

# Research and potential applications

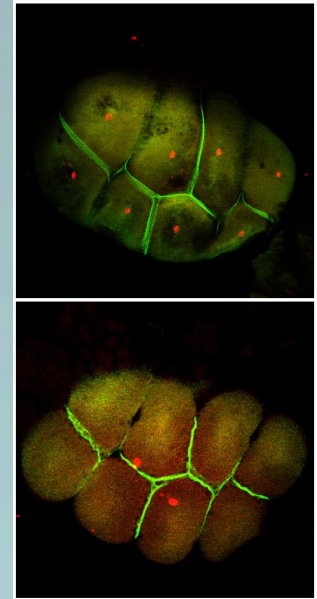
## Academics



## Outside interests



Francisco Pelegri  
Laboratory of Genetics  
U. Wisconsin - Madison



# Research and potential applications

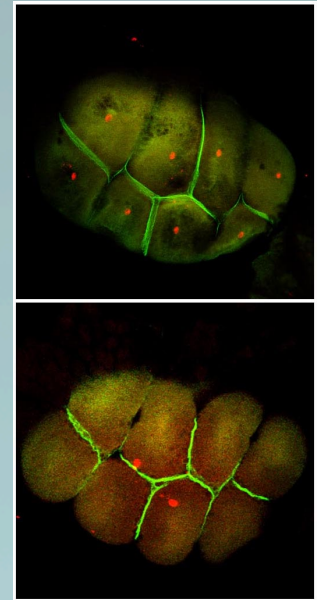
Academics



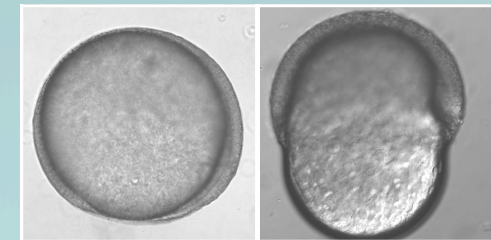
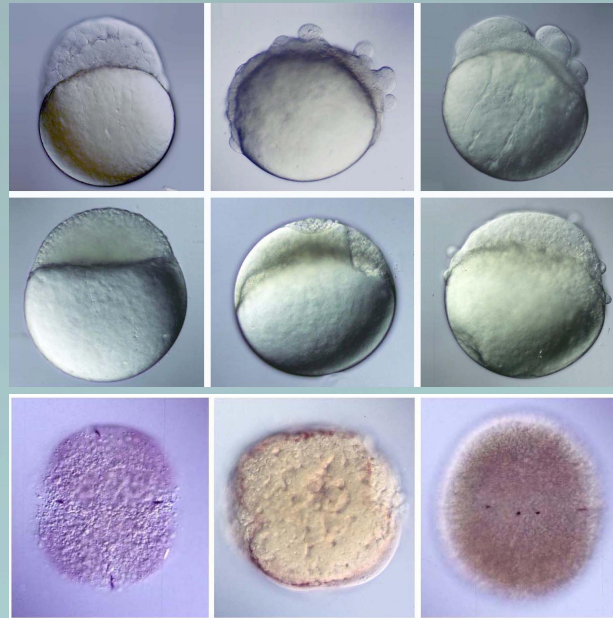
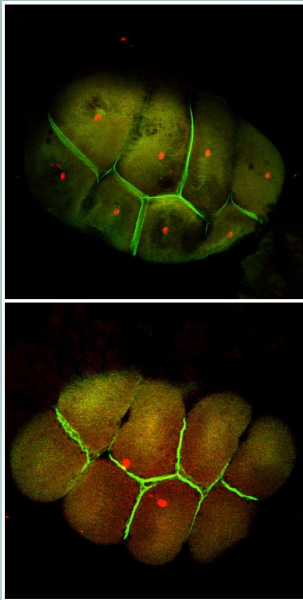
Outside interests



Francisco Pelegri  
Laboratory of Genetics  
U. Wisconsin - Madison



# Maternal and paternal genes in zebrafish embryogenesis



**Pelegri Lab**  
**Laboratory of Genetics**  
**U. Wisconsin - Madison**



# Contribution of maternal and paternal factors to embryonic development

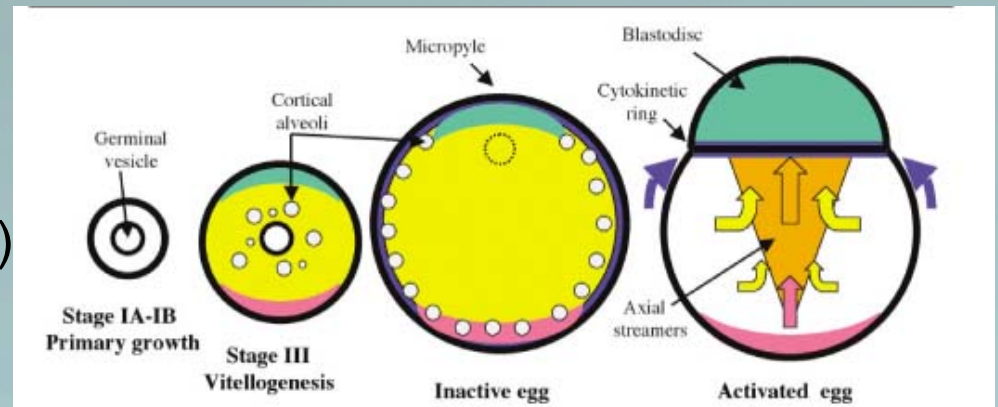
## Maternal

Female-derived DNA

Cytoplasmic products

(RNA, proteins, other molecules)

