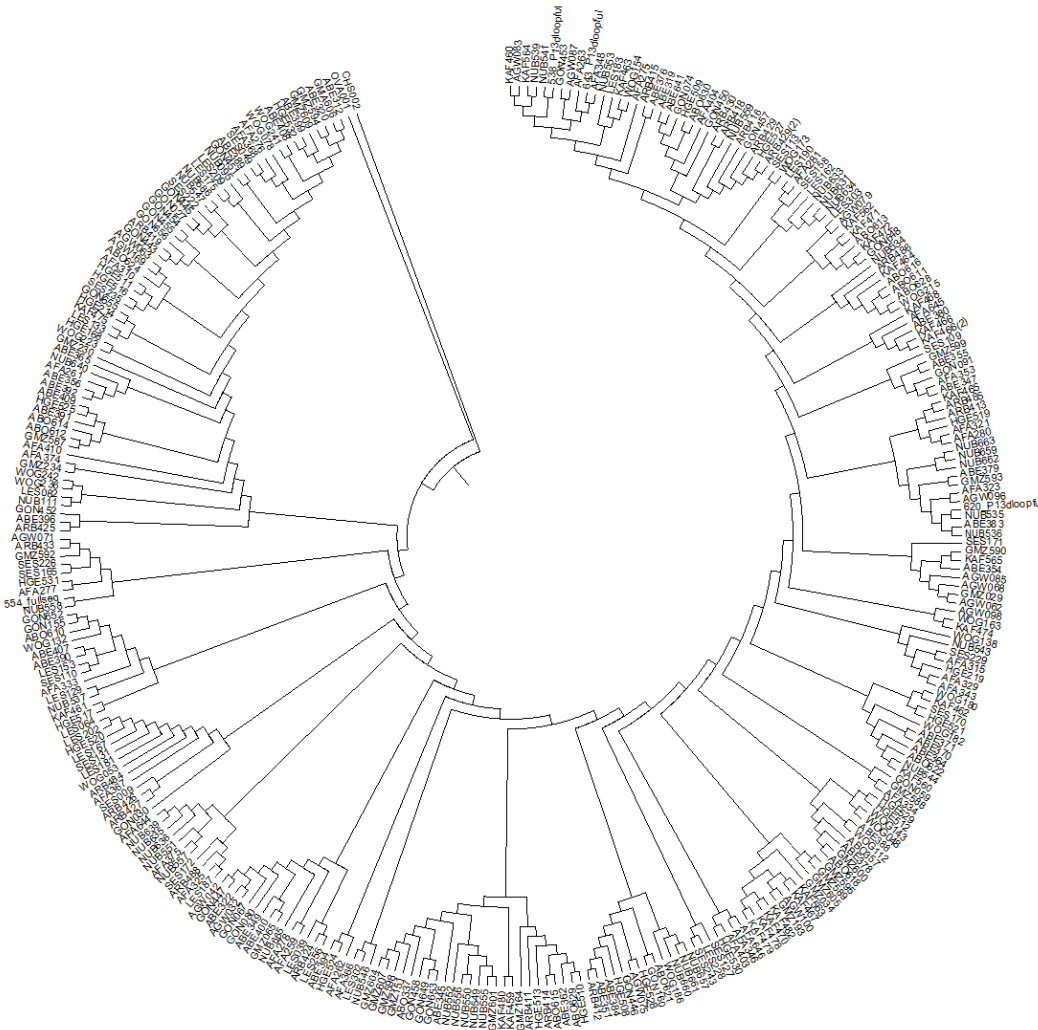


Portrait of African Goat Diversity

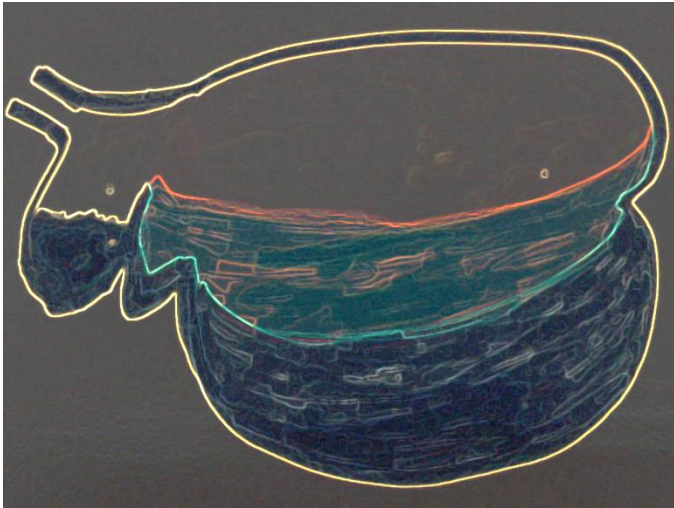
mitochondrial DNA



The 3rd Genome

Rumen microbial diversity

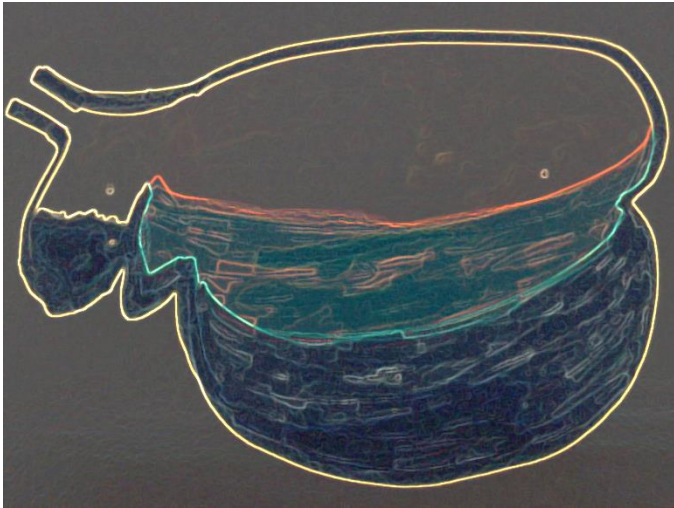
turning grass into milk



The strange metabolism of goats. Denied any sugar by their stomach; goats (and cows and sheep) live a life of a diabetic running a marathon. They use acetate and butyrate to fuel their affairs. All blood sugar is home made from propionate and is utilized sparingly

- A bioreactor that converts crude forage into nutrients for the animal.
- The major process is dominated by hydrolysis of insoluble complex carbohydrates (cellulose) into soluble fermentable sugars.
- Major by product of fermentation are volatile fatty acids – acetic, propionic and butyric acids.
- Other products are **methane** and Carbon dioxide – green house gases.
- The rumen functions as a symbiotic system in a manner similar to the root nodules of legumes

The Rumen Microbiome



A balance is maintained in the rumen between different actors depending on the nature of diet. Every one is happy as long as they stay in the rumen. Eventually, however, the digesta is moved along to the stomach and intestines and becomes the hosts nutrients. The host is the winner.

- Protozoa, Fungi, Eubacteria and Archeae are the major domains life in the rumen.
- Nutrient fluxes among species. Predator-prey interactions, and other competitive or cooperative interactions.
- Forage → prokaryote and yeasts → Protozoa → Host.

Wild Genomics

A new round of domestication?

Addax

- Sahara desert
- Endangered
- Adapted to extreme drought
- Doesn't drink water



Royal Antelope

- Humid forest
- Very small 1-2Kg



Congo Buffalo

- Humid forest
- Resistant to Nagana



Nubian ibex

- Wild African desert goat
- Interbreeds with domestic goat



Eland

- Savanna
- Resistant to Nagana
- Large body size (1000Kg)

