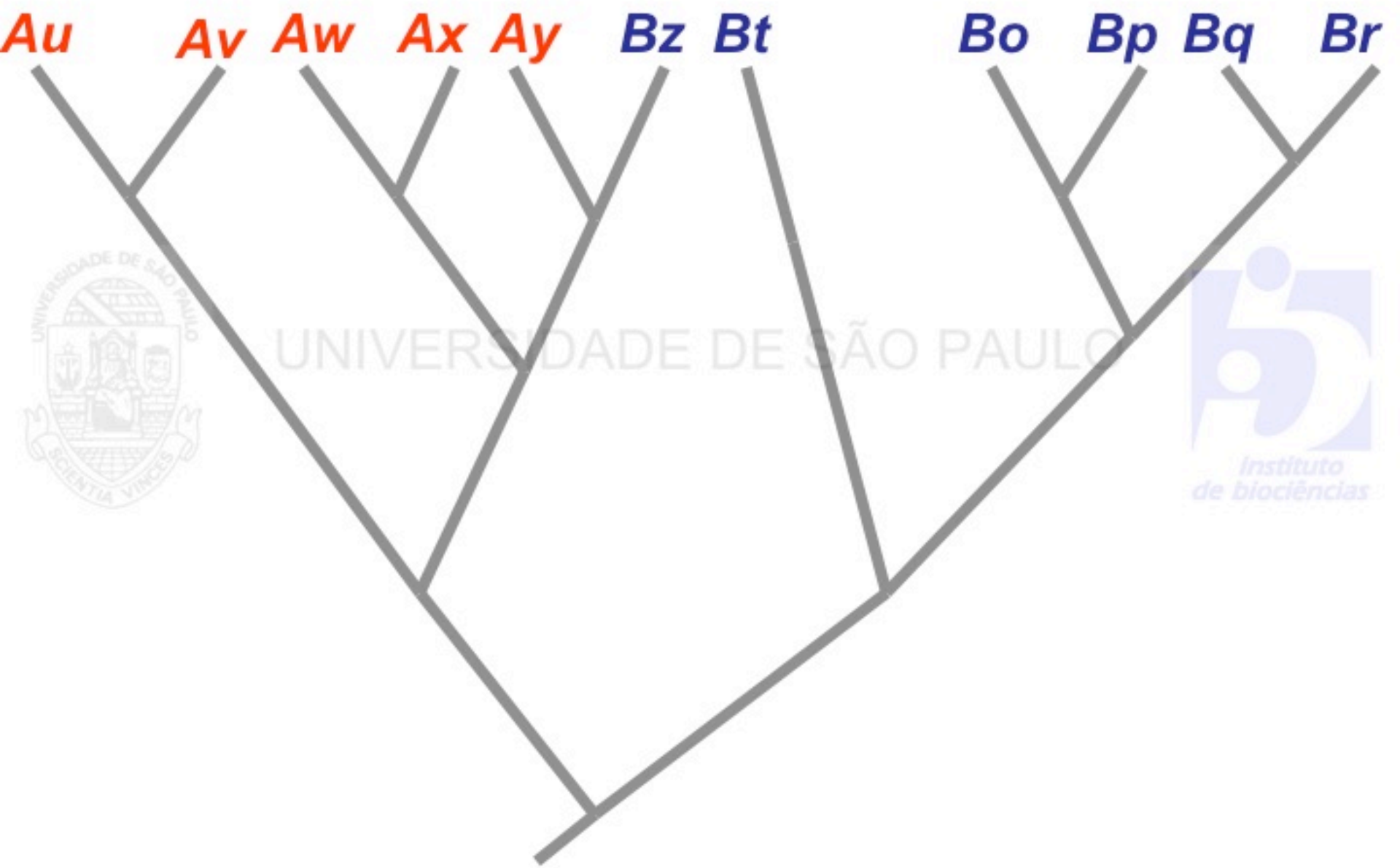


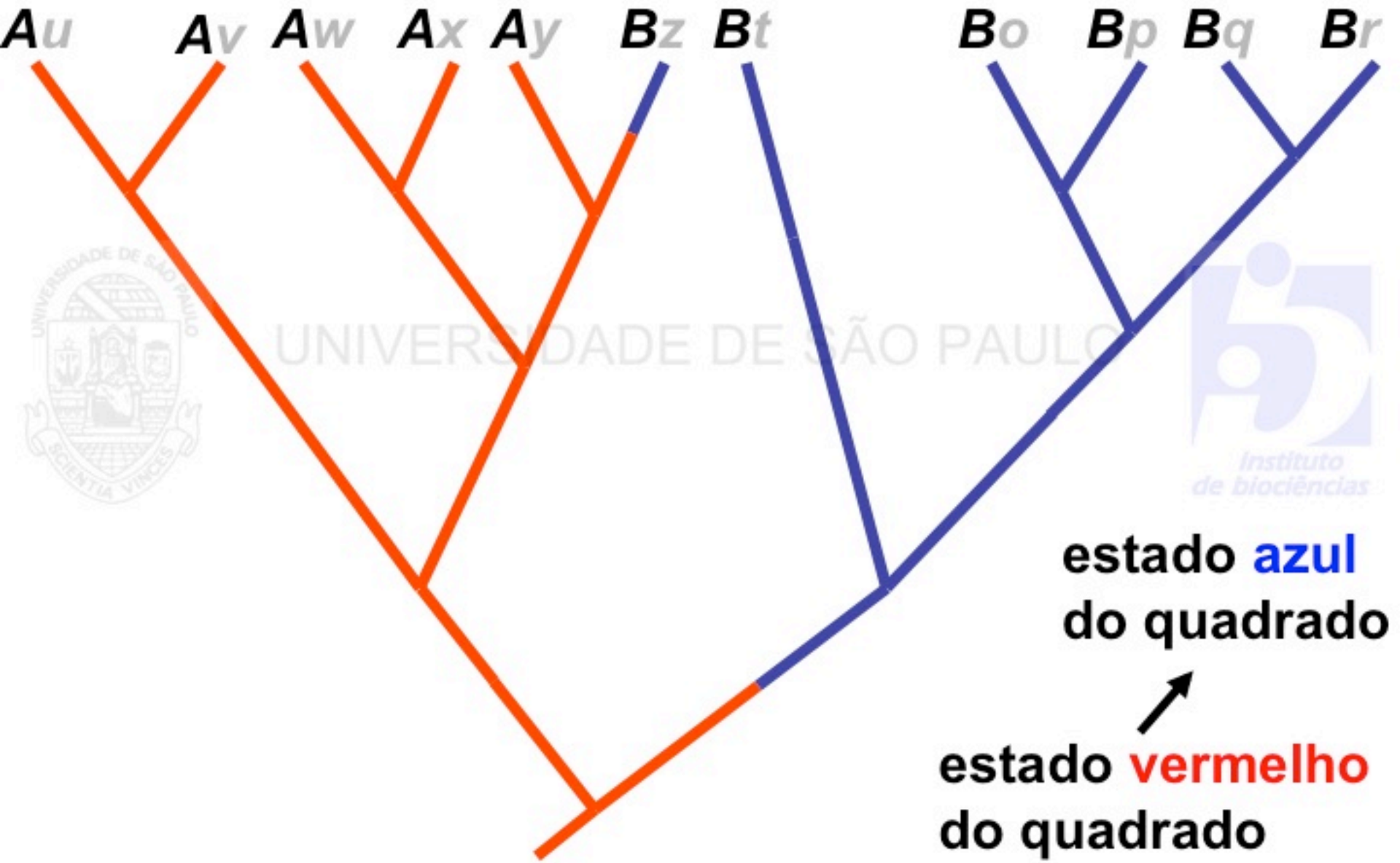



**táxon parafilético**:
aquele ao qual falta **um** grupo para que se torne monofilético

**táxon monofilético**:
aquele completo, i.e., ao qual não falta **nada**

Au Av Aw Ax Ay Bz Bt Bo Bp Bq Br




Au
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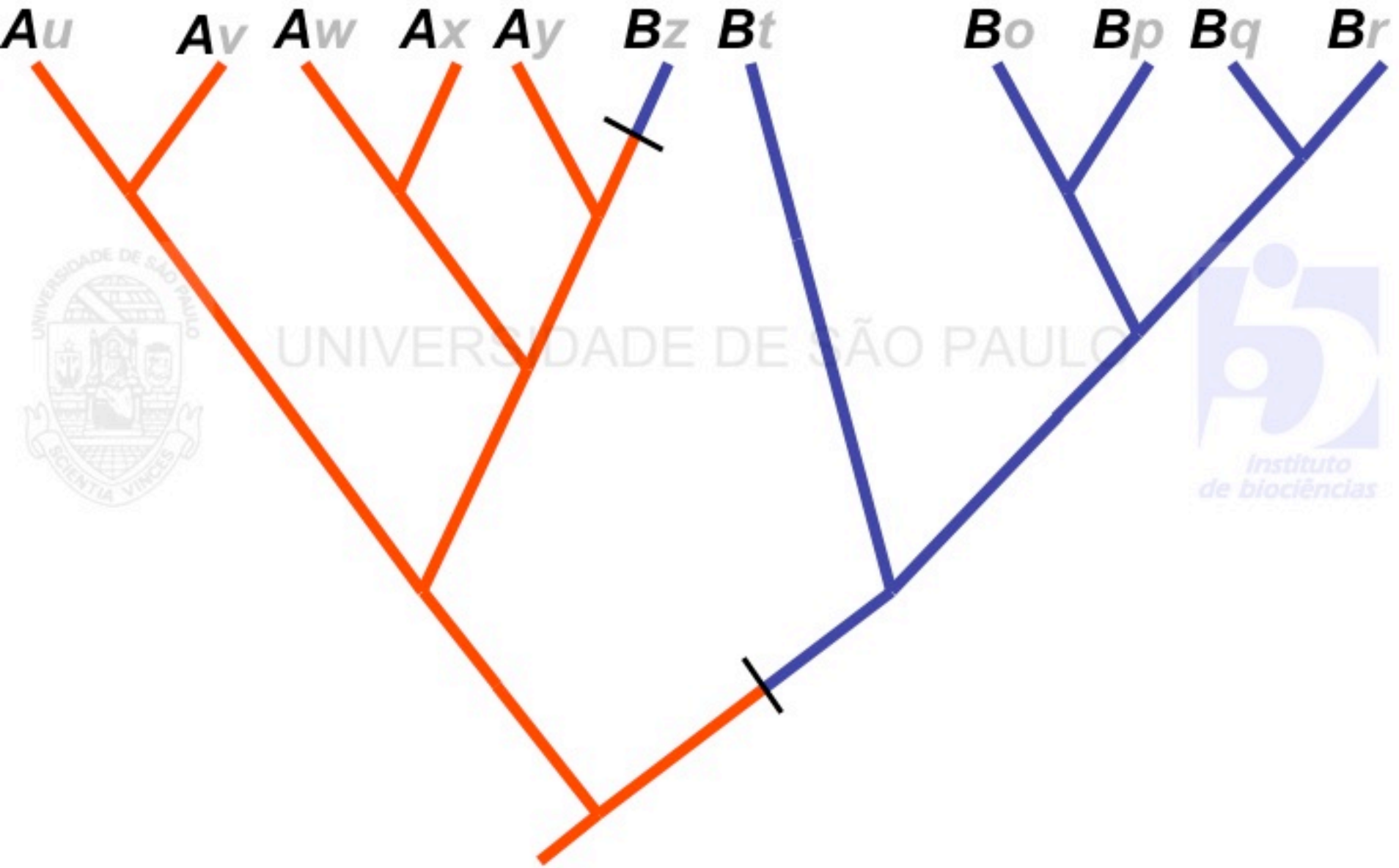
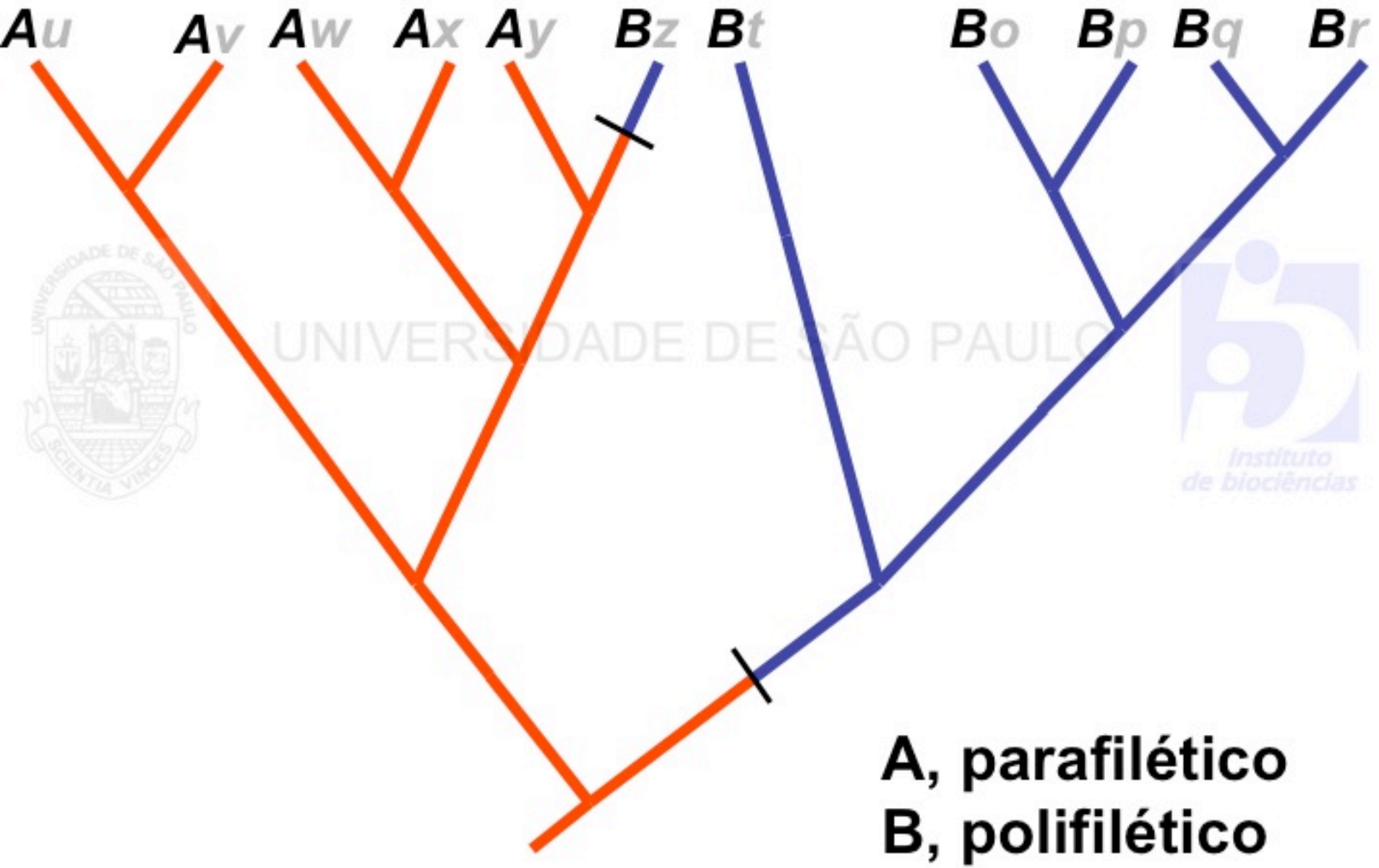
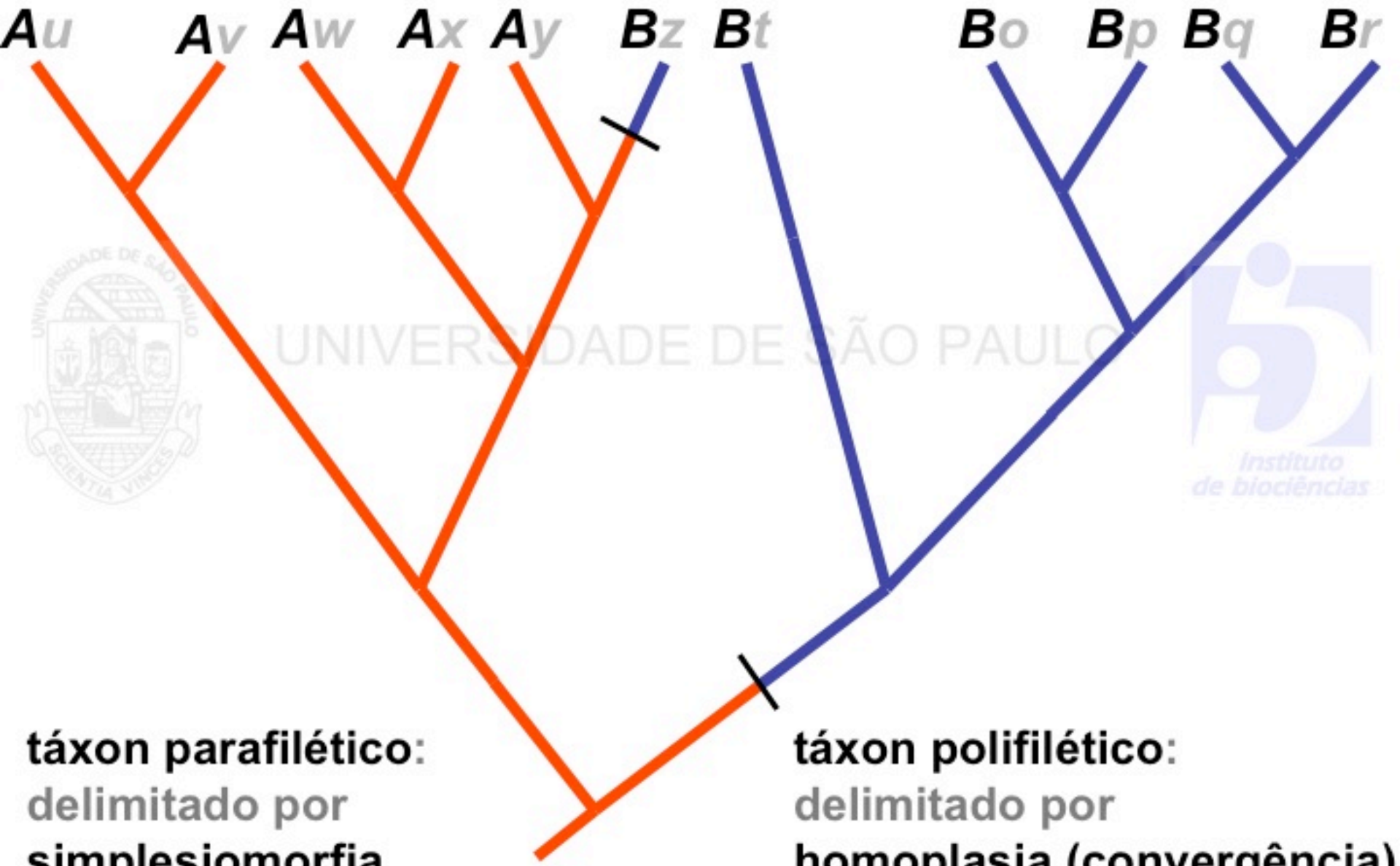
estado azul
do quadrado
estado vermelho
do quadrado