Organelles (e.g. mitochondria)

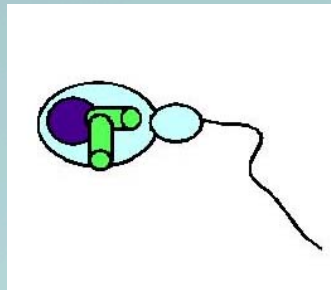


## Paternal

Male-derived DNA

Egg activation signals

Centrioles





Why are parental factors important?

1) Understanding the logic of early development - conserved pathways

2) Accessible models for signaling pathways used at all stages of development, and which are often misregulated in cancer

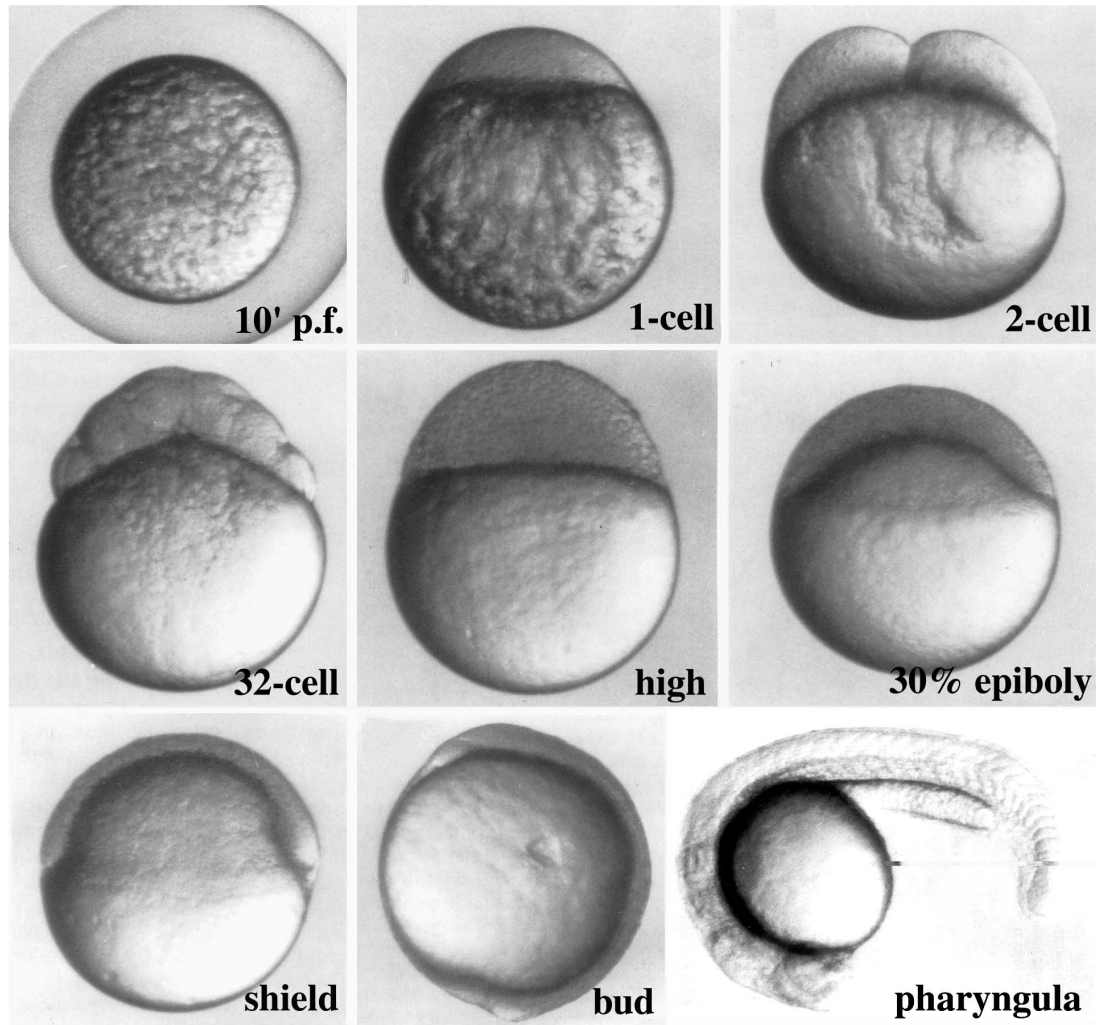
3) Study of early developmental syndromes, fertility/contraception, mitochondrial diseases.

