

# ***Engineering Ethics***

## ***Bifurcation Points***

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***New Orleans, Louisiana***

# Bifurcation Theory

# *Bifurcation Theory*

The mathematical study of changes in the qualitative or topological structure of a given family. Examples of such families are the integral curves of a family of vector fields, and the solutions of a family of differential equations.

## *Bifurcation point:*

**A point in parameter space where we can expect to see a change in the qualitative behavior of the system, such as a loss of stability of a solution or the emergence of a new solution with different properties.**

# Stable System\*

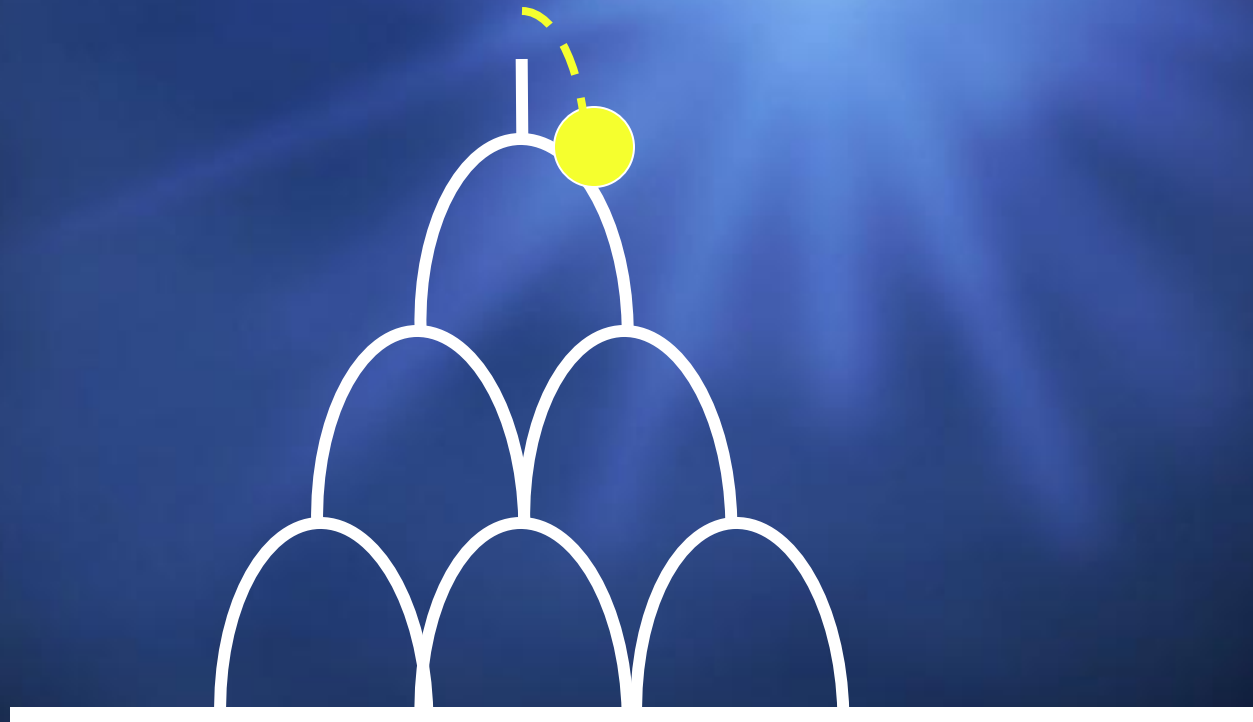


\* At least for the ball.

