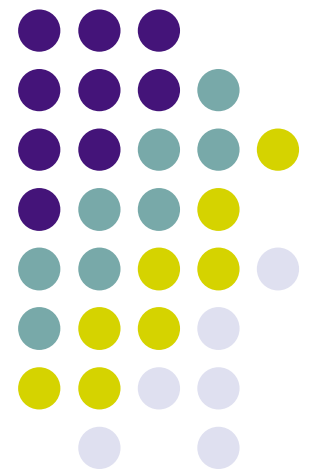
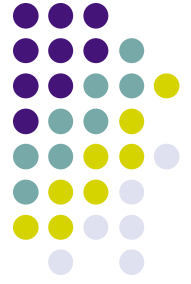


Woo-Suk Hwang: The Rise, the Fall, and the Aftermath

A presentation by Matthew
Rolnick

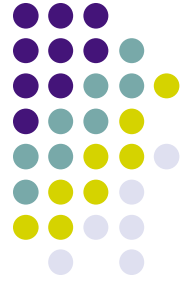




Biography

- One of six children
- Paid his way through school with farm work
- Dramatic conversion from Catholicism to Buddhism in 1987 while under treatment for liver cancer
- Veterinary doctor
- Father of three

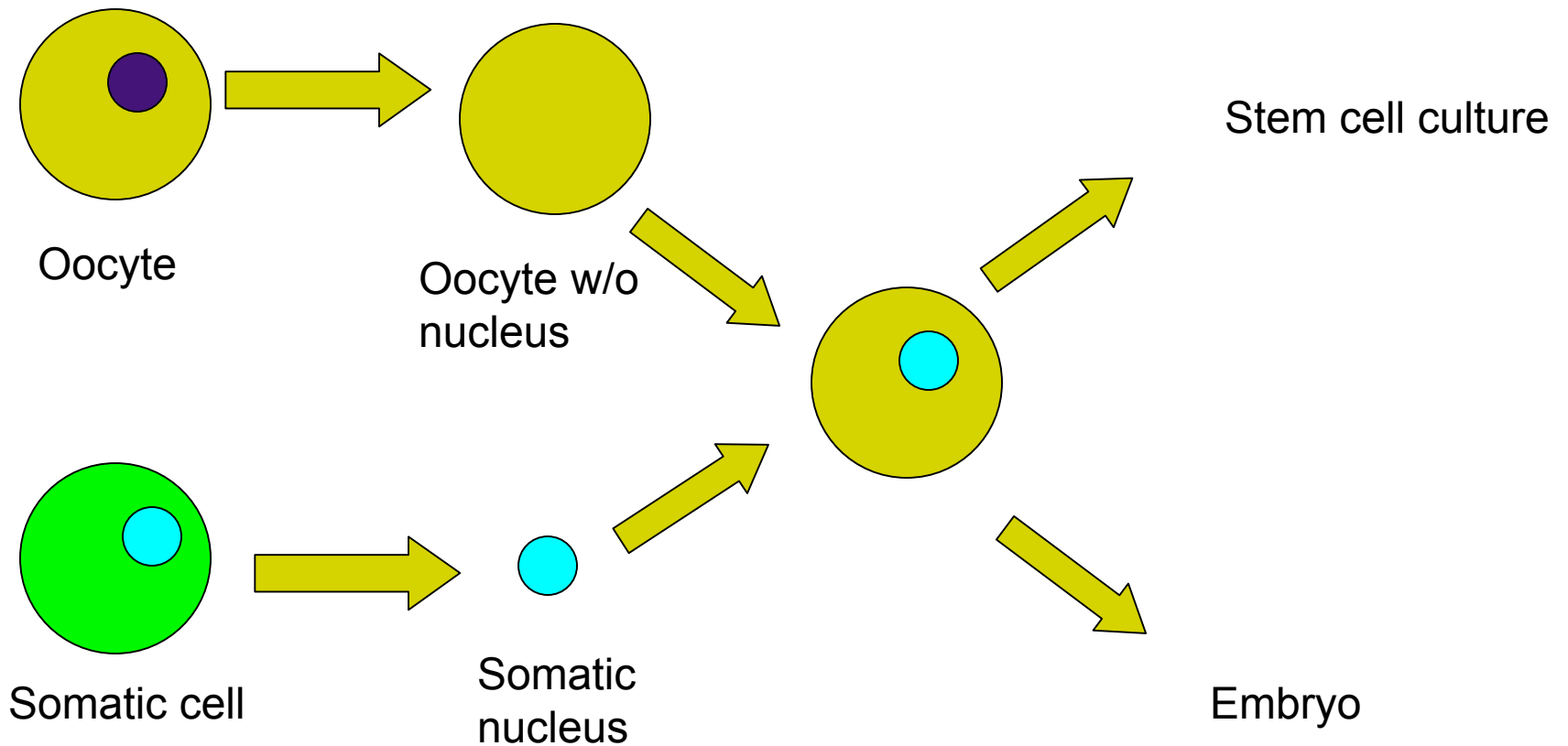
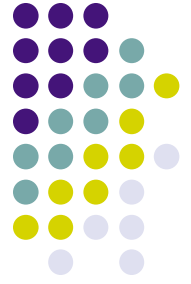