4) Important for reprogramming, somatic cell cloning, interspecies nuclear transfer (regenerative medicine, conservation biology)

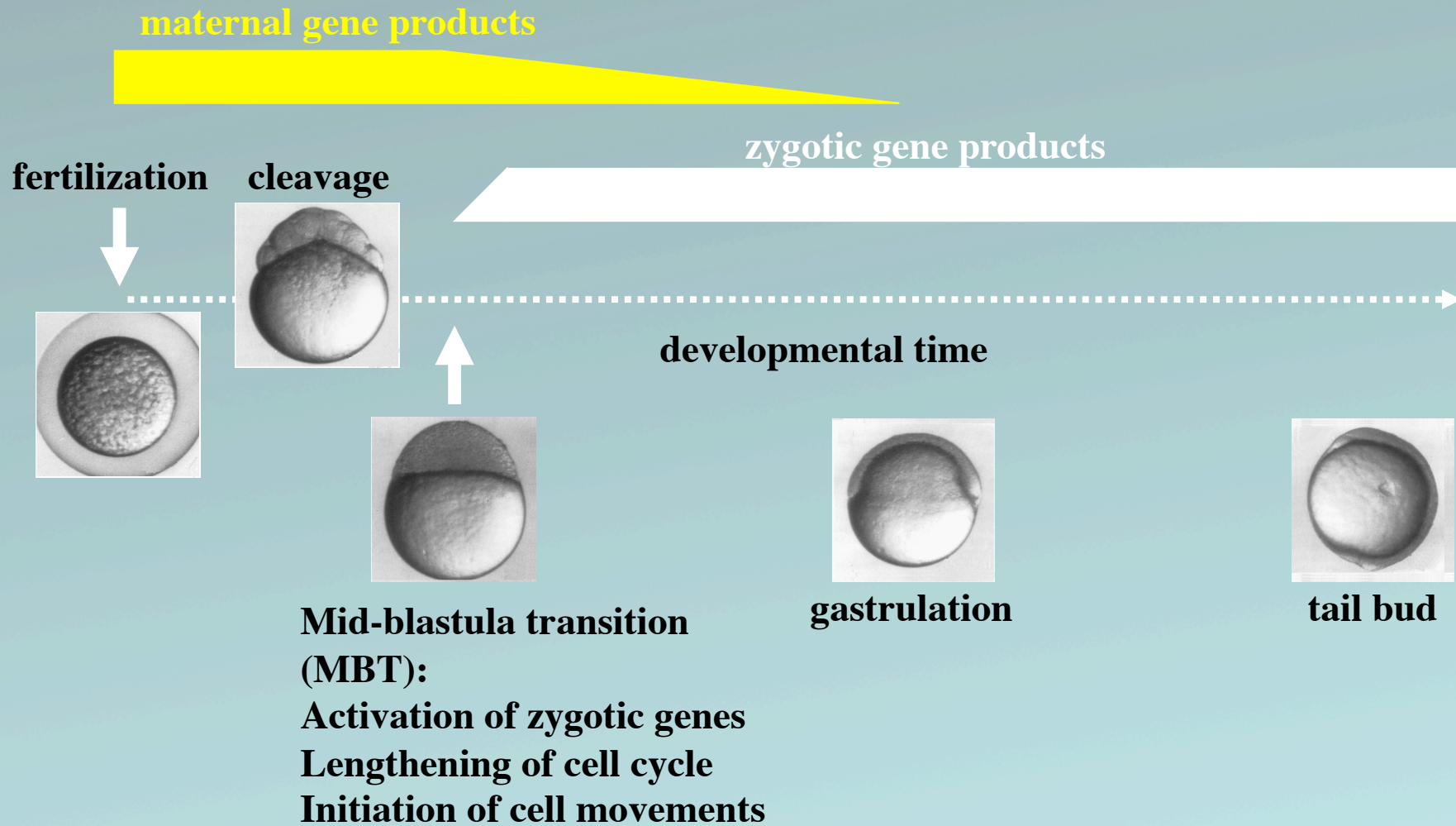
5) Evolution: mechanisms of speciation barriers in the zygote

6) Parental effects just another adult phenotype (similar genetic tools)

## Zebrafish embryogenesis (0 - 24 hrs)



# Transition from maternal to zygotic control





# Understanding maternal/paternal factors will likely aide in somatic cell cloning using oocytes and the survival of interspecies clones



Available online at [www.sciencedirect.com](http://www.sciencedirect.com)



ScienceDirect

Theriogenology 70 (2008) 638–647

Theriogenology

[www.theriojournal.com](http://www.theriojournal.com)

Success!! (cloning within canid family)

## Cloning endangered gray wolves (*Canis lupus*) from somatic cells collected postmortem

H.J. Oh<sup>a,b,1</sup>, M.K. Kim<sup>c,1</sup>, G. Jang<sup>a</sup>, H.J. Kim<sup>a</sup>, S.G. Hong<sup>a,b</sup>, J.E. Park<sup>a,b</sup>, K. Park<sup>d</sup>, C. Park<sup>d</sup>, S.H. Sohn<sup>e</sup>, D.Y. Kim<sup>b,f</sup>, N.S. Shin<sup>b,g</sup>, B.C. Lee<sup>a,b,\*</sup>