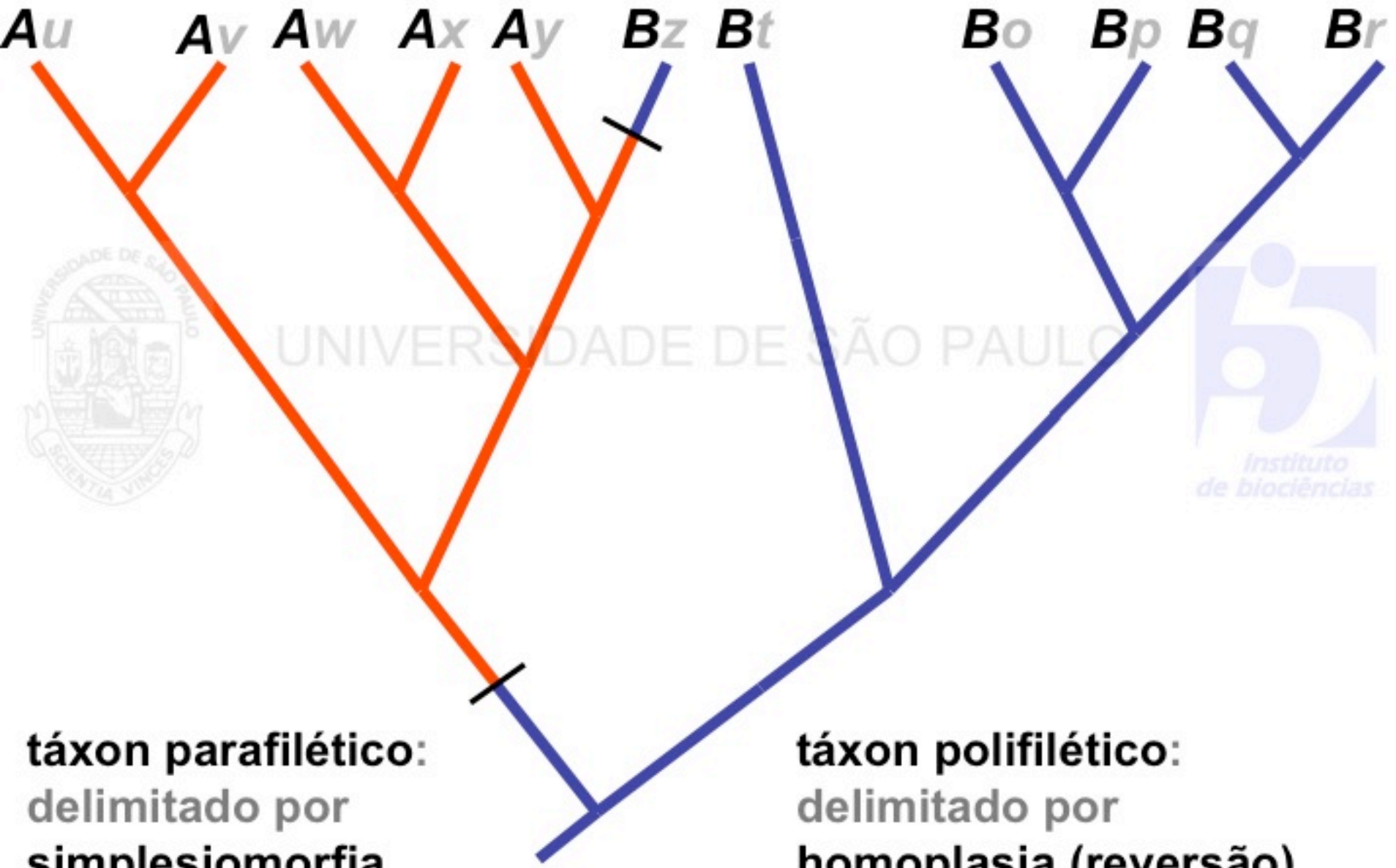







**táxon parafilético**: delimitado por **simplesiomorfia**

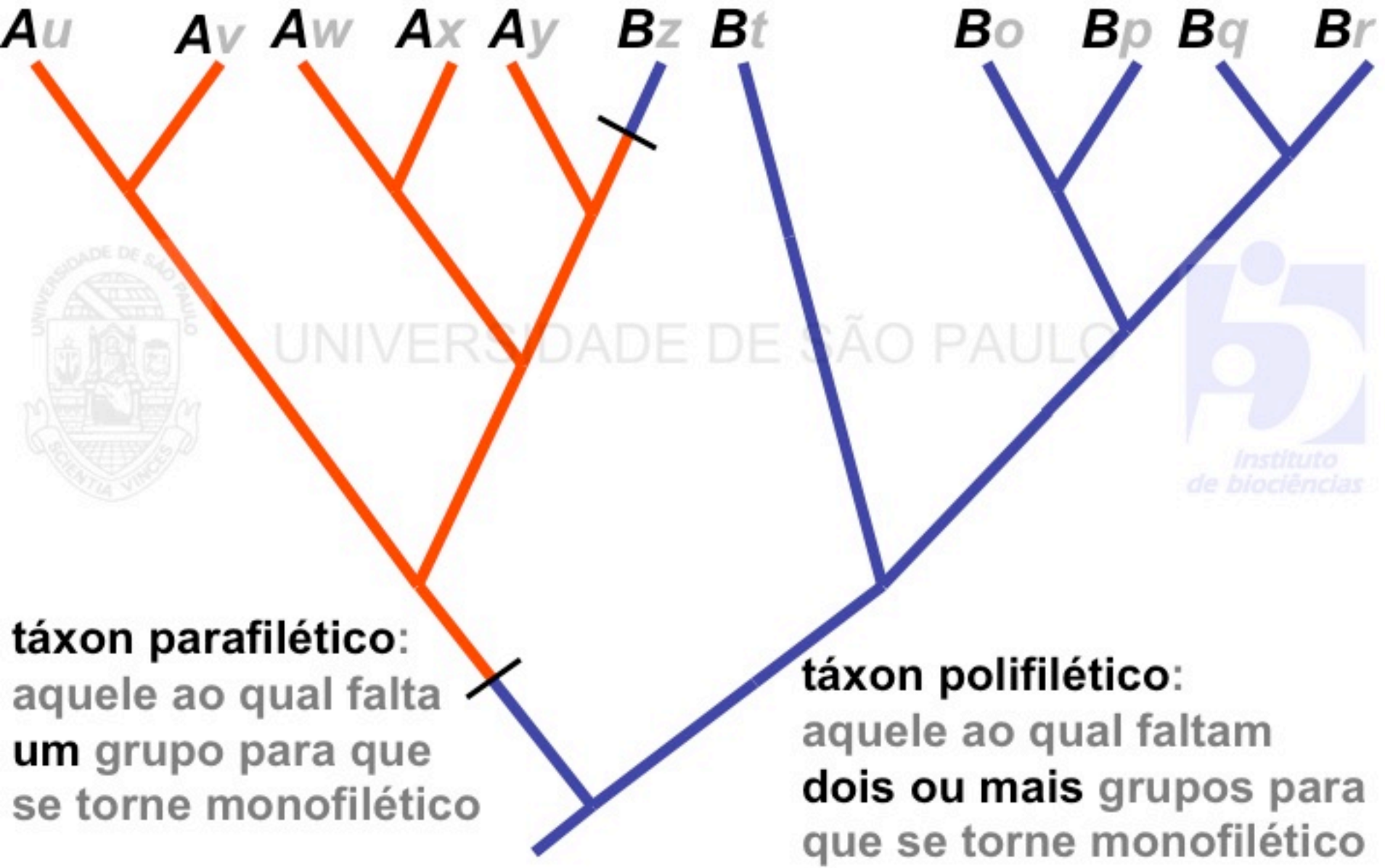
**táxon polifilético**: delimitado por **homoplasia (convergência)**