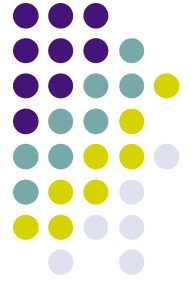


The Warning Signs

- Feb. 1999 press conference to announce fifth successfully cloned cow world wide. No resulting publications.
- April 1999 press conference to announce another cloned cow. Still no publications.
- Promises BSE-resistant cow, cloned Siberian tiger, and cloned mammoth.
- “... in 2002, we succeeded in cloning miniature sterile pigs whose organs can be used for transplantation to humans” Woo-Suk Hwang to the NYTimes (2004)

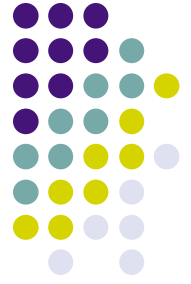
Somatic Cell Nuclear Transfer





Importance

- Stem cells widely believed to potentially be able to repair or replace damaged tissue (especially nerve tissue)
- Stem cells derived from patient's DNA would likely not have an issue with immune rejection



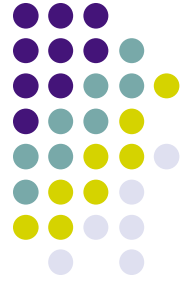
New cell line - March 2004

- Claims the creation of a new human stem cell line from a blastocyst produced from a human oocyte that had undergone SCNT
- Line was named SCNT human embryonic stem cell line 1 (SCNT-hES-1)
- Claims 242 oocytes from 16 volunteers were needed to create this one cell line.
- Innovations
 - Squeezing the egg to extract nucleus for SCNT
 - Novel way of activating the egg post SCNT.
 - Cell culture medium
- Few attempts to repeat experiment due to complexity.
- Experiment transfers somatic nucleus of donor to oocyte of same donor.

11 new cell lines – June 2005



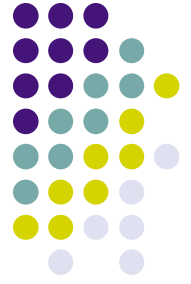
- 18 donors – 185 oocytes
- Innovations
 - Roughly 14x more efficient than previous paper.
 - In 10/11 cell lines, oocyte donor is genetically different from the somatic cell donor.



Snuppy

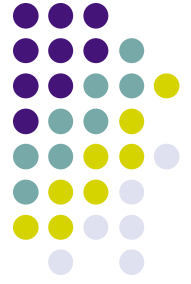
- Aug. 2005 - First announcement of successful dog cloning.
- ~1000 purported embryo transfers
- ~123 purported recipients
- 3 successful transfers. One miscarried, one died shortly after birth.
- Snuppy only successful clone, purportedly carried to term by Labrador Retriever.
- No resulting publications





The Sweet Rewards

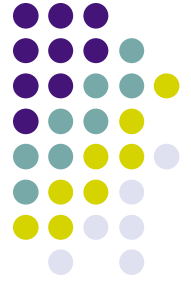
- Scientific American: Research Leader of the Year 2005
- Appointed head of the World Stem Cell Hub facility
- Overwhelming popular and governmental support.
- Given title “Supreme Scientist” by government of South Korea.



Rumors

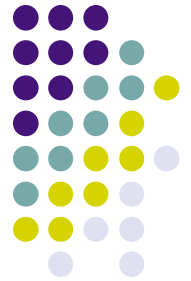
- November 2005 - Gerald Schatten professor at the University of Pittsburg ends collaboration with Hwang. Cites ethical problems relating to oocyte donation
 - Quote “information came to my attention suggesting that misrepresentations might have occurred relating to those oocyte donations”
- Hwang initially denies that donations came from laboratory members or that funds were mishandled.