*J. Vet. Sci.* (2009), **10**(4), 285–292

DOI: 10.4142/jvs.2009.10.4.285

JOURNAL OF

Veterinary  
Science

## Production of cloned sei whale (*Balaenoptera borealis*) embryos by interspecies somatic cell nuclear transfer using enucleated pig oocytes

Eunsong Lee<sup>1</sup>, Mohammad Musharraf Uddin Bhuiyan<sup>2</sup>, Hiroyuki Watanabe<sup>2</sup>, Kohji Matsuoka<sup>3</sup>, Yoshihiro Fujise<sup>3</sup>, Hajime Ishikawa<sup>3</sup>, Yutaka Fukui<sup>2,\*</sup>

<sup>1</sup>School of Veterinary Medicine and Institute of Veterinary Science, Kangwon National University, Chunchon 200-701, Korea

<sup>2</sup>Laboratory of Animal Reproduction, Obihiro University of Agriculture and Veterinary Medicine, Obihiro 080-8555, Japan

<sup>3</sup>The Institute of Cetacean Research, Tokyo 104-0055, Japan

(Die before the blastocyst stage)

Can zebrafish become a model for interspecies nuclear transfer and animal cloning?

BIOLOGY OF REPRODUCTION **80**, 674–684 (2009)

Published online before print 17 December 2008.

DOI 10.1095/biolreprod.108.074203

## Identification of Differentially Expressed Genes Between Cloned and Zygote-Developing Zebrafish (*Danio rerio*) Embryos at the Dome Stage Using Suppression Subtractive Hybridization<sup>1</sup>

Daji Luo,<sup>4,5</sup> Wei Hu,<sup>3,5</sup> Shangping Chen,<sup>5</sup> Yi Xiao,<sup>4</sup> Yonghua Sun,<sup>5</sup> and Zuoyan Zhu<sup>2,4,5</sup>

College of Life Sciences,<sup>4</sup> Wuhan University, Wuhan, China

State Key Laboratory of Freshwater Ecology and Biotechnology,<sup>5</sup> Institute of Hydrobiology, Chinese Academy of Sciences, Wuhan, China

Extinct ibex is resurrected by cloning - Telegraph

<http://www.telegraph.co.uk/science/science-news/4409958/Extinct...>

## Extinct ibex is resurrected by cloning

An extinct animal has been brought back to life for the first time after being cloned from frozen tissue.

By Richard Gray and Roger Dobson  
Published: 9:00PM GMT 31 Jan 2009

The Pyrenean ibex, a form of wild mountain goat, was officially declared extinct in 2000 when the last-known animal of its kind was found dead in northern Spain.

Shortly before its death, scientists preserved skin samples of the goat, a subspecies of the Spanish ibex that live in mountain ranges across the country, in liquid nitrogen.

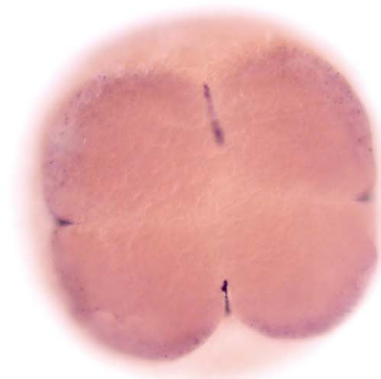


Young Spanish ibex (*Capra pyrenaica*), Sierra de Gredos, Spain. Photo: Jose Luis GOMEZ de FRANCISCO/naturepl.com

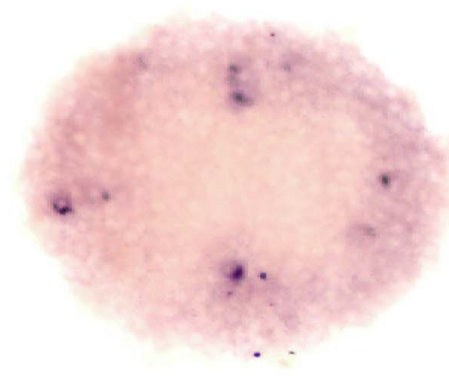
(Died within minutes of birth)

Germ plasm components become localized to the early cleavage furrows and eventually the germ line  
- understanding germ cell specification may help reproductive efforts relevant to conservation