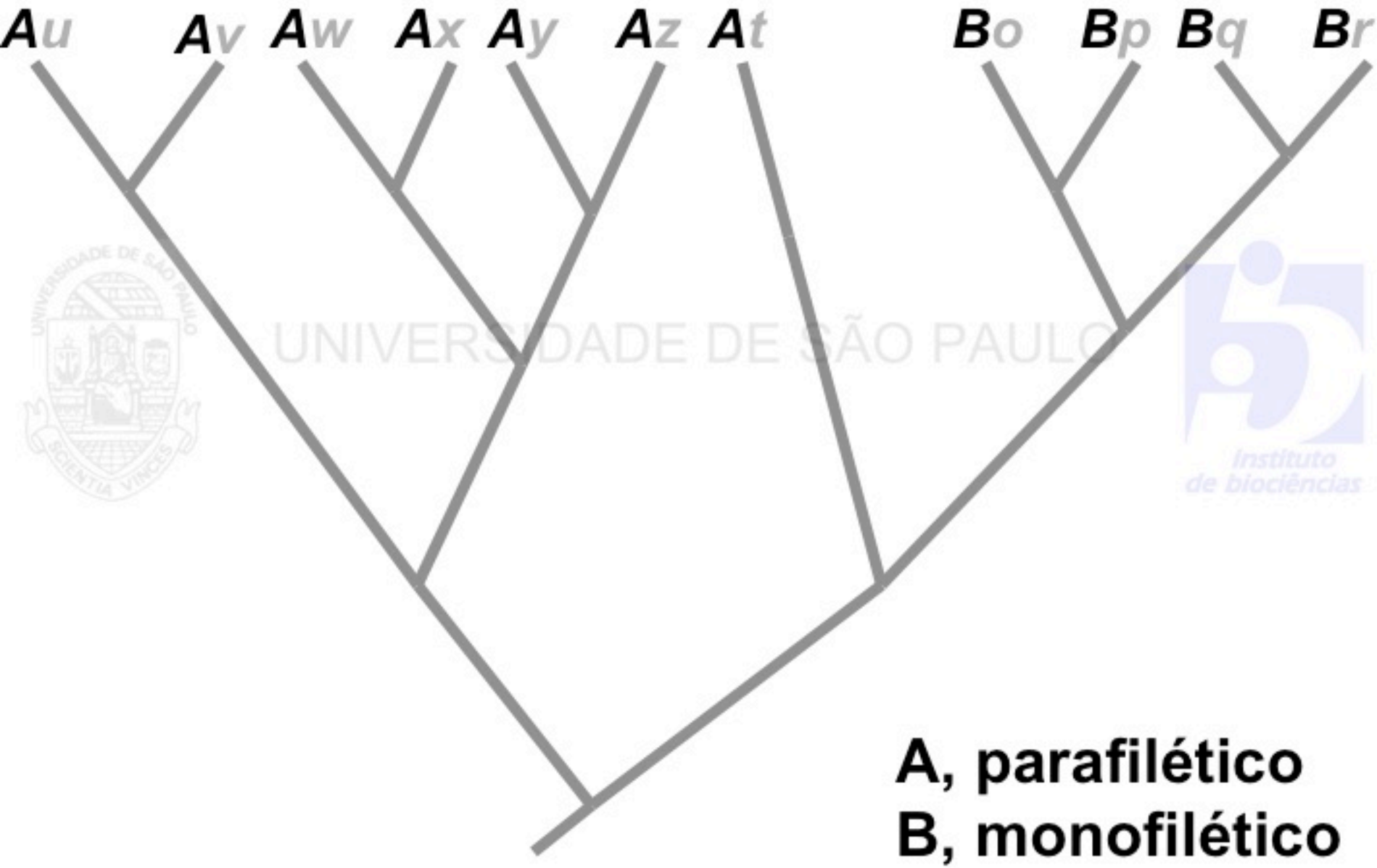



**táxon parafilético**:
delimitado por
**simplesiomorfia**

**táxon polifilético**:
delimitado por
**homoplasia (reversão)**

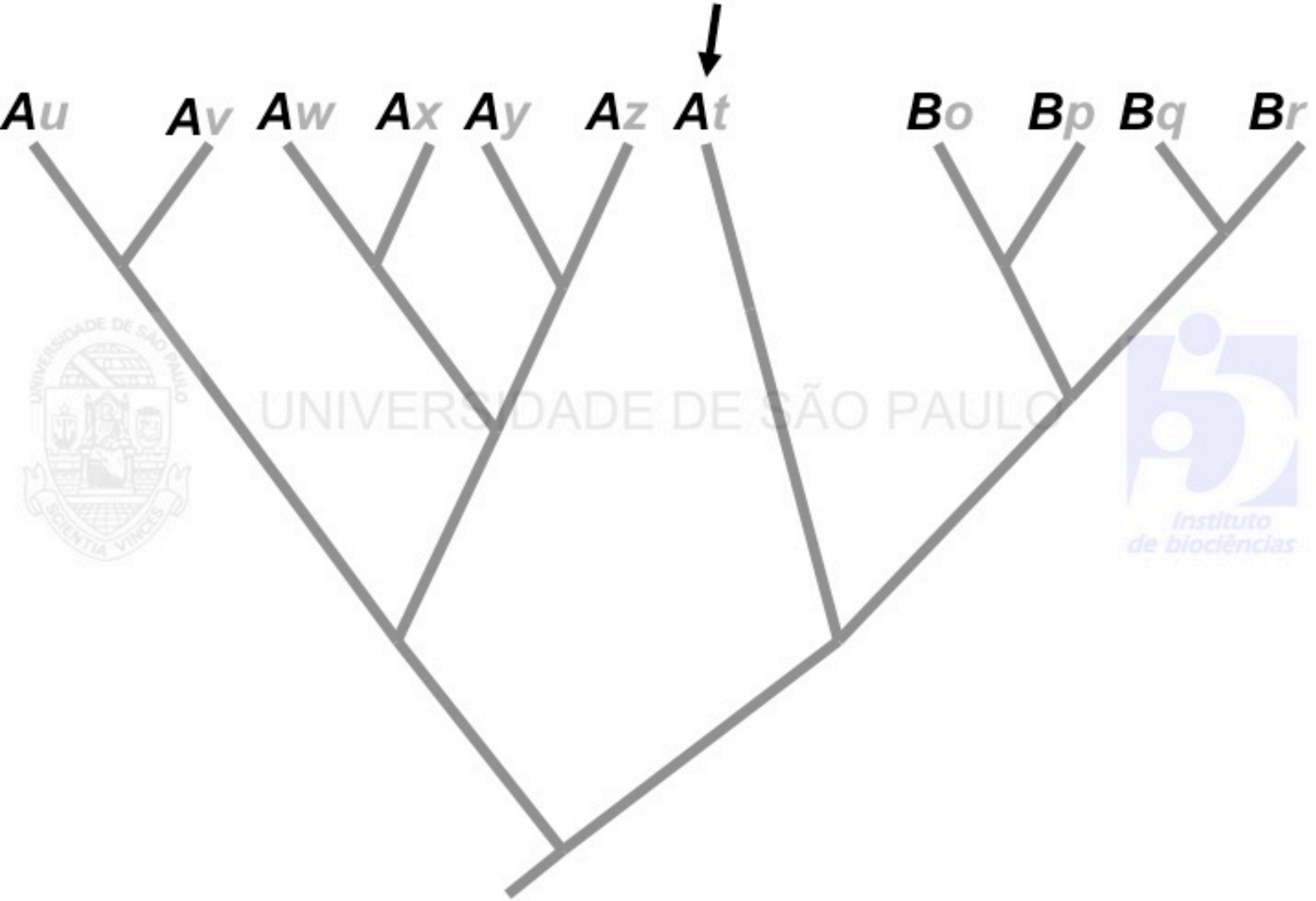


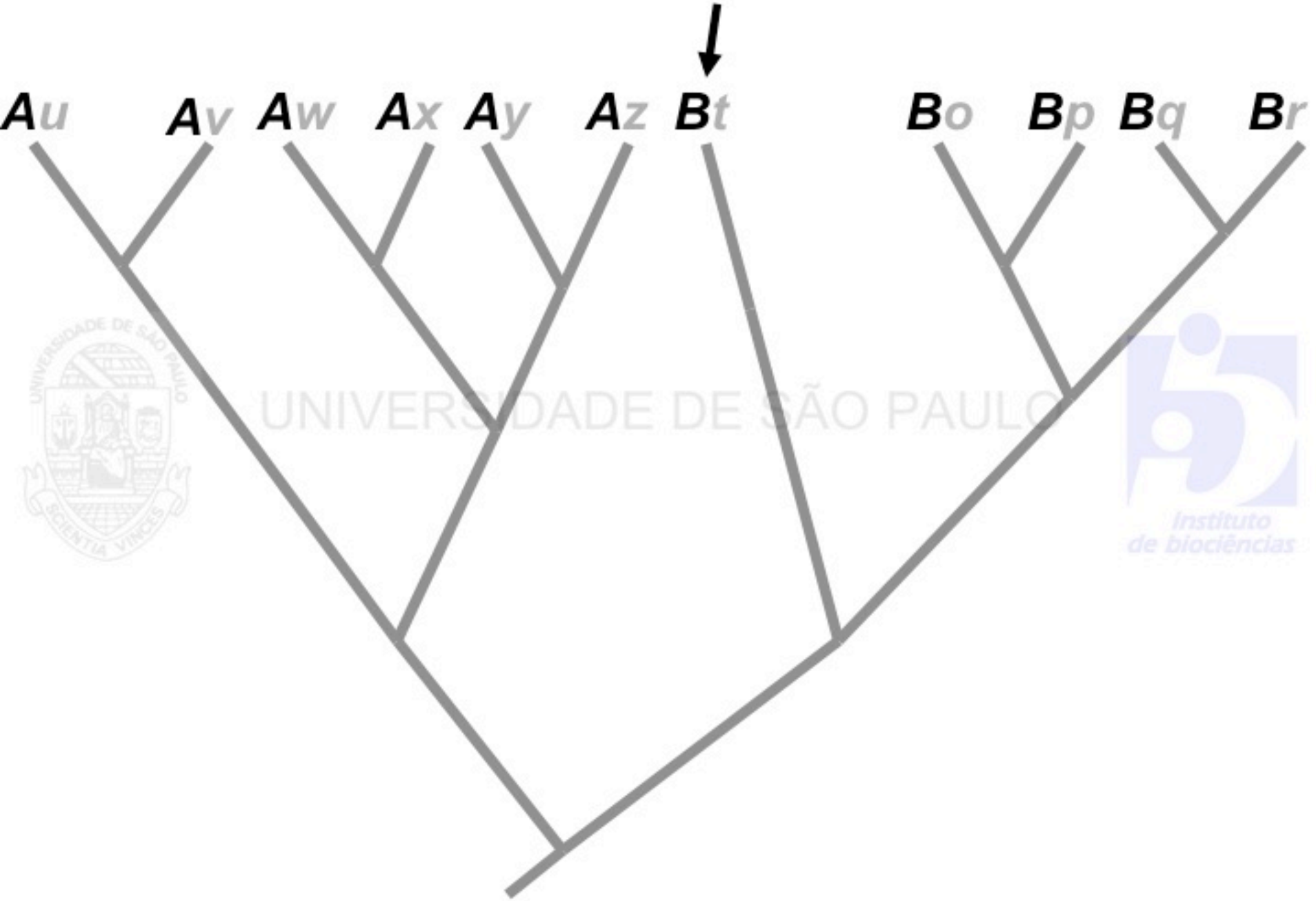
# Soluções?

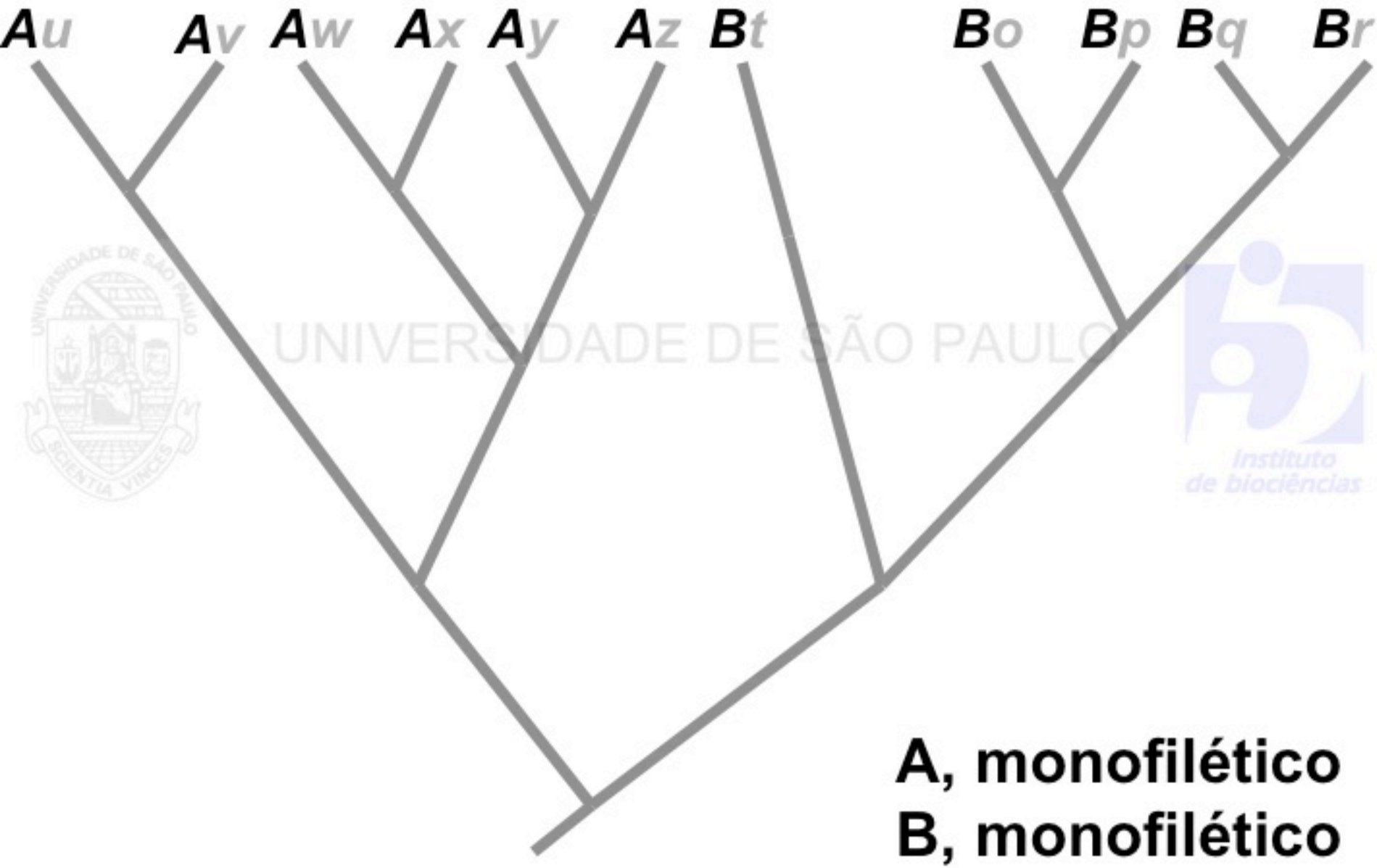





**A, parafilético**
**B, monofilético**










**A, monofilético**
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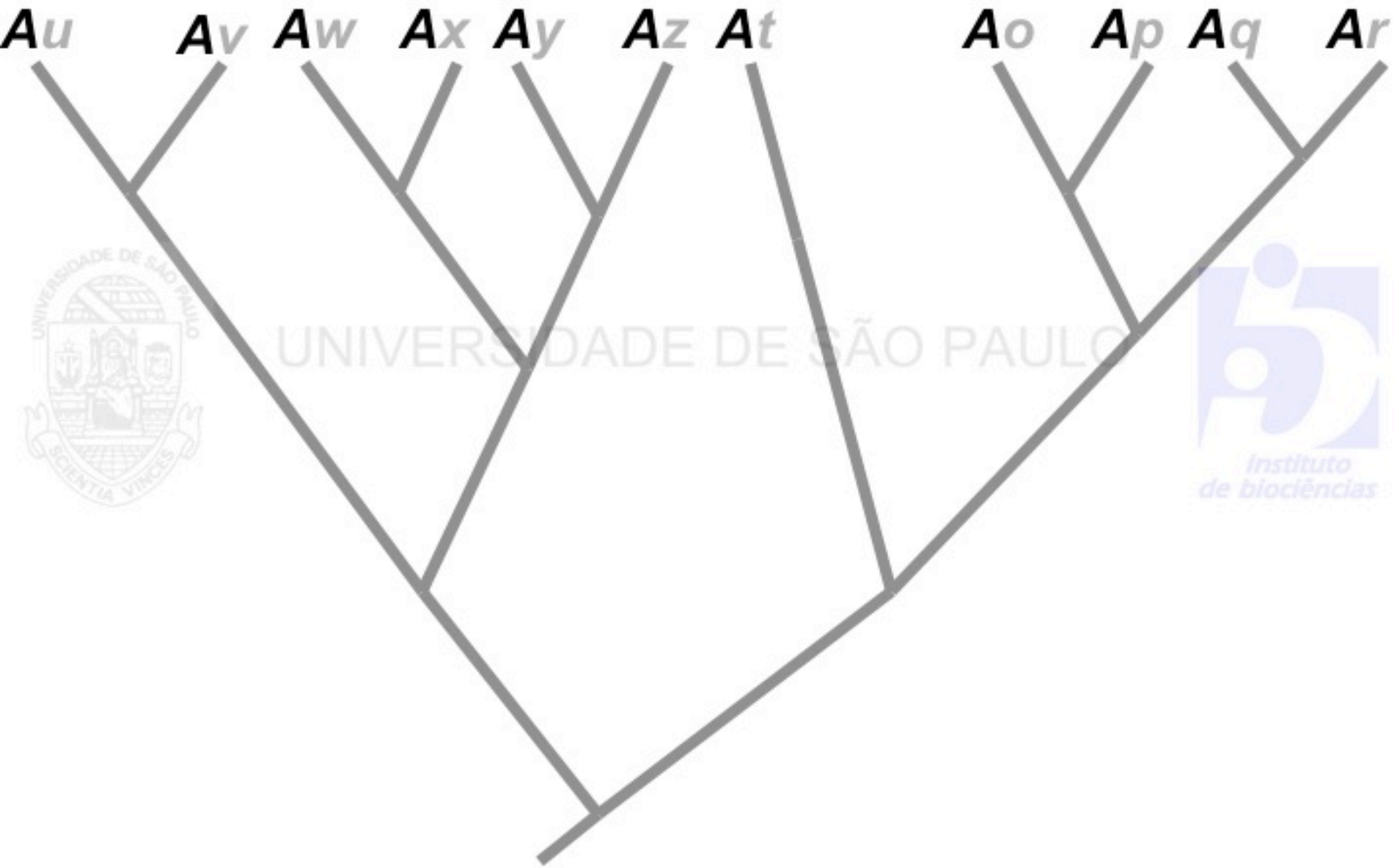
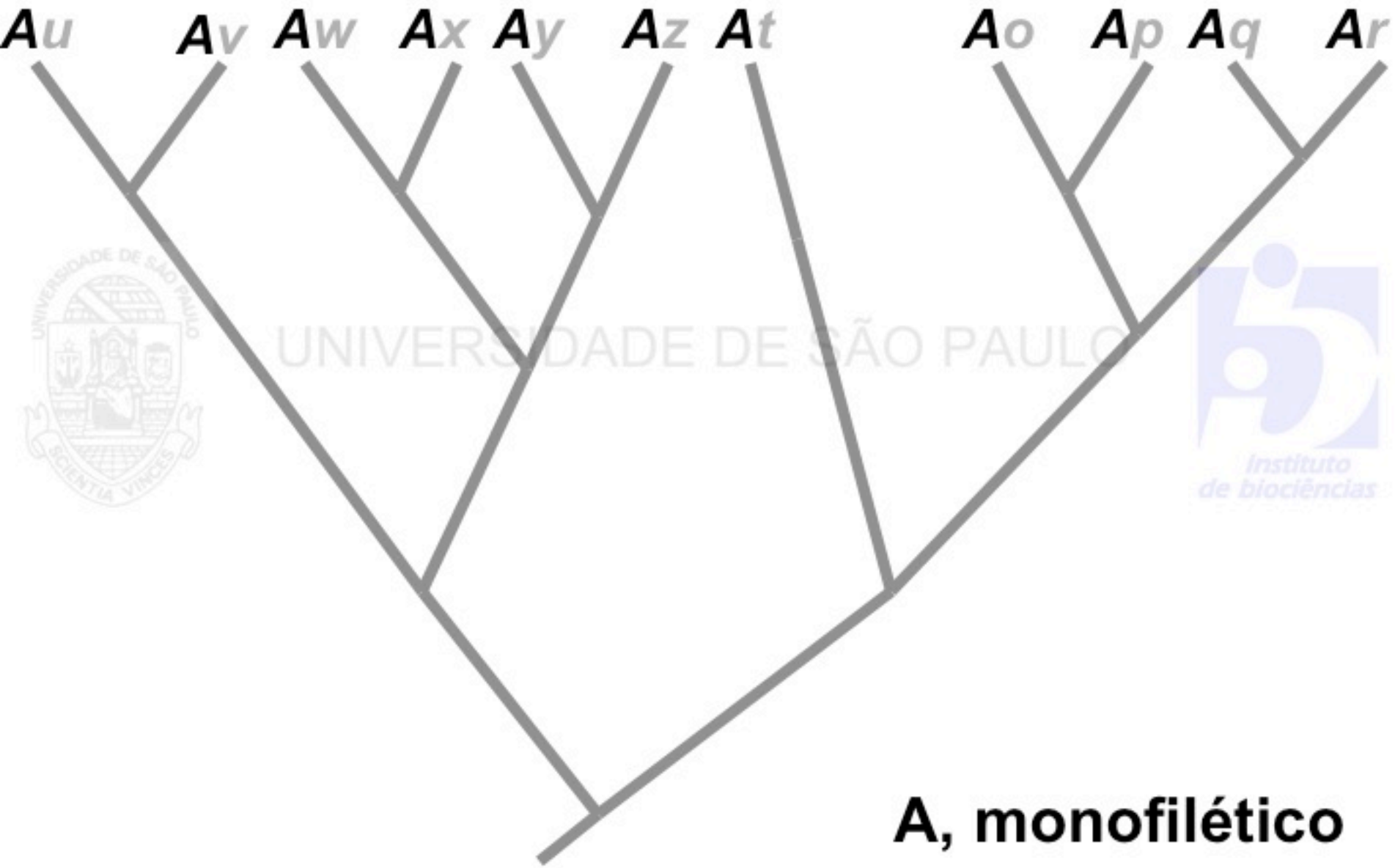
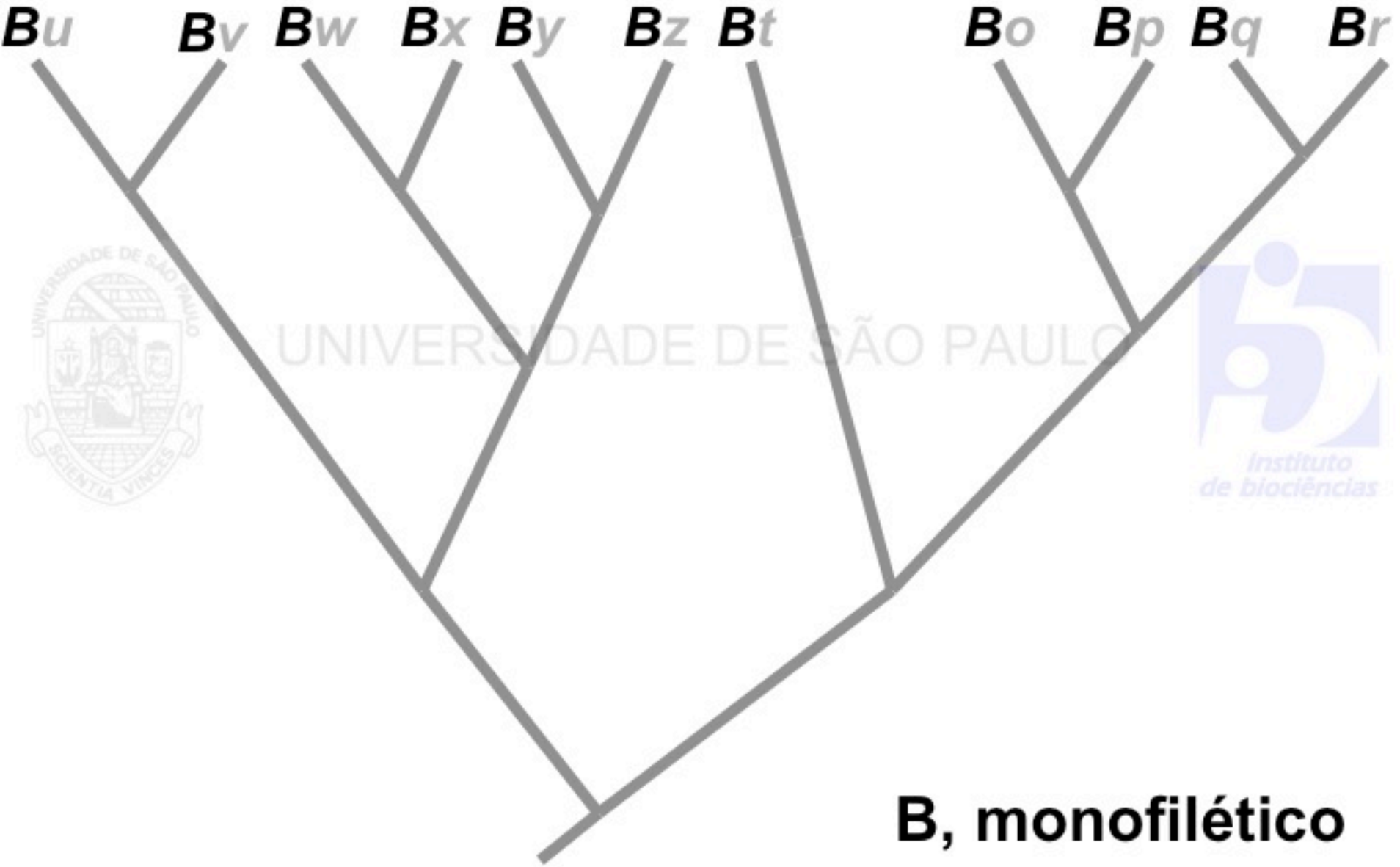