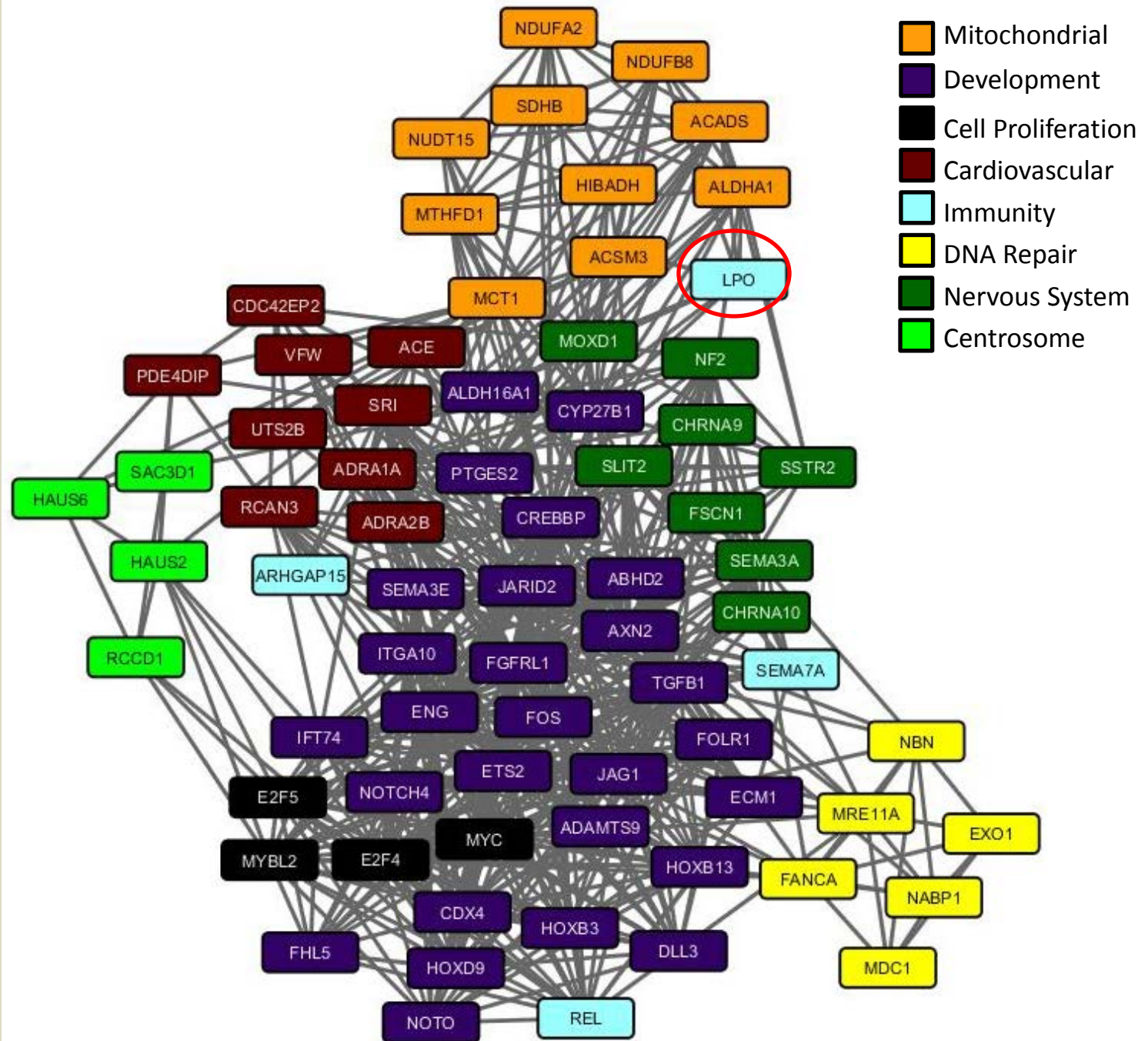


Springbok

- Goat sized
- Dry savannah
- 14% butter fat
- > 7% protein

Africa exhibits high variation in climate and vegetation cover and a corresponding diversity of adapted native wild ruminant species

The difference between GIRAFFE and OKAPI



- [Cat](#) (*Felis sylvestris catus*) - used in neurophysiological research.
- [Chicken](#) (*Gallus gallus domesticus*) - used for developmental studies, as it is an [amniote](#) and excellent for micromanipulation (e.g. tissue grafting) and over-expression of gene products.
- Cotton rat ([Sigmodon hispidus](#)) - formerly used in polio research.
- [Dog](#) (*Canis lupus familiaris*) - an important respiratory and cardiovascular model, also contributed to the discovery of [classical conditioning](#).
- [Golden hamster](#) (*Mesocricetus auratus*) - first used to study kala-azar ([leishmaniasis](#)).
- [Guinea pig](#) (*Cavia porcellus*) - used by [Robert Koch](#) and other early bacteriologists as a host for bacterial infections. hence a byword for "laboratory animal" even though less commonly used today.



an important model in developmental biology, and has the
nal Zebrafish.

orate. Many inbred strains exist, as well as lines selected
body size, obesity, muscularity, voluntary [wheel-running](#)

Modeling Livestock Genetics with Goats

research

small genome with little [junk DNA](#).

(clawed frog) - eggs and embryos from these frogs are used

in developmental biology, cell biology, toxicology, and neuroscience ^{[40][41]}

- [Zebra finch](#) (*Taeniopygia guttata*) - used in the study of the [song system](#) of [songbirds](#) and the study of non-mammalian [auditory systems](#).
- [Zebrafish](#) (*Danio rerio*, a freshwater fish) - has a nearly transparent body during early development, which provides unique visual access to the animal's internal anatomy. Zebrafish are used to study development, toxicology and toxicopathology. specific gene function and roles of signaling pathways.

Model for Livestock Genetics

Developing a goat model



Amenable to experimental manipulation.

- Short lifecycle,
- high fertility/fecundity
- Techniques for genetic manipulation?
- Genetic/Genomic data – genome sequence
- non-specialized living requirements.

Biology comparable to the target livestock species.

- Ruminant – same as the cattle, sheep and buffalo.
- Comparable diseases - i.e. susceptible to brucellosis, trypanosomes and viruses that affect other ruminants.

Comparable Utility, e.g. meat, milk.

We need an efficient protocol to manipulate goat genetics in vitro fertilization, gene engineering.

How can you propagate superior goat genetics at scale?

In the absence of effective Artificial Insemination and other reproductive technologies and in view of remoteness of goat keeping communities located in semi arid/arid systems frequently lacking in services and infrastructure.



With a million bucks!