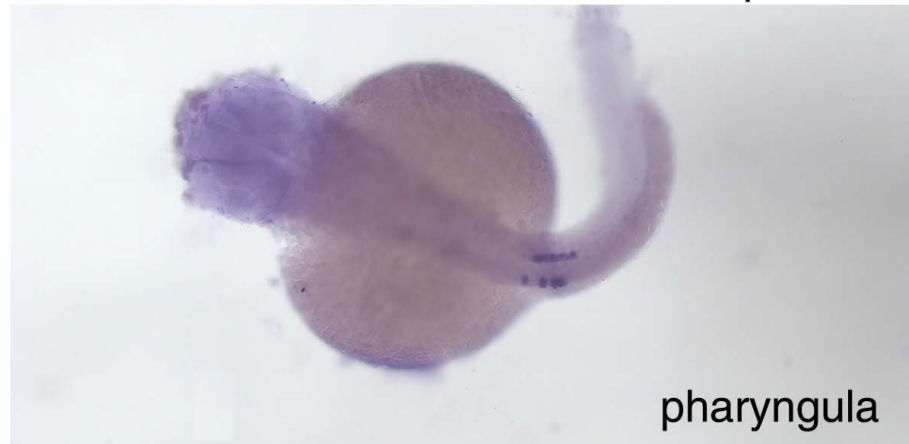
### Localization of VASA RNA



4-cells

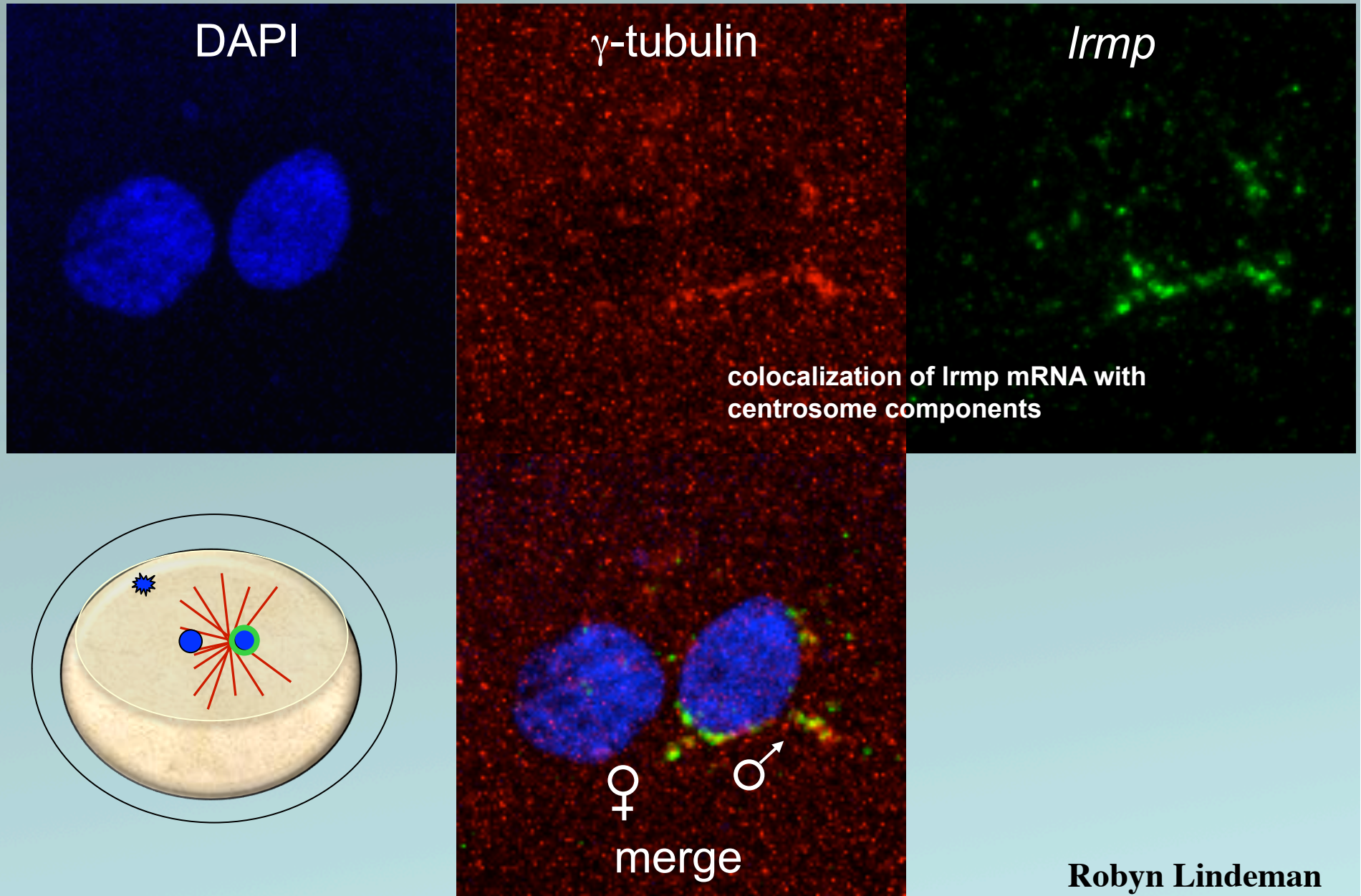


sphere



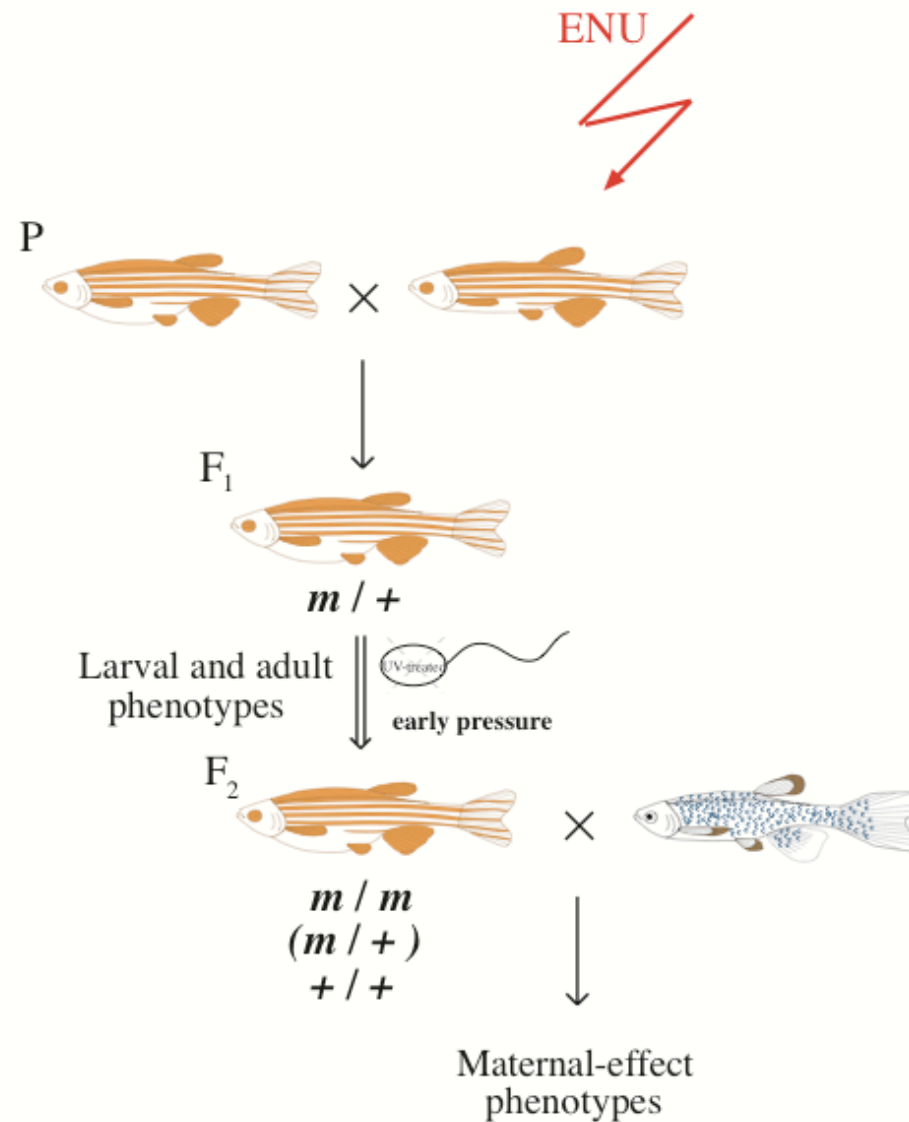
pharyngula

The *futile cycle* gene is important for anchoring the centrosome to the nucleus, and its mRNA is localized to the centrosomes - Genes in components essential for early embryonic development may be key for species differences that are obstacles to animal cloning





**A gynogenesis-based screen for maternal-effect genes – genetic manipulation of the zebrafish may help carry out genetic screens for genes involved in interspecies differences**



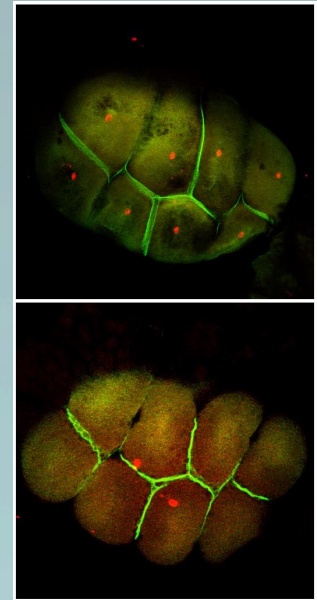
Pelegri and Schulte-Merker, 1999; Pelegri et al., 2004 (Nüsslein-Volhard lab)

# Research and potential applications

Academics



Outside interests





UNIVERSITY OF WISCONSIN-MADISON

Academic Planning & Analysis

## *A UW – Madison conservation-oriented certificate?*

“A certificate program is a designated set of courses focused upon a specific topic or theme which students may study separately from, or in addition to, their major(s) and degree requirements. The purpose of a certificate program is to give students the opportunity independently to pursue a subject of interest in a prescribed manner and, upon completion of the requirements, to have that achievement recognized by the awarding of a certificate (official document) from the sponsoring department(s). If the University officially approves a certificate program, students completing it also have an annotation posted to their student record (transcript).”