**A, monofilético**



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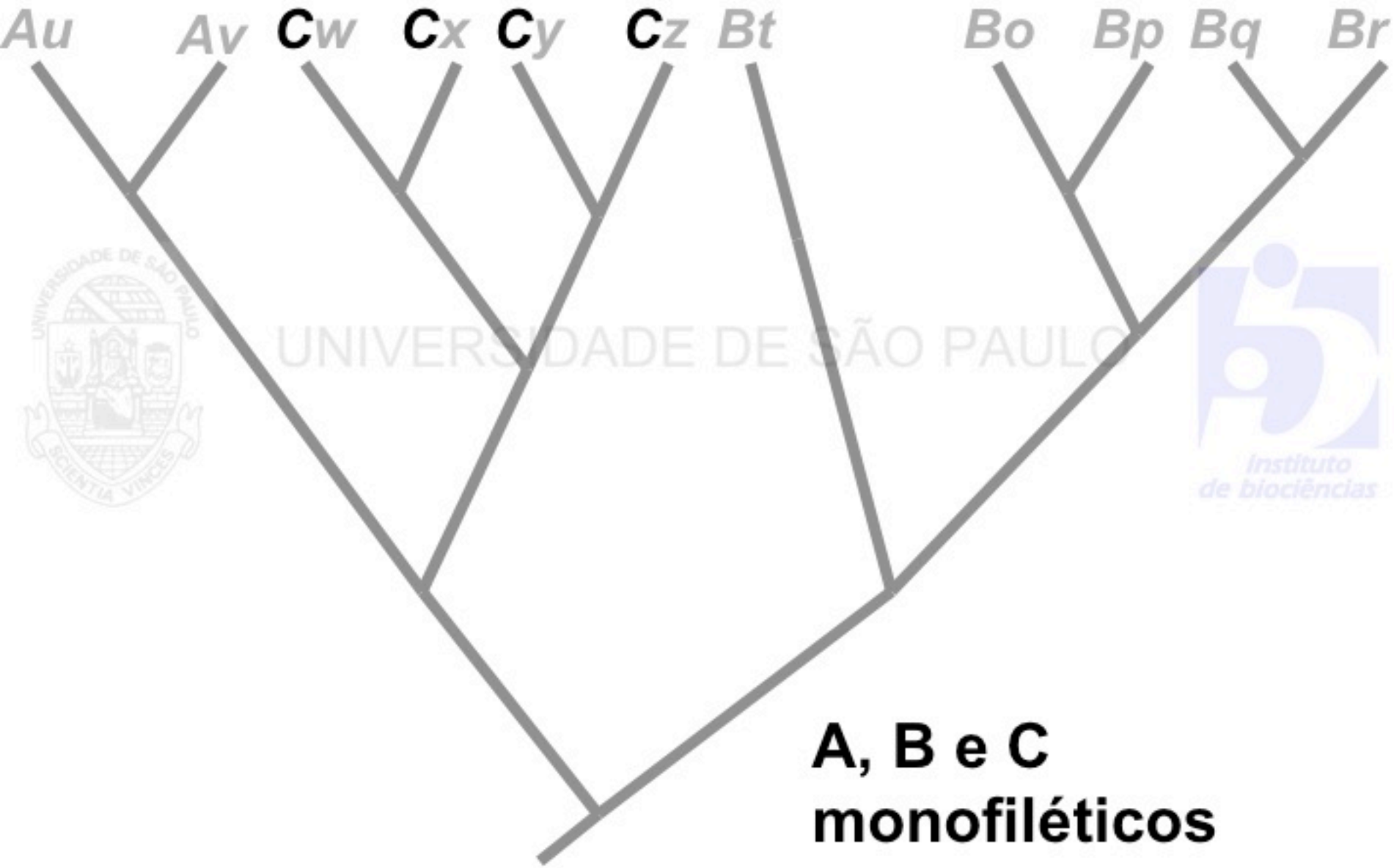
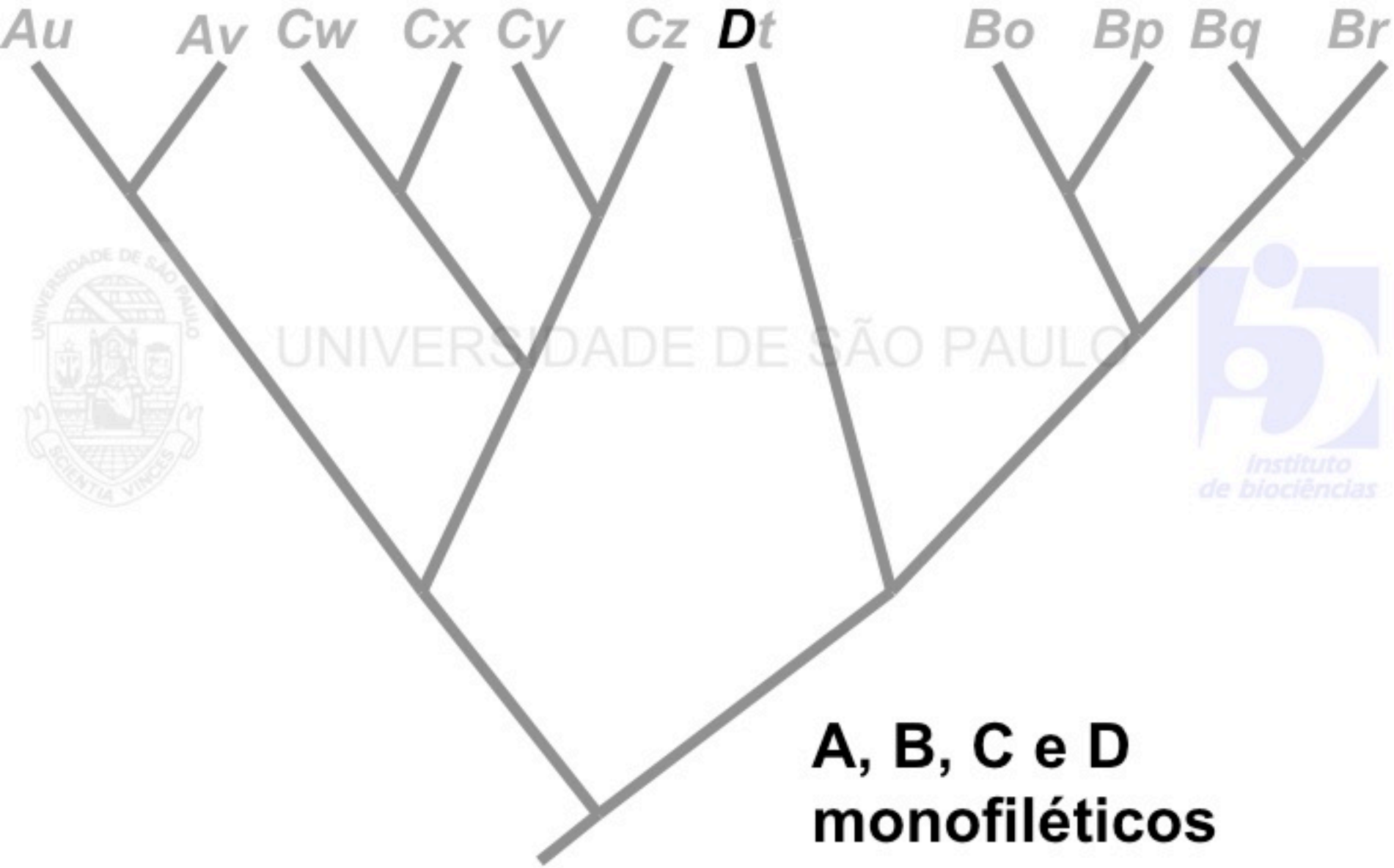
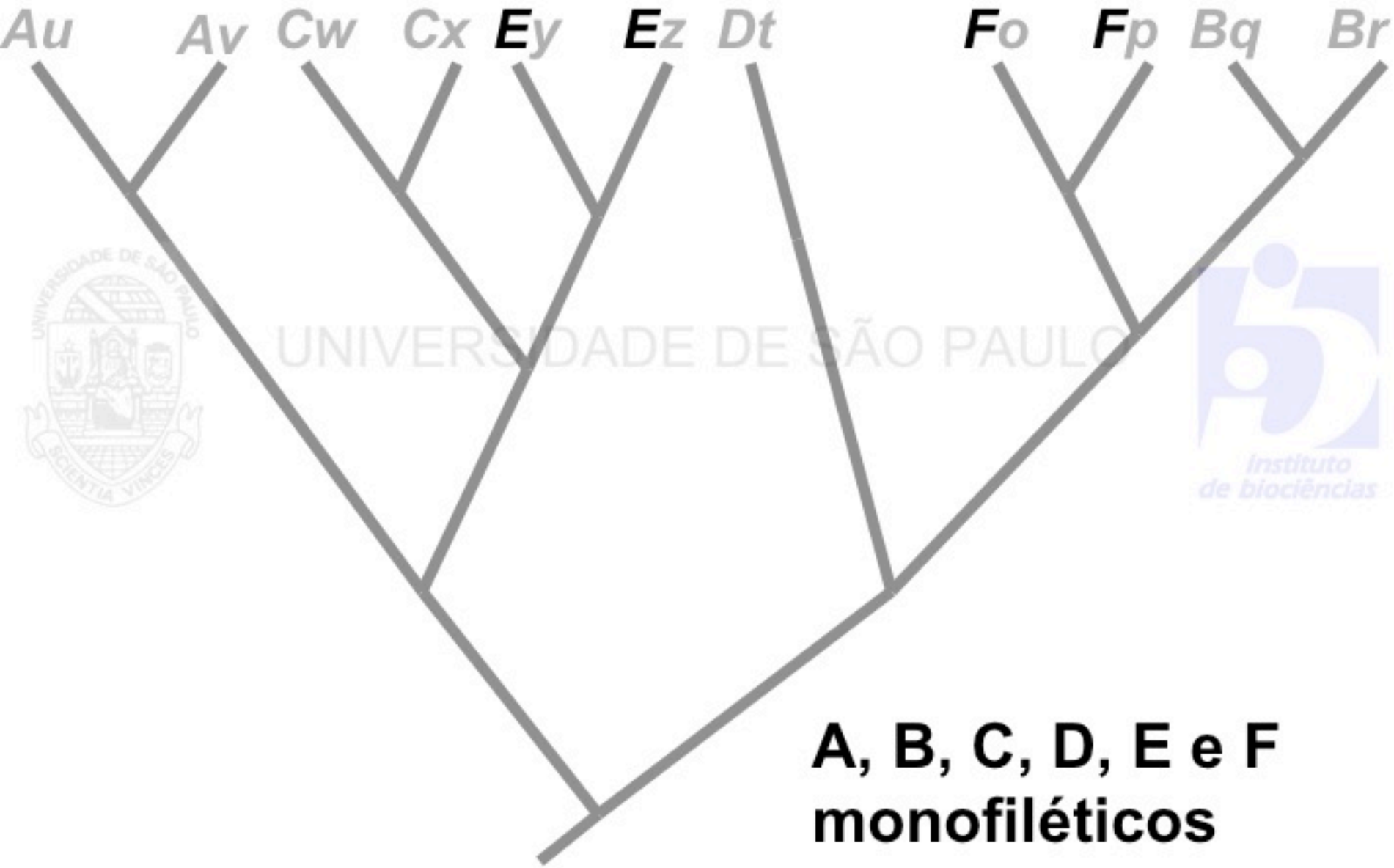