1. Breeding (classical and technology assisted)
2. Multiply through strategic use of multipliers farms/ranches
3. Disseminate the bucks through some value propositions and business arrangements
4. Cull inferior animals (e.g. trade-in)
5. Market access and linkage
6. Services – health and feeds and feeding



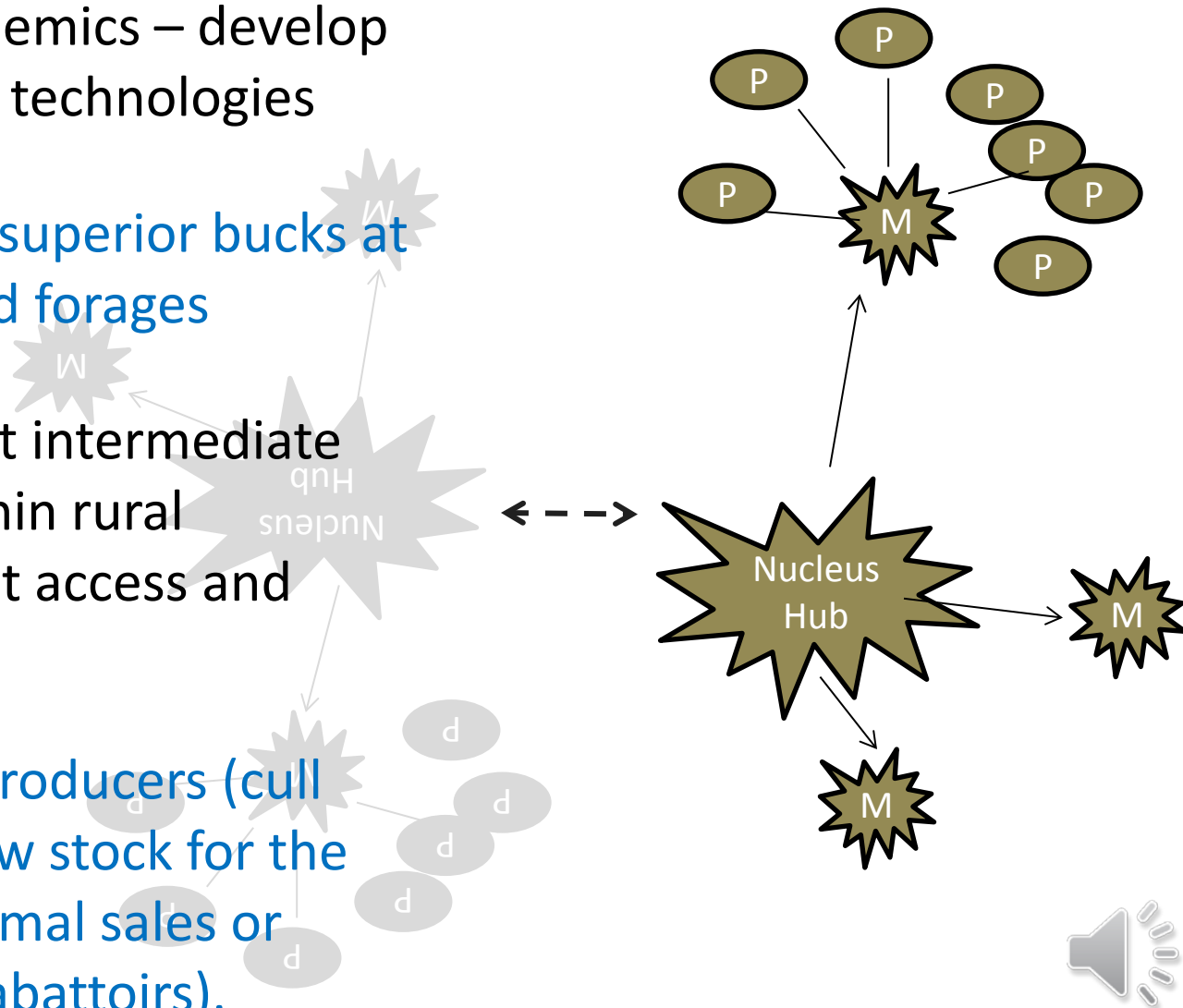
Inclusive Business Approaches

Researchers and academics – develop and provide breeding technologies

Nucleus breeding for superior bucks at hubs – also may breed forages

Stock multiplication at intermediate farms embedded within rural communities – market access and services

Small-Medium goat producers (cull inferior stock and grow stock for the market that is live animal sales or through commercial abattoirs).



With a million bucks we expect to:



Increase goat productivity in participating countries (Eastern Africa) environmentally friendly way

Increase access to markets and value of production through effective supply chains

Increase effective participation by youth in accessory businesses and production

Address increasing demand for goat products – milk, meat – in increasingly urbanized Africa



no leaf too far