UW-Madison Office of Academic Planning and Analysis

*-15 to 24 credits*

*- interdisciplinary*

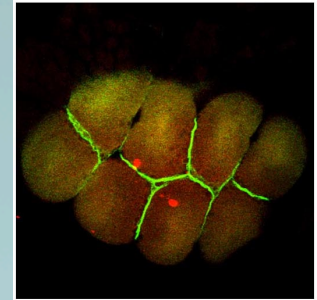
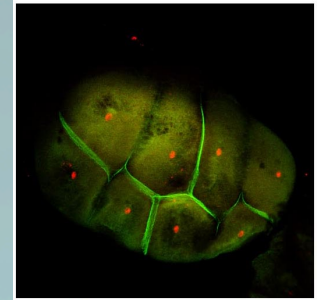


# Research and potential applications

## Academics



## Outside interests



## *Can ordinary citizens help with species conservation?*



JNCC Report No. 342  
**Checklist of mammals  
listed in the CITES appendices  
and in EC Regulation 338/97**

**6th edition  
2003**

**compiled by  
UNEP-WCMC**



@JNCC 2003

# Breed conservancy...a humble start

American Livestock Breeds Conservancy

<http://www.albc-usa.org/>

Shopping Cart  • [SEARCH ALBC](#)

"...when the last individual of a race of living things breathes no more, another Heaven and another Earth must pass before such a one can be again."  
-William Beebe



[HOME](#)

[About ALBC](#)

[Breed Information](#)

[Calendar](#)

[ALBC Store](#)

[Membership](#)

[Support ALBC](#)

[News](#)

[Links](#)

[Contact ALBC](#)

[Educational Resources](#)

[Classifieds](#)

## ABOUT US

*Ensuring the future of agriculture through genetic conservation and the promotion of endangered breeds of livestock and poultry.*

The **American Livestock Breeds Conservancy** is a nonprofit membership organization working to protect over 150 breeds of livestock and poultry from extinction. Included are asses, cattle, goats, horses, sheep, pigs, rabbits, chickens, ducks, geese, and turkeys.

Founded in 1977, the American Livestock Breeds Conservancy is the pioneer organization in the U.S. working to conserve historic breeds and genetic diversity in livestock. We hope you'll browse through these pages and learn more about the diverse and valuable agricultural heritage that is ours to enjoy and to steward.



## HIGHLIGHTS

**ALBC in Action Blog** - Check out our recent "in the field" work.

**ALBC Store** - New products just in time for holiday shopping.

**Join us on Facebook!**

**Volunteer Opportunities** - Learn how to get involved and help spread the ALBC message.

**Donate, shop, and join ALBC** using our Secure Server payment system!

## WHAT'S NEW?



**Educational Resources**

New content & design to help you learn more.  
[View Now](#)



**Directory Update**

Update your membership info for the annual Breeders Directory.



**Online Classifieds**

Visit ALBC's new online classifieds section.



**E-News Sign Up**

Receive monthly news and updates via our new electronic newsletter.



**HERITAGE CHICKEN**

ALBC's Heritage Chicken definition, resources, Heritage chicken breeds, & more



**ALBC NEWS**

Read excerpts from ALBC's bi-monthly member newsletter.



**Heritage Turkeys**

What are Heritage Turkeys?, Where can I find a Heritage Turkey?, & more



## Two cases of conservation rescue efforts with wild horses

- 1) *The Tarpan horse: a prehistoric wild horse who originally ranged from Spain to Central Russia, the Tarpan horse dwindled in numbers due to deforestation and conflicts with humans. The last surviving Tarpans lived in ancient forests and wetlands of Poland and the last pure Tarpan horse died in a Ukrainian game preserve in 1879. In the mid 1900s, the Polish government initiated a genetic experiment to “rescue” the Tarpan horse, by breeding Tarpan-descended horses from a forest in Bialowieza and selecting for Tarpan-like characteristics. This is called the New Tarpan, or the Polish Primitive Horse. Although this is a breeding attempt to “recreate” the Tarpan horse, the New Tarpan does not contain pure Tarpan blood. only a subset of its genetic heritage.*



*Drawing of the extinct Tarpan Horse  
(note primitive markings)*



*The “recreated” Tarpan breed in a nature preserve  
in the Netherlands.*

- 2) *The Przewalski horse: the only living subspecies of wild horses, originally lived in the plains from Germany to Mongolia. Almost extinct in the early 1900s, breeding programs were established in zoos using 14 founders. Przewalskis have 66 chromosomes, as opposed to 64 chromosomes in the domesticated horse, but hybrids are fertile, and cytogenetic analysis showed that some lines were contaminated with domestic horse. Only pure individuals were used for breeding. Currently, the population has 1500 individuals, living primarily in Zoos across the world and semi-reserves in the Netherlands and Germany. In the year 2000 the first Przewalski foals were reintroduced to the plains of Mongolia.*



## On the search for native breeds in need...

American Livestock Breeds Conservancy - Breeds Information http://www.albc-usa.org/cpl/wtchlist.html