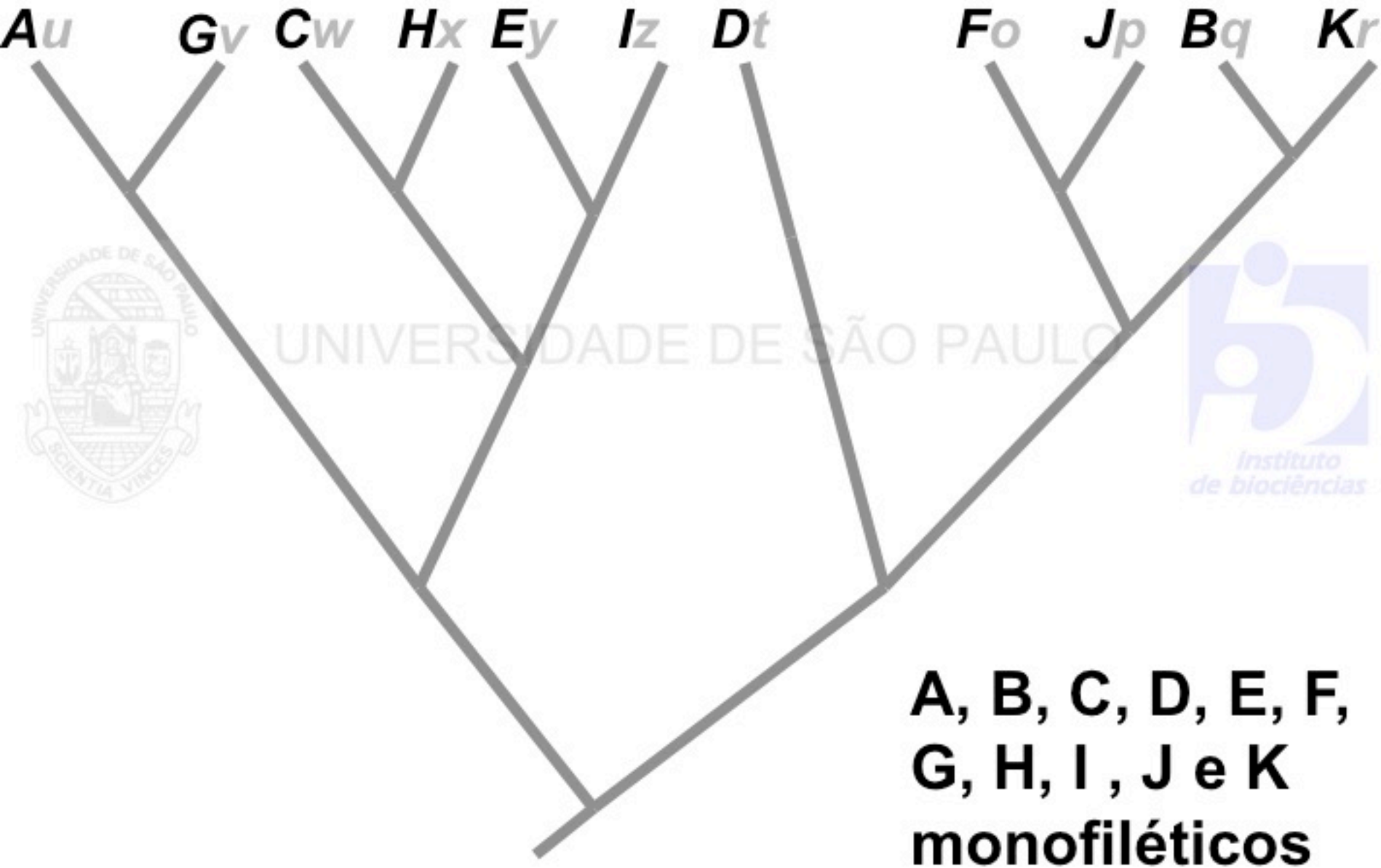



**A, B, C e D monofiléticos**





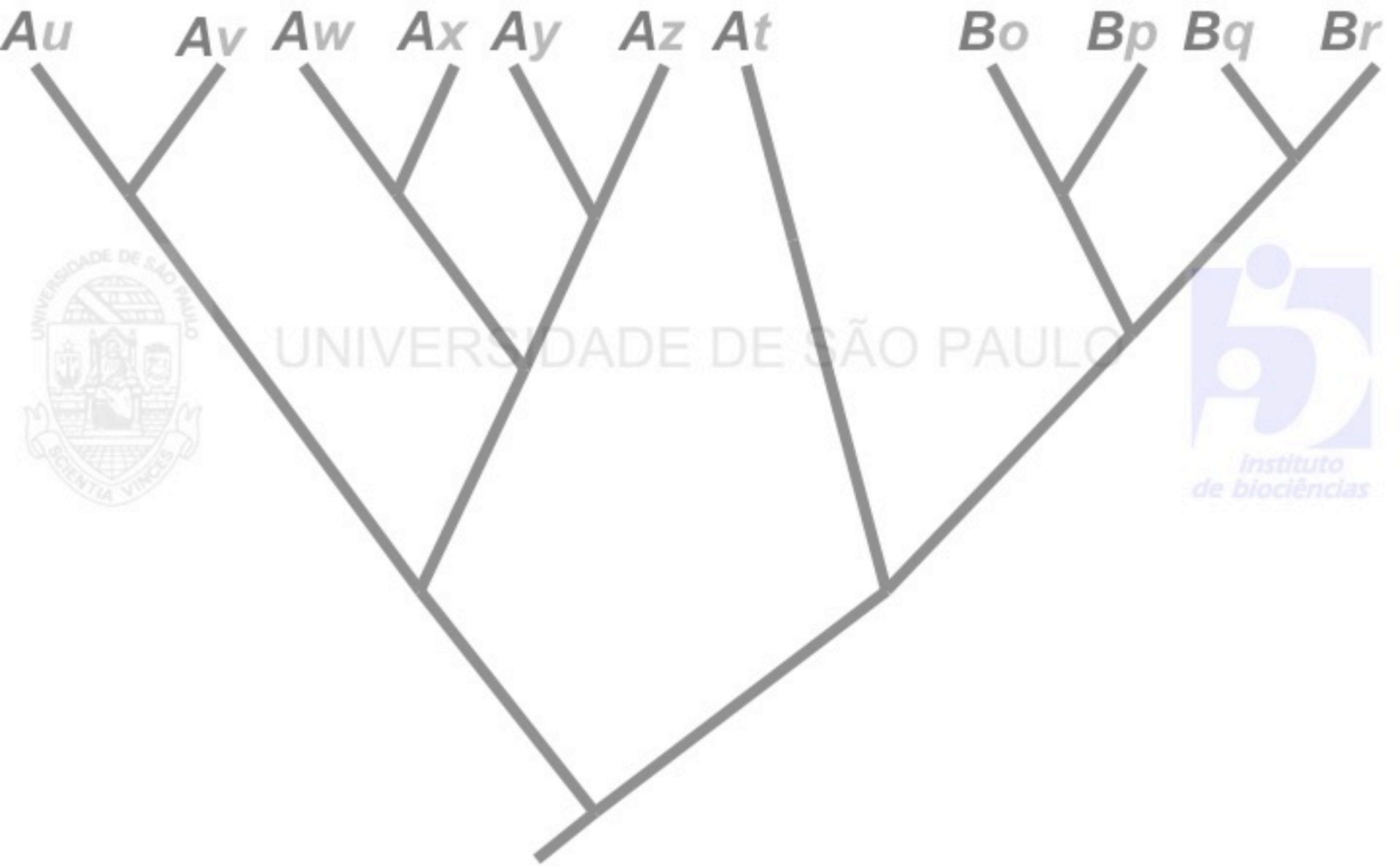

**A, B, C, D, E e F monofiléticos**

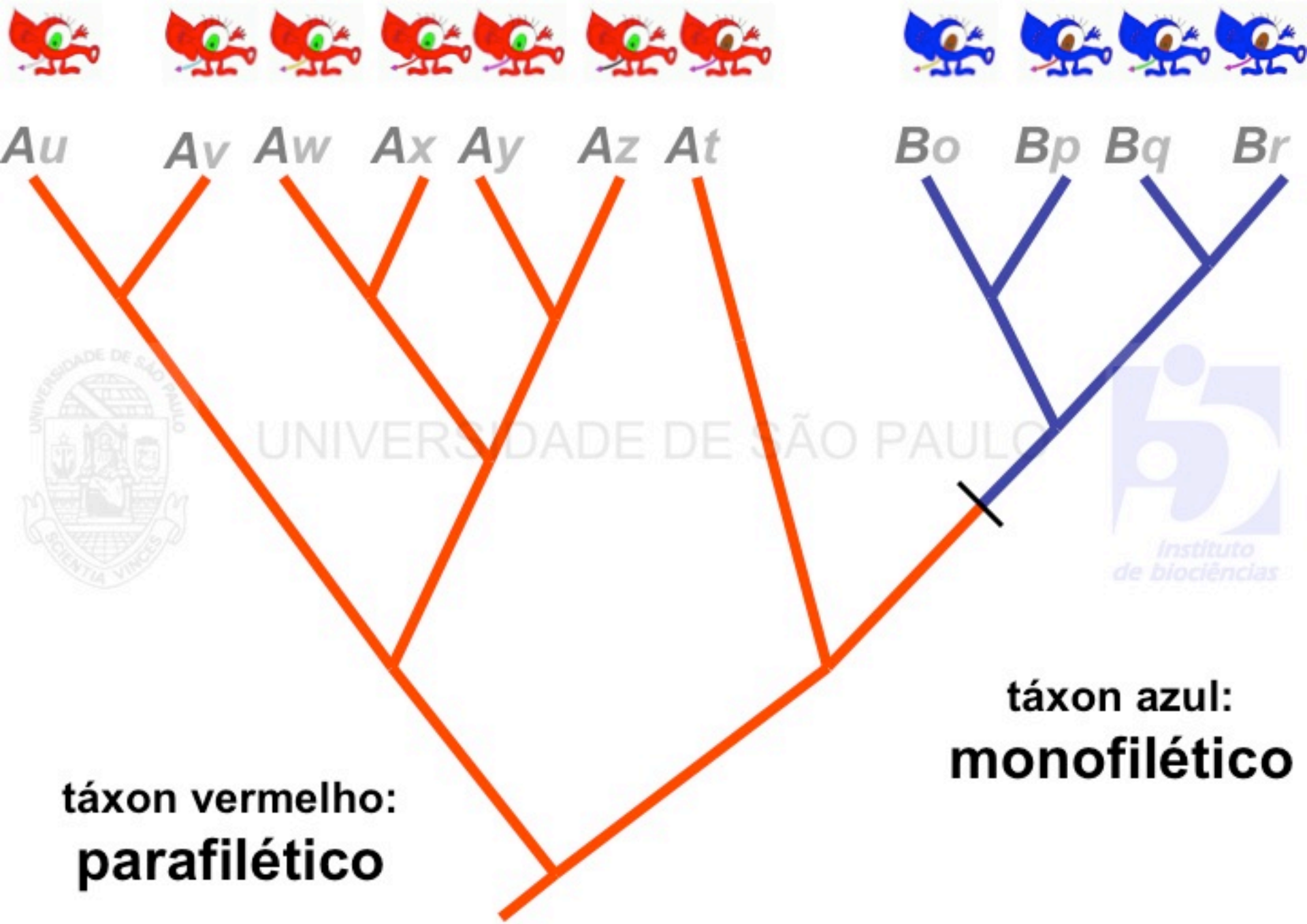





**A, B, C, D, E, F, G, H, I , J e K monofiléticos**

Au Av Aw Ax Ay Az At Bo Bp Bq Br

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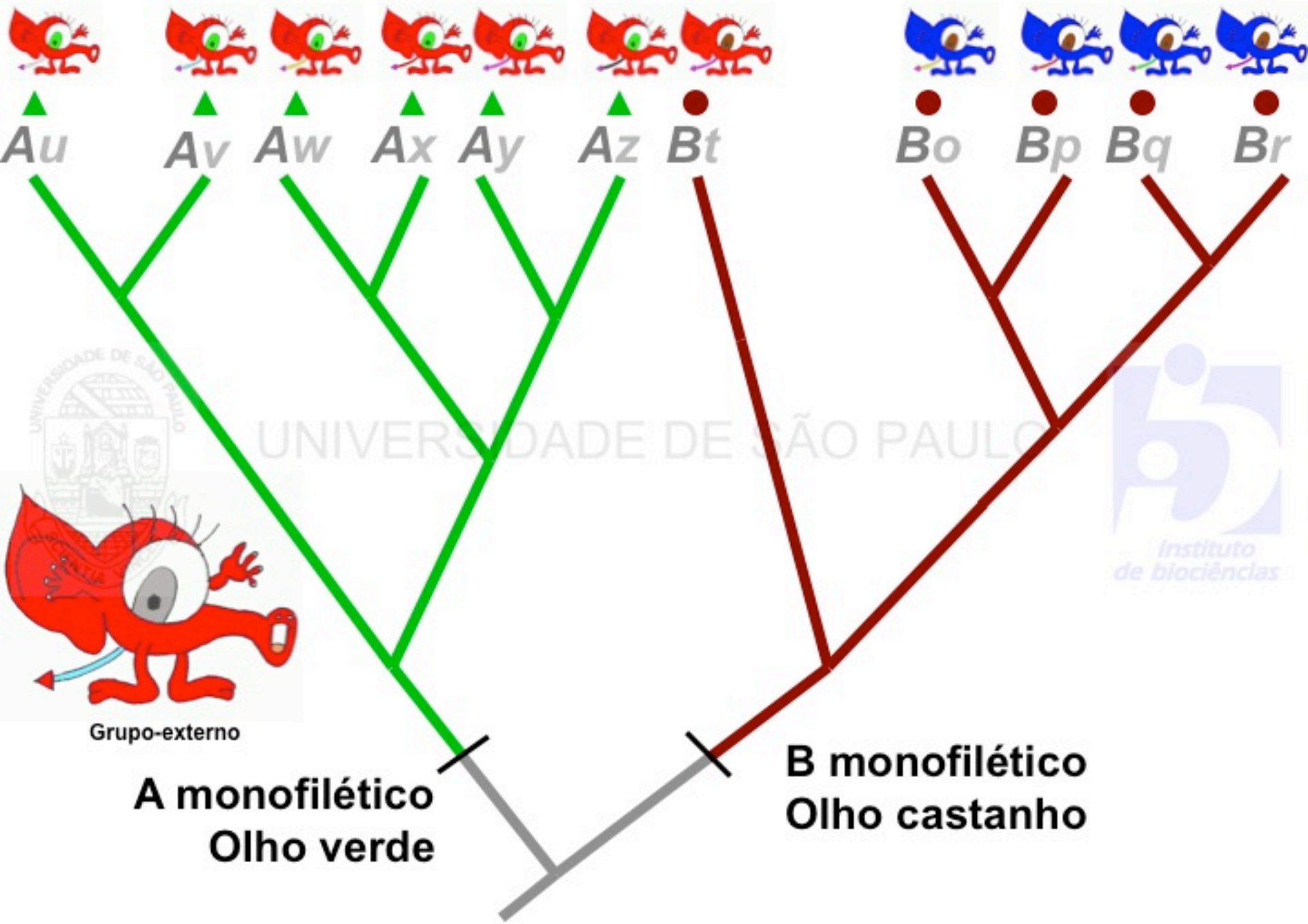
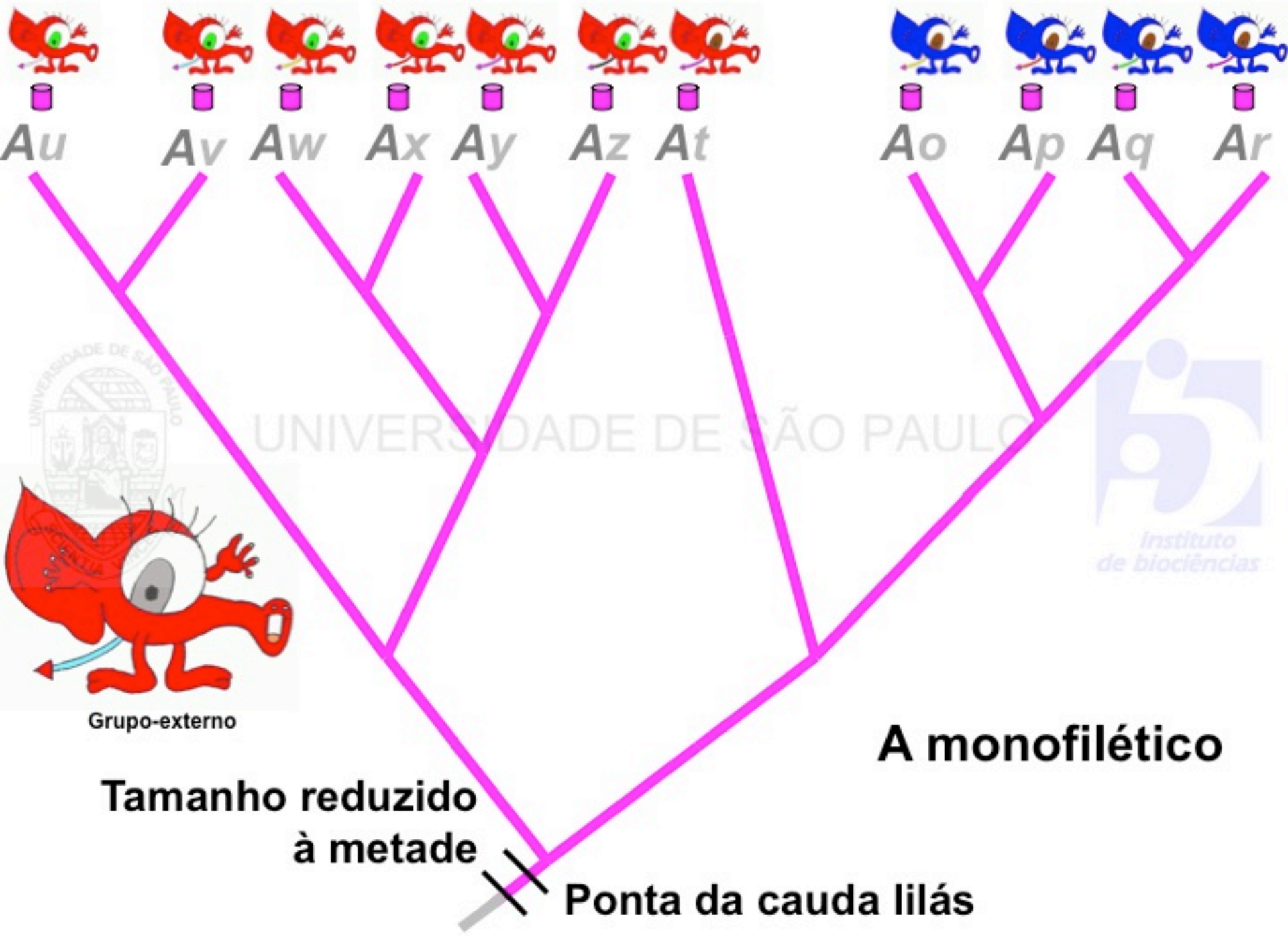
UNIVERSIDADE DE SÃO PAULO
Instituto de biociências
táxon azul:
monofilético
táxon vermelho:
parafilético