Scrutiny

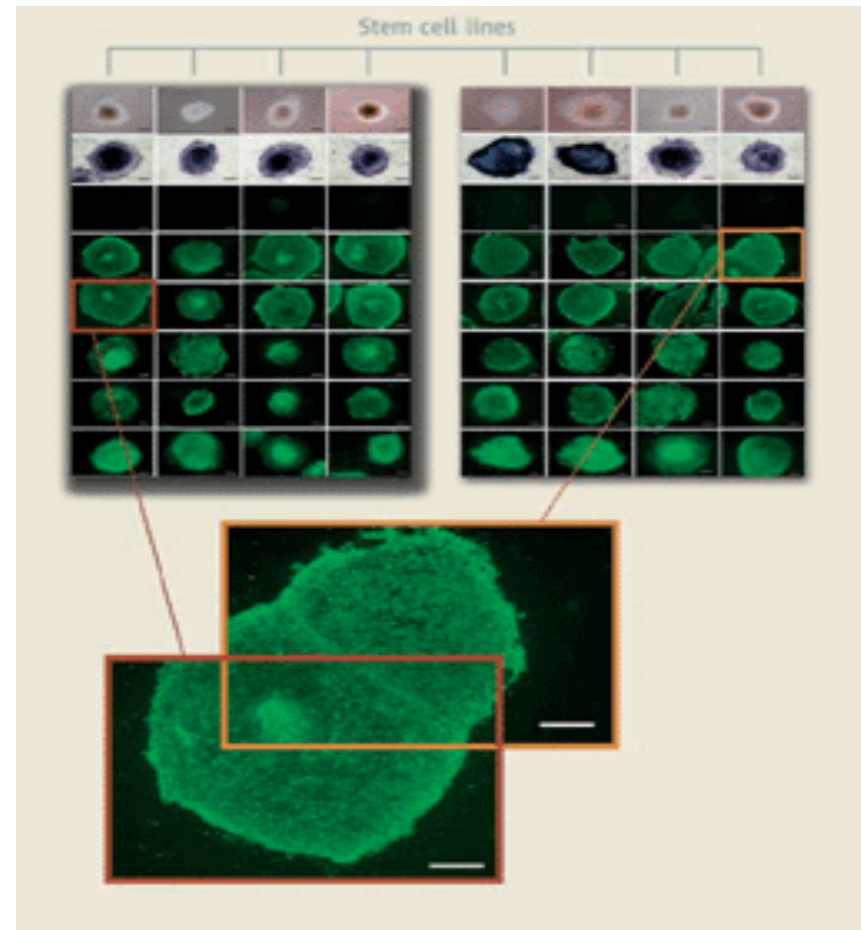


- Hwang admits in December 2005 interview with Time magazine to accepting donations from lab members
- Kim Sun Jong goes on the South Korean television program PD Diary and claims that Hwang ordered him to make the 11 cell lines out of the 2 or 3 working lines.
- December 15 2005 - Roh Song Il goes to media claiming 9 out of 11 of the lines are faked
- Hwang offers to resign in late December 2005 from his position at SNU. His resignation is refused. He is ultimately dismissed in March 2006 after a review by SNU.

The Obvious Evidence of Fraud

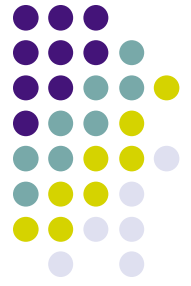


- Identical pictures used multiple times to represent different data.