CRITICAL	THREATENED	WATCH	RECOVERING	STUDY
American Cream	Akhal-Teke	Clydesdale	Belgian	
Caspian	Canadian	Fell Pony	Friesian	
Cleveland Bay	Colonial Spanish - Combined <sup>2</sup>	Gotland	Percheron	
Colonial Spanish Strains <sup>2</sup>	Dales Pony	Mountain Pleasure/Rocky Mountain		
Banker <sup>3,4</sup> (F)	Dartmoor			
Belsky <sup>3</sup>	Exmoor			
Cerbat <sup>3</sup> (F)				
Choctaw <sup>3,4</sup>	Lipizzan			
Florida Cracker <sup>3</sup>				
Marsh Tacky <sup>3</sup>				
New Mexico <sup>3,6</sup>				
Pryor <sup>3</sup> (F)				
Santa Cruz <sup>3</sup>				
Sulphur <sup>3</sup> (F)				
Wilbur-Cruce <sup>3</sup>				
Hackney Horse				
Shire				
Suffolk				
PIGS				
			• links	
Choctaw (F)	Tamworth	Hereford	Saddleback	
Gloucestershire Old Spots				
Guinea Hog				

3 of 8 3/24/10 11:15 AM

*Dartmoor ponies are also in the watch list of the U.K.'s Rare Breed Survival Trust (www.rbst.org.uk)*


## Why Dartmoor ponies need help:

Dartmoor Pony Society

<http://www.dartmoorponysociety.com/>

**Home**  
**About the Breed**  
**Membership**  
**Sales List**  
**Stud Adverts**  
**Passports**  
**Shows**  
**Show Affiliations**  
**Registration**  
**Daughter Societies**  
**Latest News**  
**Part Bred**  
**Merchandise**  
**Contacts**

**DARTMOOR PONY SOCIETY**  
***GUARDIAN OF THE BREED***  
Registered in England 3240342



**THE PURE BRED DARTMOOR PONY**  
RECOGNISED AS A RARE BREED BY THE RARE BREEDS SURVIVAL TRUST

Membership costs last updated:  
14/01/2010  
Registration costs last updated:  
21/11/2008  
Sales list last updated:  
19/03/2010  
Site Last Updated:  
07/03/2010

The Dartmoor Pony Society accept no responsibility for the accuracy of information and data submitted by third parties.  
Designed and maintained by **Fearn Marketing Services Ltd**  
Copyright ©2010 Dartmoor Pony Society. All rights reserved.

- Used to be 30,000, went down to < 20 after WWII – suffered strong bottleneck effect (now up to 2,000)
- No longer have a home in the wild: all dartmoors officially recognized as “pure” are in breeding studs. Only ponies left wild in the dartmoor area are regarded as mixed “bush ponies”
- Currently subject to strong human selection
- Not all international societies (e.g. the US) are affiliated with primary (UK) society (i.e. lack of unified, interbreeding population)



## *Our Dartmoor ponies*



*Giselle – age 15 (UK registered)*



*Tangy – age 2 (both parents imported  
but not UK registered)*



*Masterpiece – age 2.5  
(UK licensed stallion)*

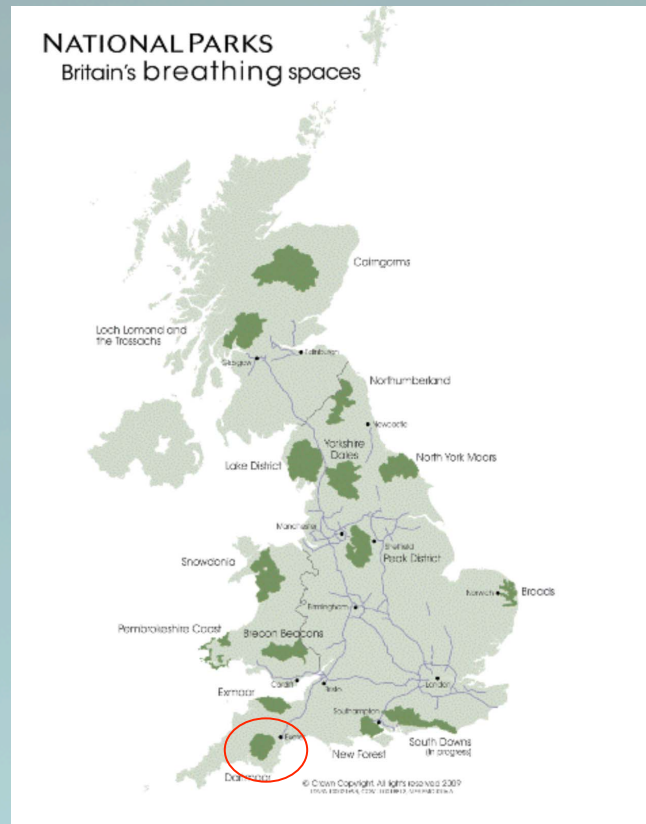


## *Can Dartmoors be returned to the wild?*

<http://www.dartmoor-npa.gov.uk/index/visiting/maps.htm>



Dartmoor National Park



*Przewalski horses, returned to wild conditions in Mongolian reserves*

*Thanks!*