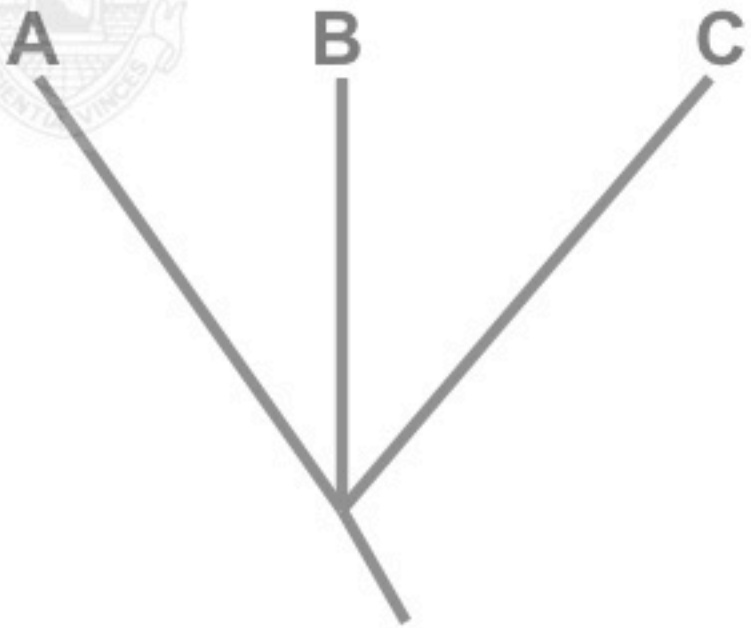
**Grupo-externo**

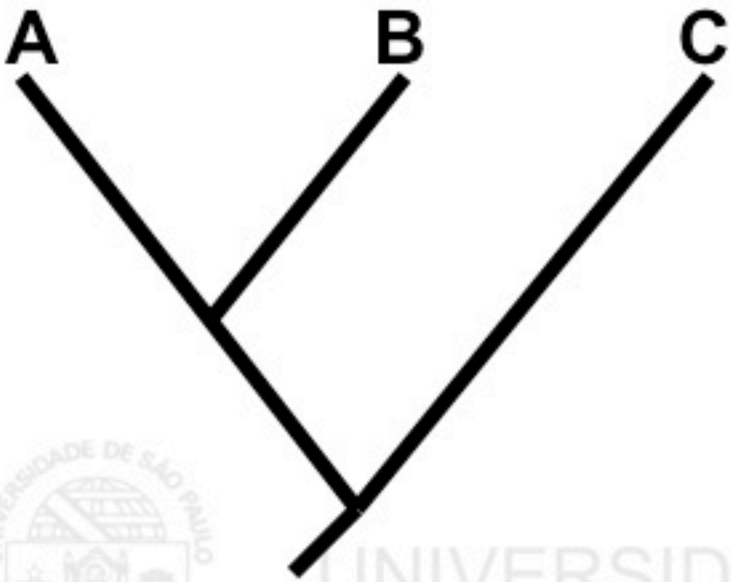

Au
Av
Aw
Ax
Ay
Az
Bt
Bo
Bp
Bq
Br
Grupo-externo
A monofilético
Olho verde
B monofilético
Olho castanho

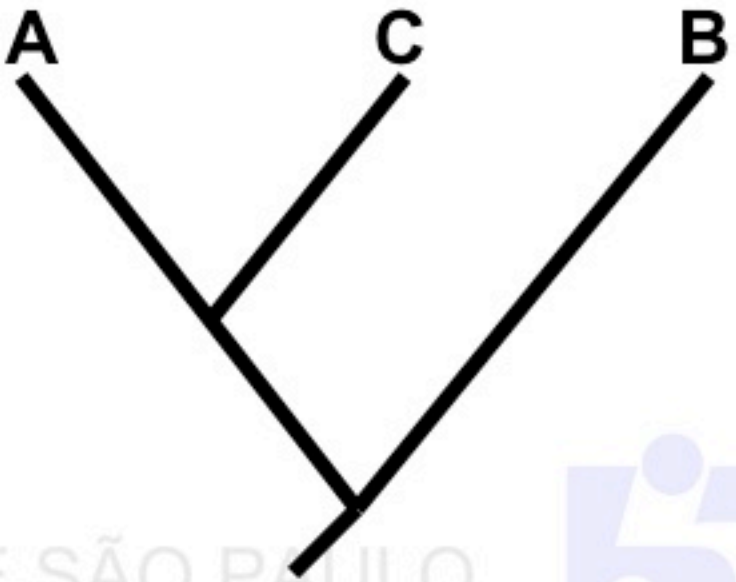

Au
Av
Aw
Ax
Ay
Az
At
Ao
Ap
Aq
Ar
Grupo-externo
A monofilético
Tamanho reduzido
à metade
Ponta da cauda lilás

# Politomias

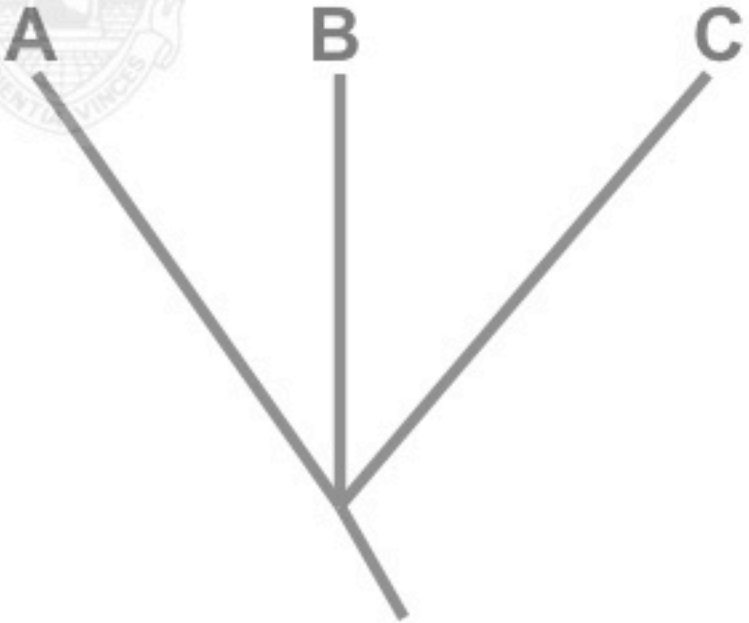

politomia
tricotomia

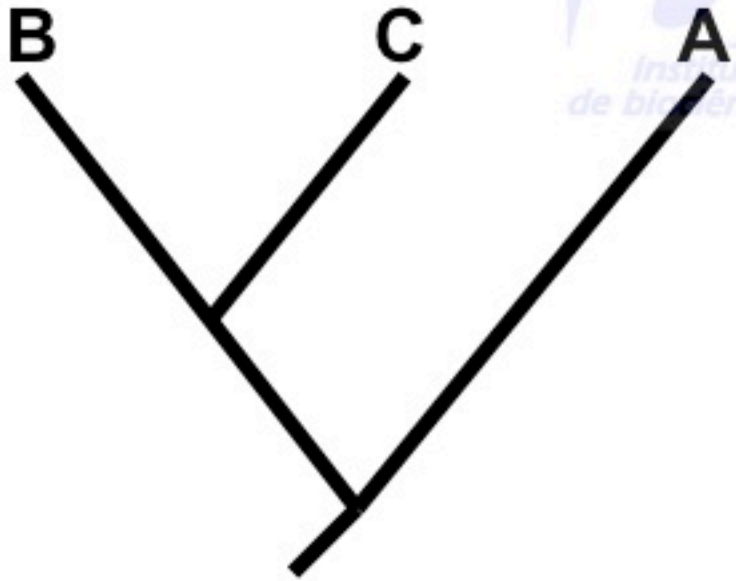


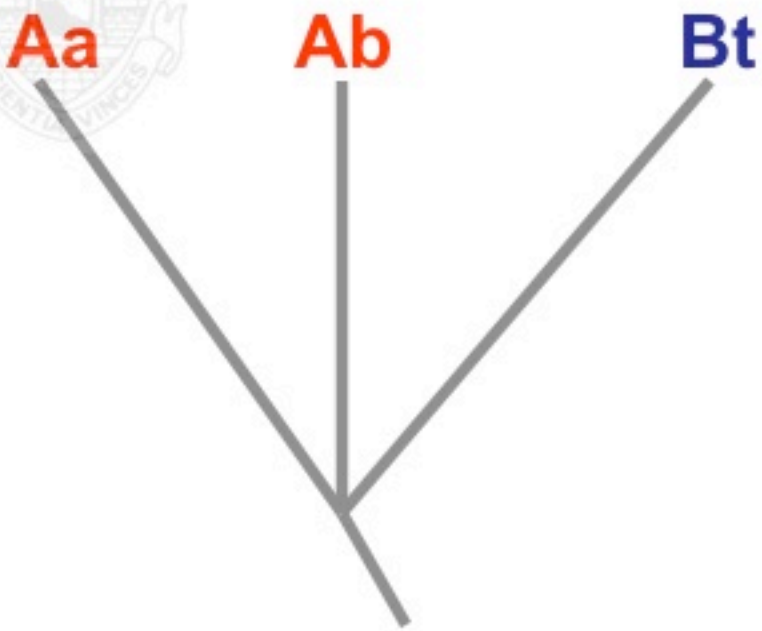


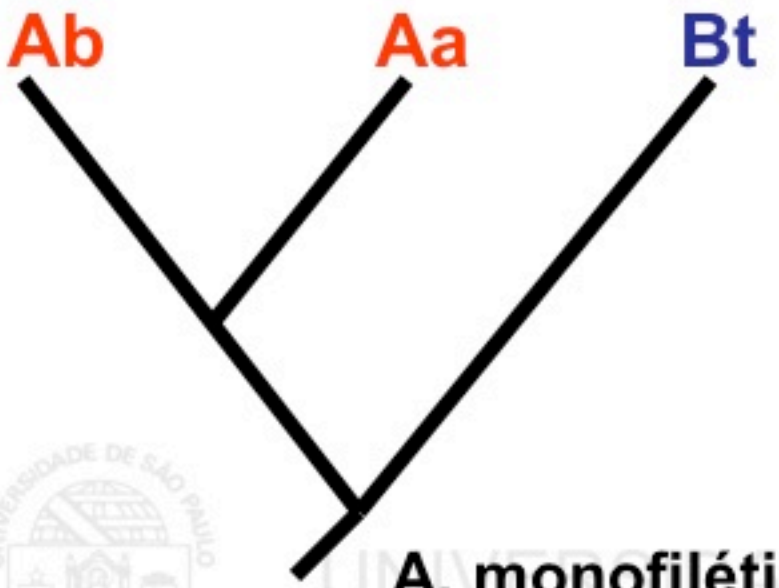





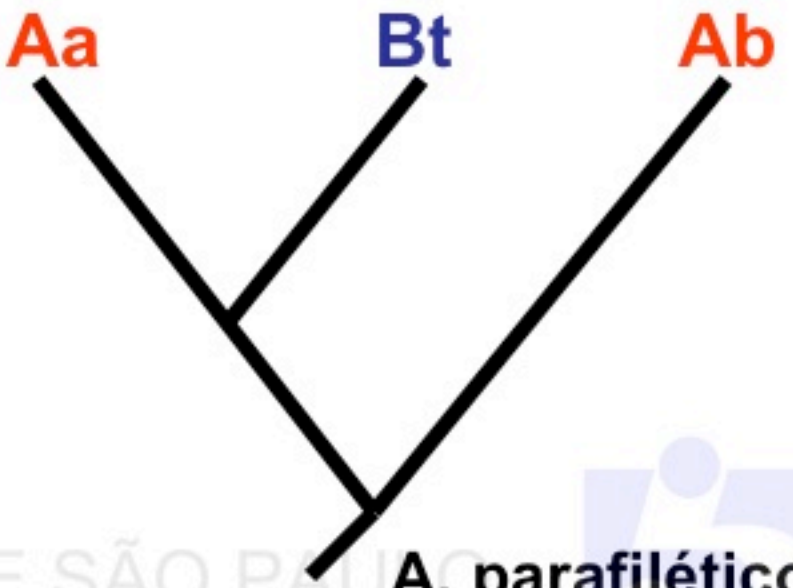



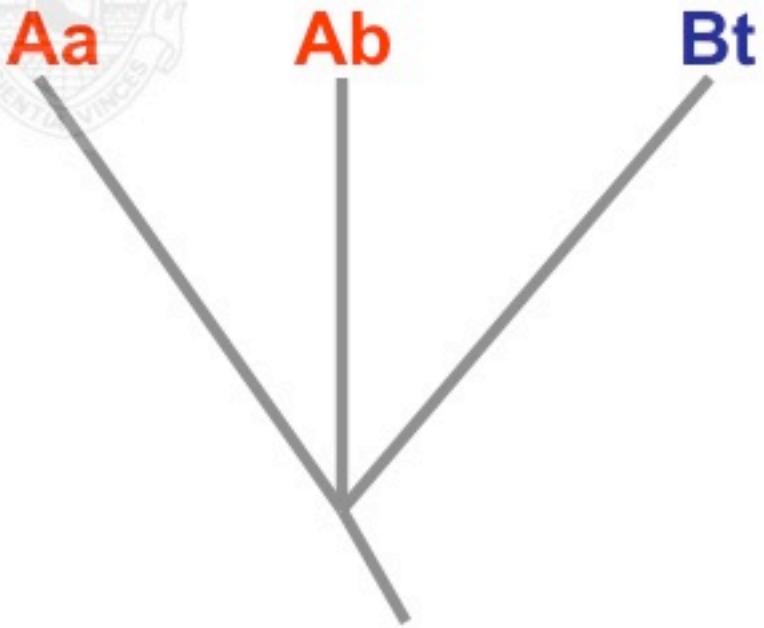


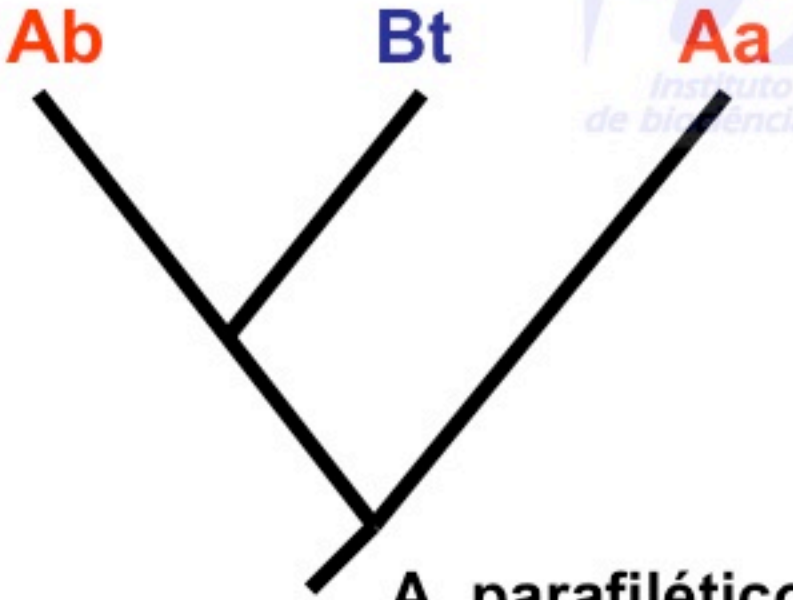



A, monofilético




A, parafilético




A, parafilético

**SCHEFFLERA** :–
reiniana *D.G. Frodin in Proc. Acad. Nat. Sci. Philadelphia*, 140(2): 337 (1988), nom. nov.: S. aromatica f. scandens *Hochreutiner*.
revolutissima *M.G. Baum[illegible] Pedanbria, Syst. Fl. Neu-Caledonien*, 5: 77, [illegible] (198[illegible] without latin descr. or type—New Cale[illegible]ia.
rodriguesiana *Frodin ex M[illegible] M. C[illegible]non in Bull. Brit. Mus. (Nat. Hi[illegible], Bot[illegible]9: [illegible] (19[illegible]), nom. nov.: Didymopanax [illegible]tieri *Marchal*.
rodriguesiana *D.G. Frodin in Proc. Acad. Nat. Sci. Philadelphia*, 141: 317 (1989), nom. nov.: Didymopanax pittieri *Marchal*.
sapoensis *M.J. & J.F.M. Cannon in Bull. Brit. Mus. (Nat. Hist.), Bot.*, 19: 38 (1989)—Panama.
simplex *J.A. Steyermark & Holst in Ann. Missouri Bot. Gard.*, 75(3): 1082 (1988)—Venezuela.
urbaniana *(Marchal) D.G. Frodin in Proc. Acad. Nat. Sci. Philadelphia*, 141: 318 (1989): Didymopanax urbanianus.
vanuatua *P.P. Lowry in Bull. Mus. Nation. Hist. Nat., B, Adansonia*, Ser. 4, 11(2): 129 (1989)—Vanuatu.
veitchii *(Carrière) D.G. Frodin & P.P. Lowry in Baileya*, 23(1): 11 (1989): Aralia veitchii.
whitefoordiae *M.J. & J.F.M. Cannon in Bull. Brit. Mus. (Nat. Hist.), Bot.*, 19: 47 (1989)—Panama.
yutajensis *J.A. Steyermark & Hol[illegible] An[illegible] Missouri Bot. Gard.*, 75(3): 1082 (1988)[illegible] Venezuela.

**SCHIEDEA** (Caryophyllac.).
kauaiensis *H. St. John in Phytologia*, 64(3)[illegible] 177 (1988)—Hawaiian Is.
obatae *H. St. John in Phytologia*, 64(2)[illegible] 178 (1988)—Hawaiian Is.
wichmanii *H. St. John in Phytologia*, [illegible]3): 17[illegible] (1988)—Hawaiian Is.

**SCHIEDEELLA** (Orchidac.).
chartacea *(L.O. Wms.) P. Burns-Balogh in Orquídea (México)*, 10(1): 92 (1986): Spiranthes chartacea.
dendroneura *(Sheviak & Bye) P. Burns-Balogh in Orquídea (México)*, 10(1): 92 (1986): Spiranthes dendroneura.
diaphana *(Lindl.) P. Burns-Balogh & Greenwood in Orquídea (México)*, 10(1): 93 (1986): Spiranthes diaphana.
dodii *P. Burns-Balogh in Orchidee*, 40(5): 169 (1989)—Hispaniola (Dominican Republic).
durangensis *(A. & S.) P. Burns-Balogh in Orquídea (Méxi[illegible]* 10(1): 93 (1986): Spiranthes durangensis.