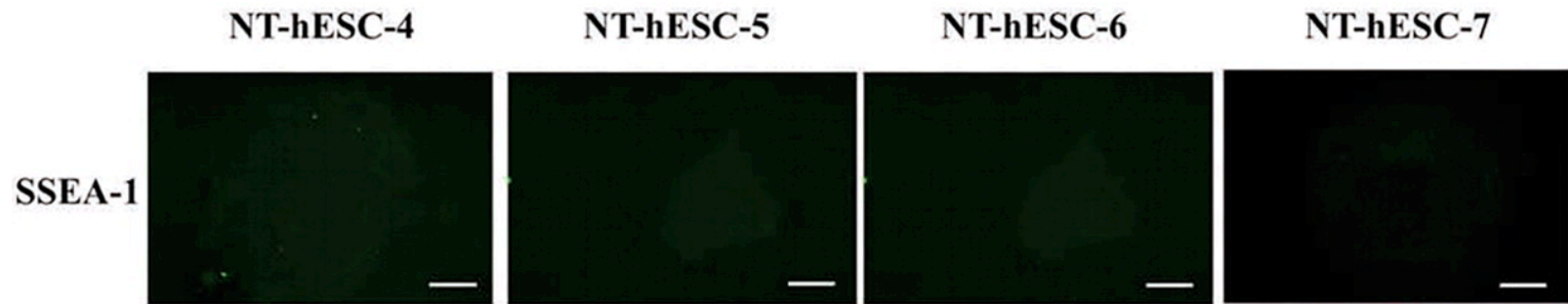


K. BUCKHEIT/SCIENCE

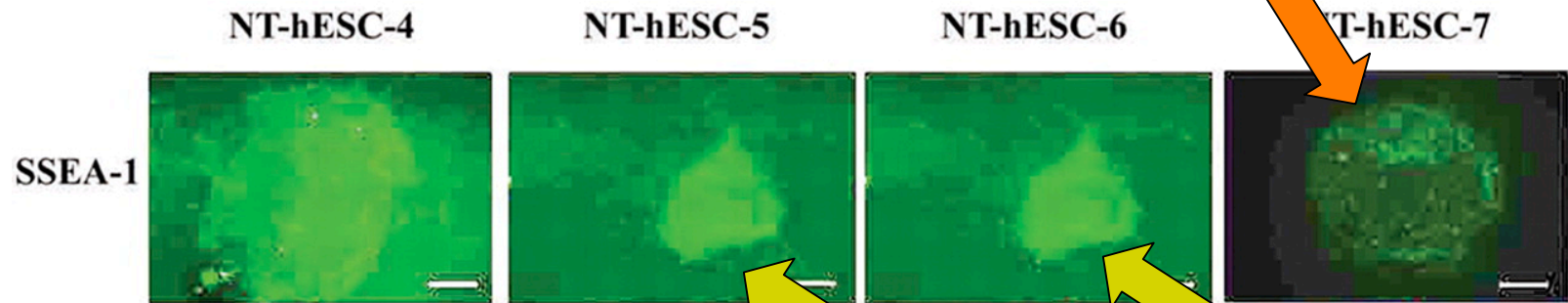
Evidence pt. 2



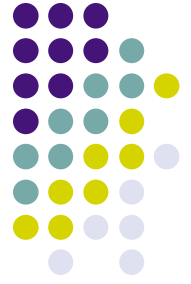
Original



Adjusted Tonal Range



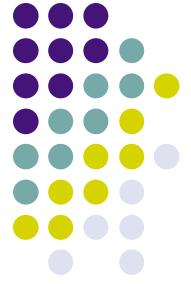
From *The Scientist*



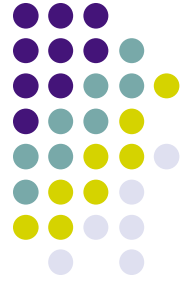
What is the truth?

- The purported cloned cows have never been confirmed to actually be clones
- The pigs also have not been evaluated.
- BSE-resistant cow, cloned Siberian tiger, and cloned mammoth have not materialized.

January – 2006 SNU Report



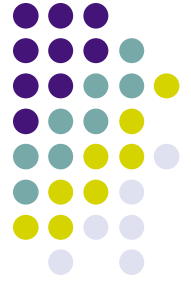
- Re: 2004 paper
 - 23 subcultures of SCNT-hES-1 were tested by DNA fingerprinting. 9 subcultures were identical to a known ES cell line derived from in-vitro fertilized (IVF) eggs. The others did not resemble the donor's fingerprinting.
 - The figure in the 2004 paper matched none of the cell lines, but did match the donor's cells.
- Re: 2005
 - All data derived from IVF derived cell lines. Much of the data is fabricated.



SNU report cont.

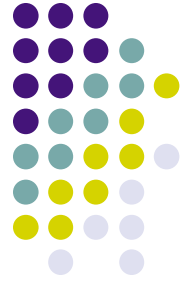
- Estimate of 2061 eggs collected from 129 donors vs. 427 reported in both papers.
 - Hwang later admit 2236 oocytes were collected from 122 donors. 71 donors were compensated.
- Hwang accompanied at least one student for egg donation. Hwang also circulated egg donation form around lab.
- Snuppy is genetically identical to somatic donor.
- Report finds that the Hwang team was capable of SCNT of human cells and the formation of blastocysts from these cells.
 - However they could not and did not derive cell lines from these blastocysts.

The Response of Science



- Report on how to improve peer review process at *Science*
 - Assess the risk that work is deceptive or wrong as well as consequences of the error to science, *Science*, or for other issues.
 - Better access of reviewers to primary data and more extensive supporting material.
 - Collaboration with *Nature* and other “high profile journals” to create uniform standards.

Indictment – Embezzlement, Fraud, Bioethics Violations



- Prosecutors claim
 - Kim Sun Jong used IVF stem cells, mixed them with the SCNT cells. He worked in very low-light and away from other lab members.
 - Believing the lines were real, Hwang ordered Kim Sun Jong to send somatic DNA as clone DNA for cell line confirmation and falsify other data.
- Hwang is charged with mishandling \$2.99 million in funds.
 - Prosecution claims that Hwang took the money in cash and set up accounts under the names of relatives and laboratory members.
- Hwang recently admitted to using private funds to buy mammoth tissue from the Russian Mob.