**SCHISTOSTEMON** (Humiriac.).
fernandezii *J. Cuatrecasas in Phytologia*, 68(4): 261 (1990)—Venezuela.
sylvaticum *D. Sabatier in Proc. Kon. Nederl. Akad. Wetensch., C*, 90(2): 206 (1987)—French Guiana.

**SCHIZACHYRIUM** (Gramin[illegible]
[illegible]ku T. K[illegible]en i[illegible]n. Missou[illegible] Bot.[illegible]ra 77(1[illegible] 184 (199[illegible] Boli[illegible]
[illegible]itchell[illegible]a K. [illegible]non in [illegible]ust[illegible]ail[illegible], [illegible]): [illegible] (1989)—Australia (W. Aust[illegible]
praematurum *(Fern.) C.F. Reed in Phytologia*, 67(6): 451 (1989): Andropogon praem[illegible]us.
*f.* hirtivaginatum *(Fern.) C.F. Reed in Phytologia*, 67(6): 451 (1989): Andropogon praematurus f. hirtiva[illegible]us.
scoparium
*f.* calve[illegible] *(Fern.) C.F. Reed in Phytologia*, 67(6): 45[illegible] (1[illegible]): Andropogon scoparius f. calvescens.
*var.* poly[illegible]m *(Scribn. & Ball) C.F. Reed in P[illegible]* 63(5): 410 (1987): Andropogon scoparius var. polycladus.
*f.* villosissimum *(Kearney) C.F. Reed in Phytologia*, 67(6): 451 (1989): Andropogon scoparius f. villosissimus.
villosum *(Poir.) J.F. Veldkamp in Blumea*, 31(2): 306 (1986)[illegible]ottb[illegible]ia villosa.

**SCHIZ[illegible]** (Gramin[illegible].
[illegible]m[illegible]icu[illegible] *O.[illegible] H[illegible]ra in [illegible]otes [illegible]y. Bot. Gar[illegible] E[illegible]nburgh*, 4[illegible]: [illegible] (19[illegible] pu[illegible] 19[illegible])—Sou[illegible] A[illegible]ca (Cape Province)
rubiginosum *O.M. Hilliard in Notes Roy. Bot. Gard. Edinburgh*, 45([illegible]: 182 (1988 p[illegible]bl. [illegible]989)—[illegible]uth Africa (Natal).

**SCHIZOPETALON** (Cruc[illegible].
[illegible]rcuatum *I.A. Al-Shehbaz in Harvard Pap. Bot.*, 1: 34 (1989)—Chile.
[illegible]brachycarpum *I.A. Al-Shehbaz in Harvard Pap. Bot.*, [illegible]: 38 (1989)—Chile.
cory[illegible]bosum *I.A. Al-Shehbaz in Harvard Pap. Bot.*, 1: 41 (1[illegible]9)—Chile.
maipoanum *P. Ravenna in Onira, Bot. Leafl.*, 1(4): 32 (1988), as '[illegible]hyzop[illegible]alon'—Chile.

**SCHIZOPHRAGMA** (Hydrangeac.).
hydrangeoides
*f.* mollis *(Honda) Hara ex H. Ohba in J. Jap. Bot.*, 64(11): 325 (1989): S. hydrangeoides var. mollis.

**SCHOENOCAULON** :–
lauricola *McVaugh ex D. Frame in Novo-Galiciana*, 15: 267 (1989)—[illegible]
pellucidum *D. Frame in R. McVa[illegible] Galiciana*, 15: 272 (1989)—Mexico
tigrense *D. Frame in R. McVa[illegible] Galiciana*, 15: 274 (1989)—Mexico

**SCH[illegible]ENOCEPHALIUM** (Rapatead[illegible]
[illegible]si[illegible]oanum *B. Maguire in Acta Bot.* [illegible] (1984)—Venezuela.

**SCHOENOIDES** O. Seberg in Wil[illegible] 181 (1986). *CYPERACEAE*.
oligocephalus *(W.M. Curtis) O. Seber[illegible]* 16(1): 182 (1986): Oreobolus oligo[illegible]

**SCHOENOPLECTUS** (Cyperac.).
×kuekenthalianus *(Junge) D.H. Ke[illegible]* 18(2): 213 (1990): Scirpus × kuek[illegible]
lacustris
*subsp.* validus *(Vahl) T. Koyama[illegible] Occas. Pap.*, 29: 128 (1989): Sci[illegible]

**SCHOENORCHIS** (Orchidac.).
eberhardtii *(Finet) L.V. Aver'yanov[illegible]* 73(1): 107 (1988): Saccolabium eb[illegible]
endertii *(J.J. Smith) E.A. Christenso[illegible] Lindleyana*, 5(2): 101 (1990): Rob[illegible]

**SCHOENOXIPHIUM** (Cyperac.).
[illegible]altum *I. Kukkonen in Notes R[illegible] Edinburgh*, 43(3): 365 (1986)—So[illegible] Province).
bracteosum *I. Kukkonen in Notes [illegible] Edinburgh*, 43(3): 365 (1986)—So[illegible] Province, Natal), Lesotho.
burttii *I. Kukkonen in Notes [illegible] Edinburgh*, 43(3): 365 (1986[illegible] (Natal).
molle *I. Kukkonen in Notes R[illegible] Edinburgh*, 43(3): 366 (1986[illegible] (Natal).
strictum *I. Kukkonen in Notes [illegible] Edinburgh*, 43(3): 366 (1986[illegible] (Natal).

**SCHOEPFIA** (Olacac.).
clarkii *J.A. Steyermark in Ann. Mi[illegible]* 75(3): 1061 (1988)—Venezuela.

| BOTÂNICA | | BACTERIOLOGIA | | ZOOLOGIA | |
|---|---|---|---|---|---|
| REINO* | | | | REINO* | |
| | | | | Sub-Reino | |
| | | | | (Superfilo) | |
| DIVISÃO | (-phyta)<br>(-myceta) | (DIVISÃO) | | FILO | |
| Subdivisão | (-phytina)<br>(-mycotina) | (Subdivisão) | | Subfilo | |
| CLASSE* | (-phyceae)<br>(-mycetes)<br>(-opsida) | CLASSE* | | CLASSE* | |
| Subclasse | (-idae) | | | Subclasse | |
| Superordem | | | | Superordem | |
| ORDEM* | -ales | ORDEM* | -ales | ORDEM* | |
| (Subordem) | -ineae | Subordem | -ineae | Subordem | |
| | | | | Infraordem | |
| | | | | Superfamília | (-oidea) |
| FAMÍLIA | -aceae | FAMÍLIA | -aceae | FAMÍLIA | -idae |
| Subfamília | -oideae | (Subfamília) | -oideae | Subfamília | -inae |
| Tribo | -eae | Tribo | -eae | Tribo | (-ini) |
| Subtribo | -inae | (Subtribo) | -inae | Subtribo | (-ina) |
| GÊNERO* | | GÊNERO* | | GÊNERO* | |
| Subgênero | | (Subgênero) | | Subgênero | |
| Seção | | | | Seção | |
| Subseção | | | | Subseção | |
| Série | | | | Série | |
| Subsérie | | | | Subsérie | |
| ESPÉCIE* | | ESPÉCIE* | | ESPÉCIE* | |
| Subespécie | | (Subespécie | | Subespécie | |
| Variedade | | = Variedade) | | | |
| (Subvariedade) | | | | | |
| Forma | | | | | |
| (Subforma) | | | | | |



Adaptado de Jeffrey (1973)

| BOTÂNICA | | BACTERIOLOGIA | | ZOOLOGIA | |
|---|---|---|---|---|---|
| **REINO*** | | | | **REINO*** | |
| | | | | Sub-Reino | |
| | | | | (Superfilo) | |
| **DIVISÃO** | **(-phyta)** | **(DIVISÃO)** | | **FILO** | |
| | **(-myceta)** | | | | |
| Subdivisão | (-phytina) | (Subdivisão) | | Subfilo | |
| | (-mycotina) | | | | |
| **CLASSE*** | **(-phyceae)** | **CLASSE*** | | **CLASSE*** | |
| | **(-mycetes)** | | | | |
| | **(-opsida)** | | | | |
| Subclasse | (-idae) | | | Subclasse | |
| Superordem | | | | Superordem | |
| **ORDEM*** | **-ales** | **ORDEM*** | **-ales** | **ORDEM*** | |
| (Subordem) | -ineae | Subordem | -ineae | Subordem | |
| | | | | Infraordem | |
| | | | | Superfamília | (-oidea) |
| **FAMÍLIA** | **-aceae** | **FAMÍLIA** | **-aceae** | **FAMÍLIA** | **-idae** |
| Subfamília | -oideae | (Subfamília) | -oideae | Subfamília | -inae |
| Tribo | -eae | Tribo | -eae | Tribo | (-ini) |
| Subtribo | -inae | (Subtribo) | -inae | Subtribo | (-ina) |
| **GÊNERO*** | | **GÊNERO*** | | **GÊNERO*** | |
| Subgênero | | (Subgênero) | | Subgênero | |
| Seção | | | | Seção | |
| Subseção | | | | Subseção | |
| Série | | | | Série | |
| Subsérie | | | | Subsérie | |
| **ESPÉCIE*** | | **ESPÉCIE*** | | **ESPÉCIE*** | |
| Subespécie | | (Subespécie | | Subespécie | |
| Variedade | | = Variedade) | | | |
| (Subvariedade) | | | | | |
| Forma | | | | | |
| (Subforma) | | | | | |



Adaptado de Jeffrey (1973)

| BOTÂNICA | | BACTERIOLOGIA | | ZOOLOGIA | |
|---|---|---|---|---|---|
| ORDEM | -ales | ORDEM | -ales | ORDEM | |
| FAMÍLIA | -aceae | FAMÍLIA | -aceae | FAMÍLIA | -idae |



Adaptado de Jeffrey (1973)

Backlund & Bremer (1988). To be or not to be – principles of classification and monotypic plant families. *Taxon* 47: 391-400.

# Princípio primário: Monofiletismo

# Princípios secundários:

Maximizar:

## Estabilidade nomenclatural

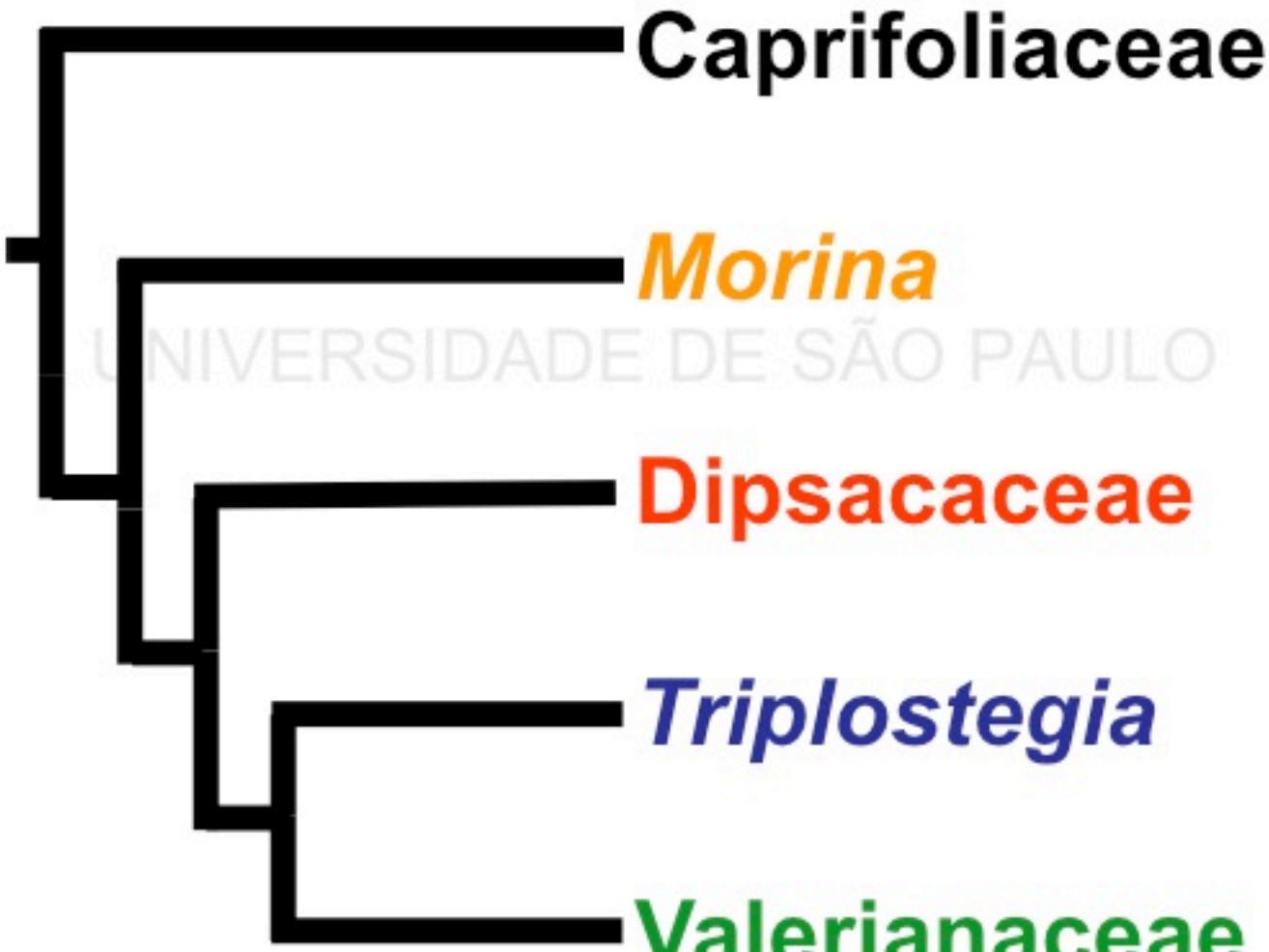
## Facilidade de identificação

## Informação filogenética

## Sustentação do monofiletismo

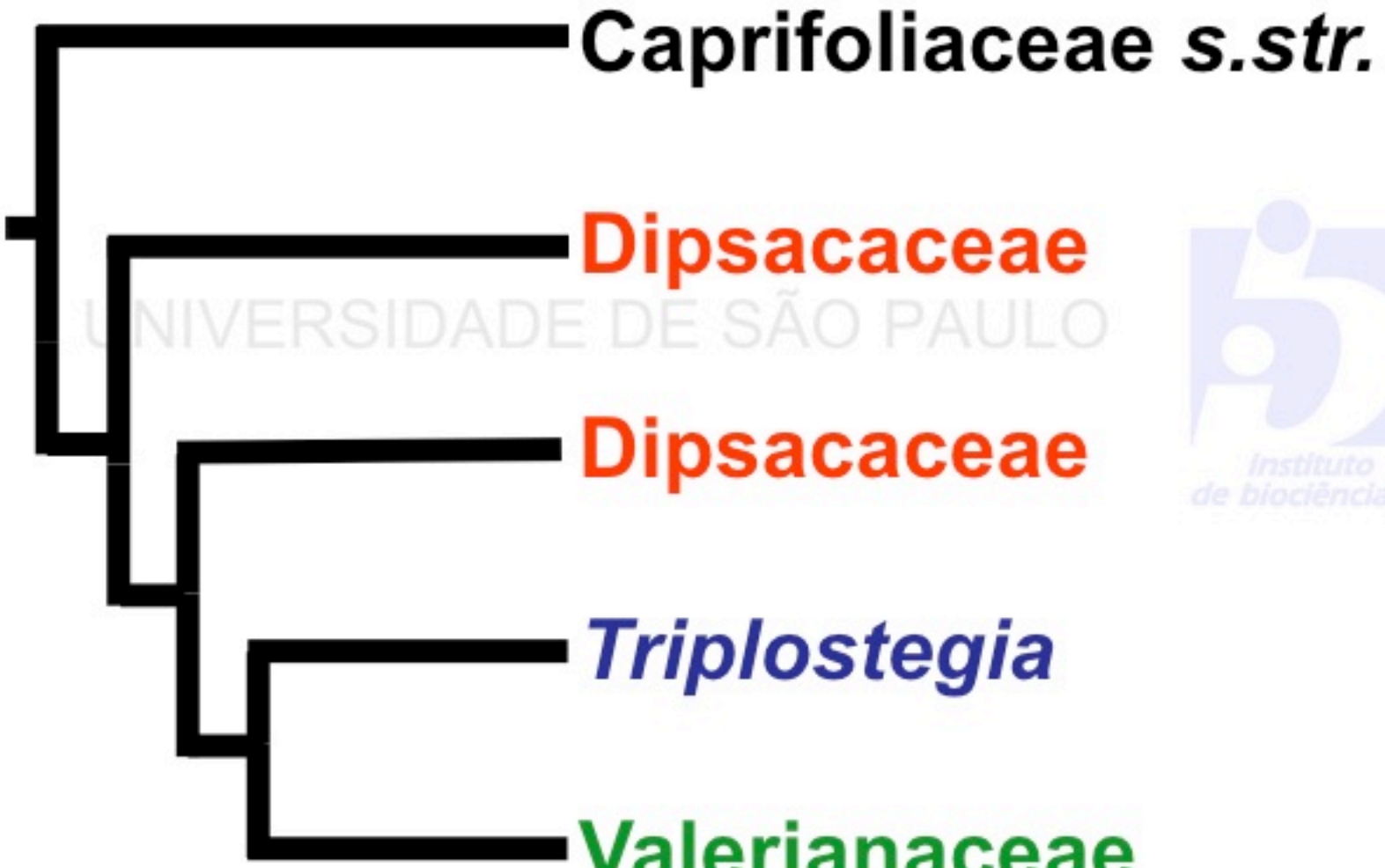
# Dipsacales

Backlund & Donoghue (1996) - Morfologia
Blackund & Bremer (1998) - *rbc*L



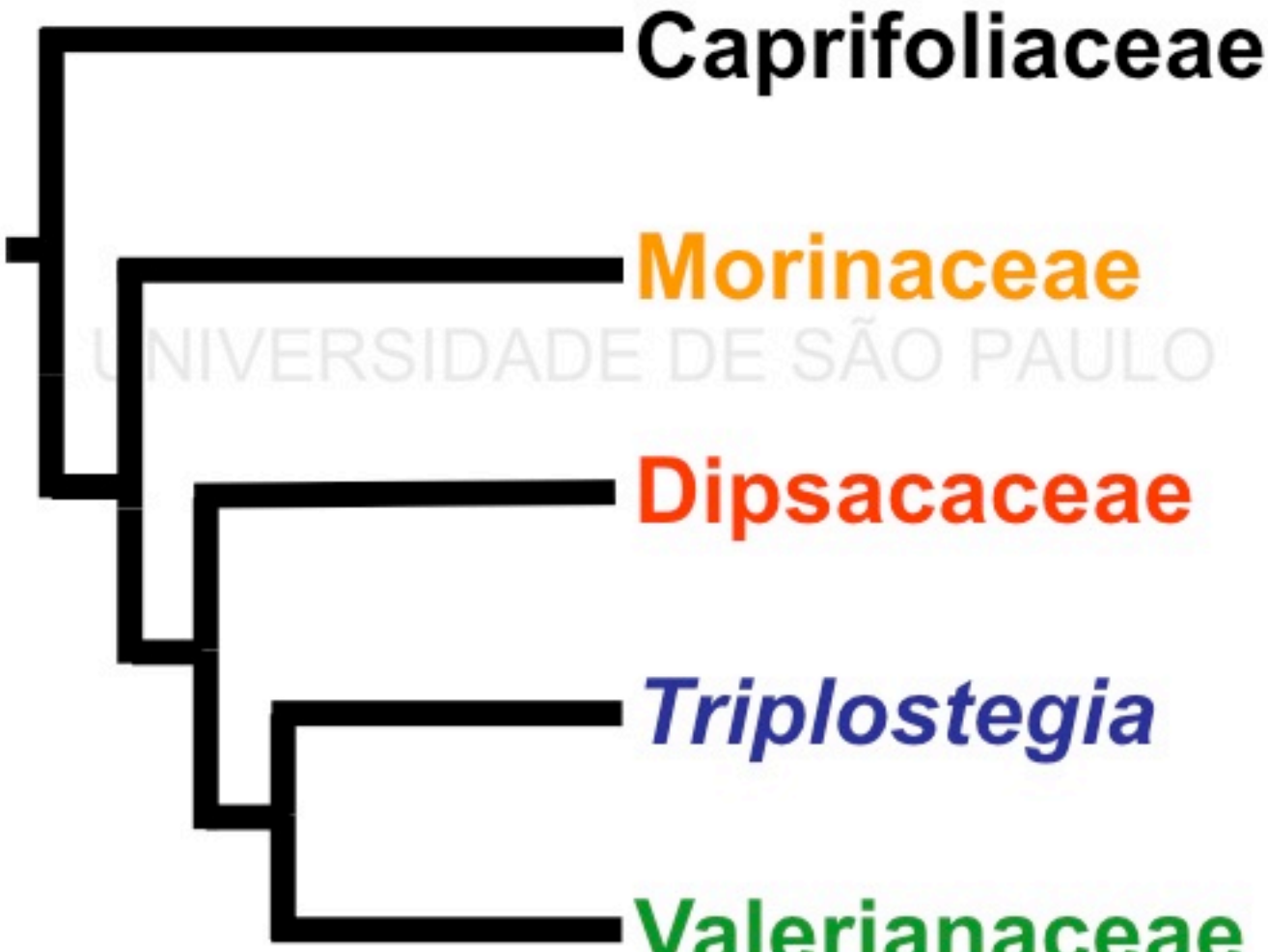
# Dipsacales

Backlund & Donoghue (1996) - Morfologia
Blackund & Bremer (1998) - *rbc*L



# Dipsacales

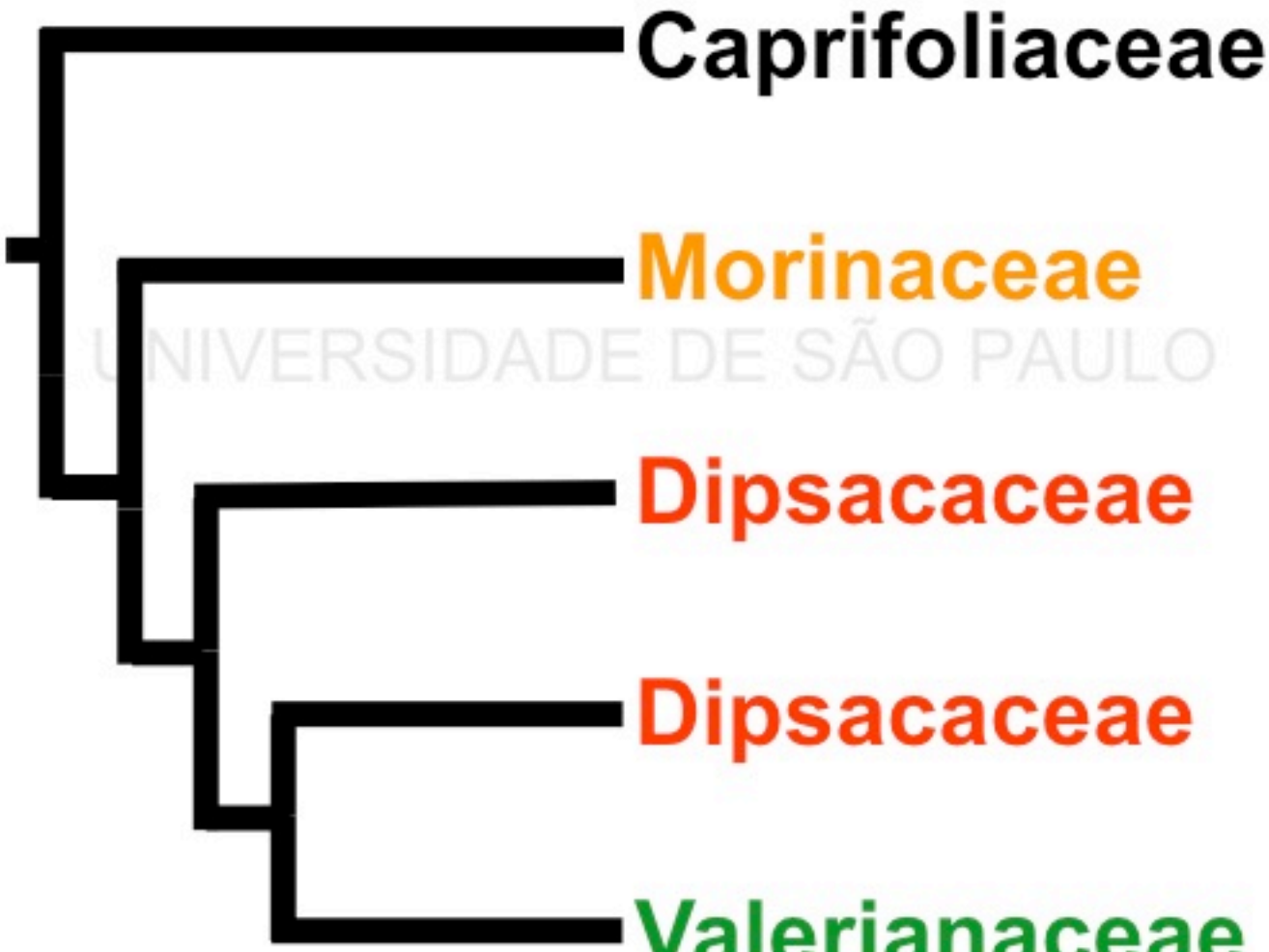
Backlund & Donoghue (1996) - Morfologia
Blackund & Bremer (1998) - *rbc*L




***Monofiletismo***

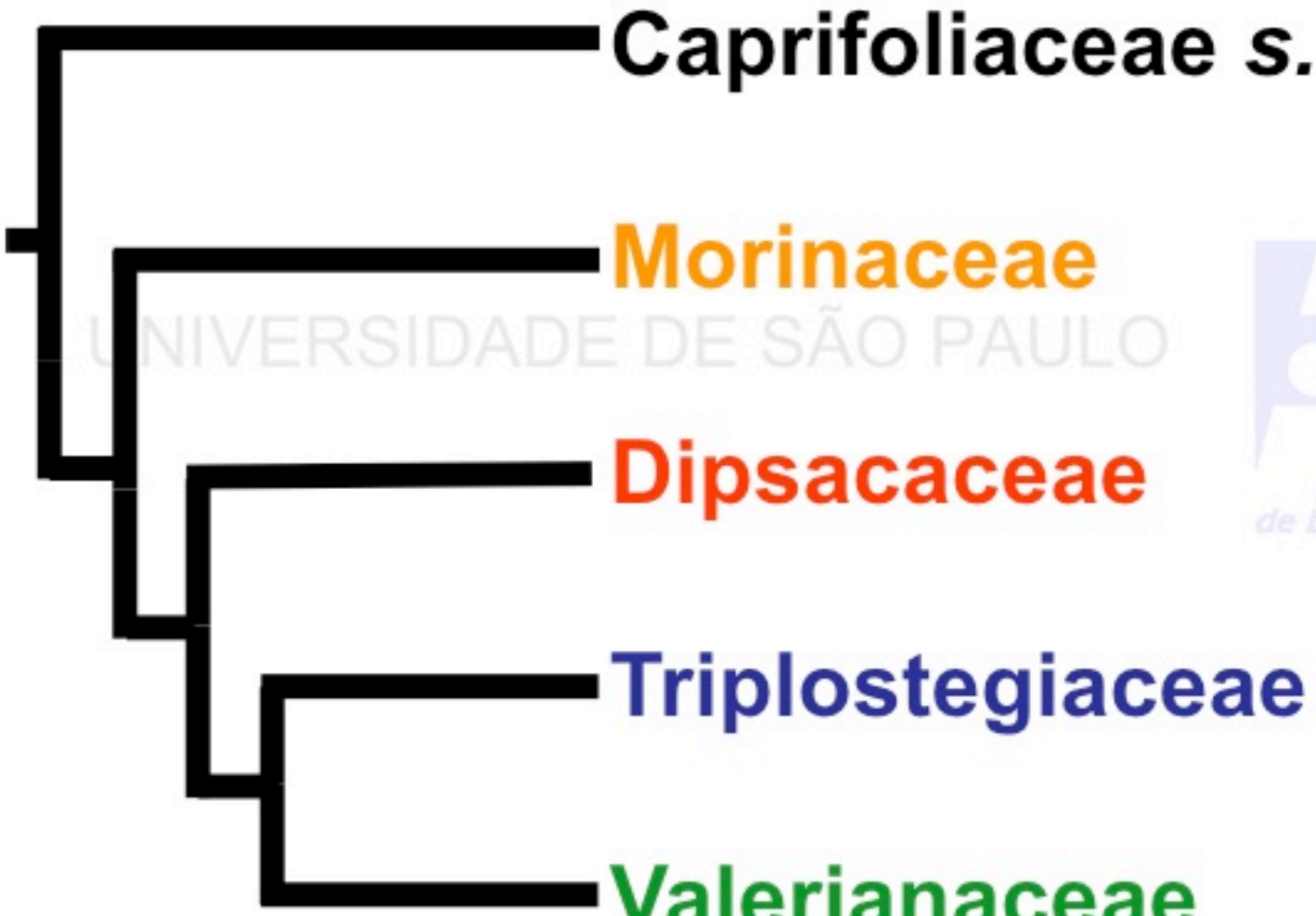
# Dipsacales

Backlund & Donoghue (1996) - Morfologia
Blackund & Bremer (1998) - *rbc*L



# Dipsacales

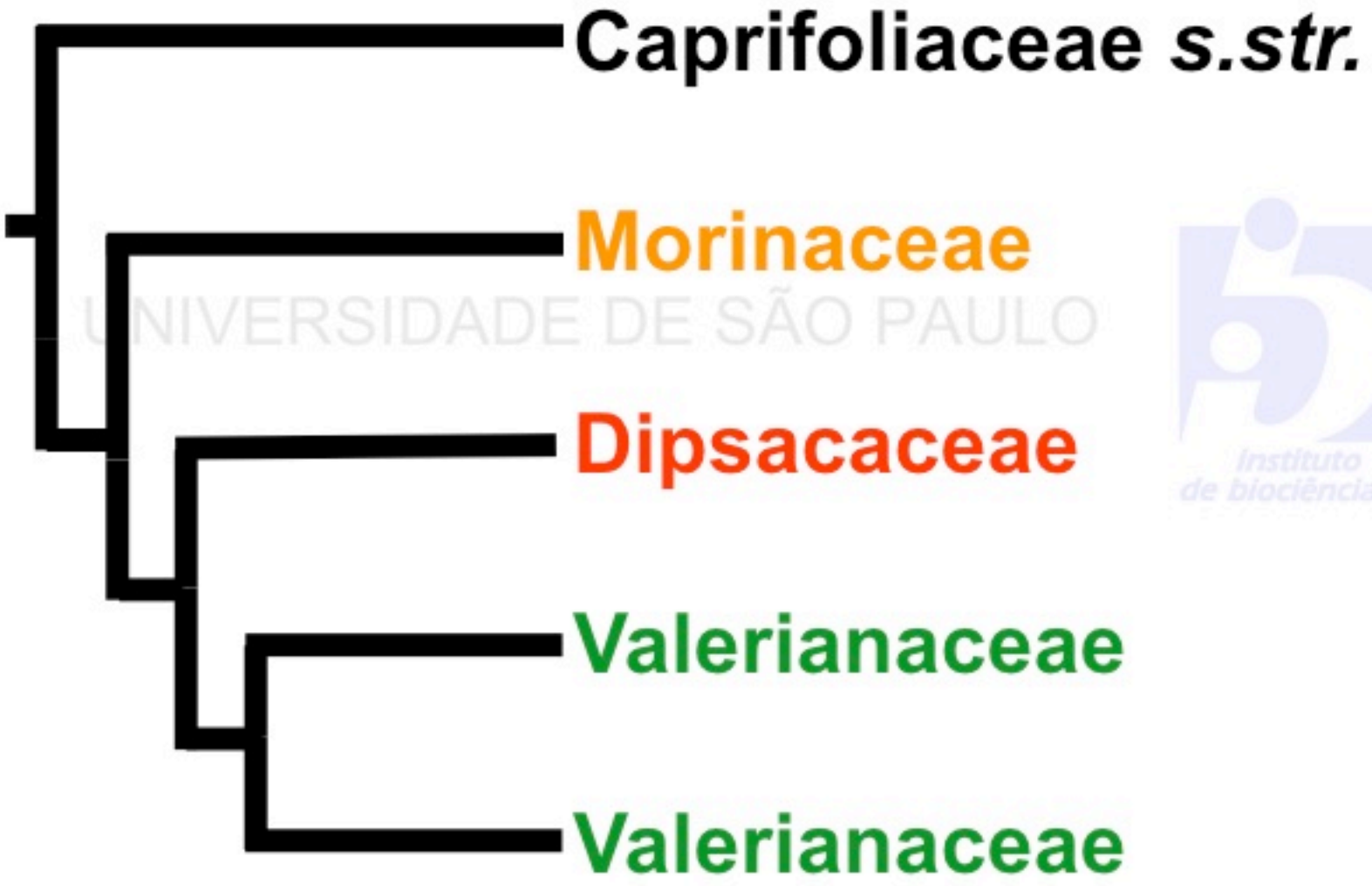
Backlund & Donoghue (1996) - Morfologia
Blackund & Bremer (1998) - *rbc*L




***Monofiletismo***

# Dipsacales

Backlund & Donoghue (1996) - Morfologia
Blackund & Bremer (1998) - *rbc*L



# Dipsacales

Backlund & Donoghue (1996) - Morfologia
Blackund & Bremer (1998) - *rbc*L




***Informação filogenética***

# Dipsacales

APG 2003




***Informação filogenética***

**Caprifoliaceae *s.l.***