# Stability & Dynamical Systems



# Stability & Dynamical Systems

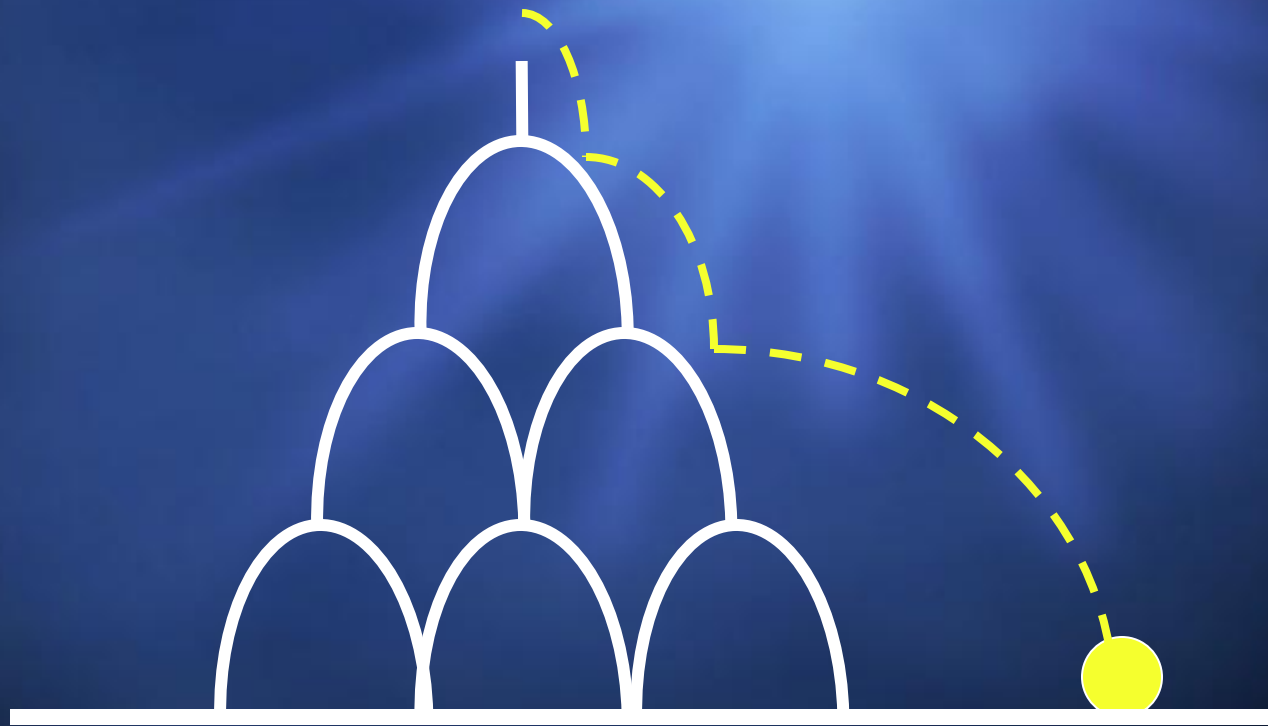


# Stability & Dynamical Systems

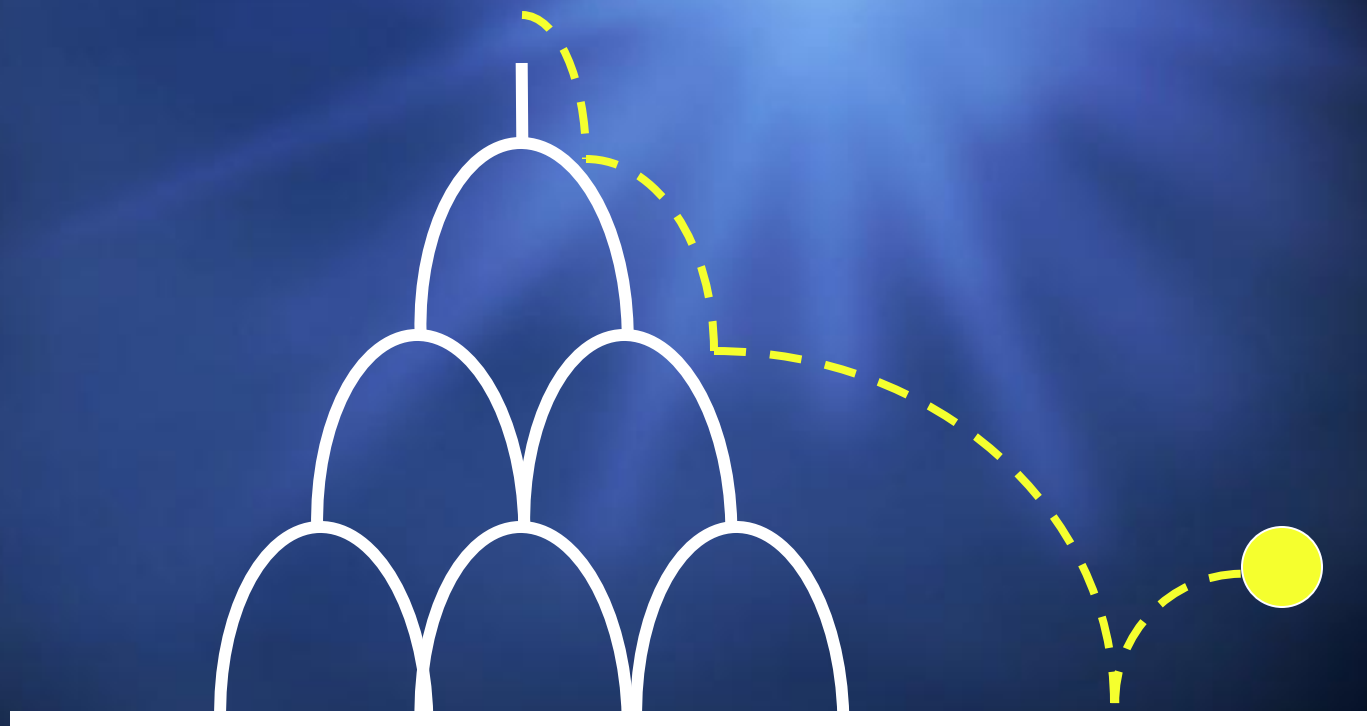




# Stability & Dynamical Systems



# Stability & Dynamical Systems



**Consider:**

$$\left\{ \begin{array}{l} \mathbf{x}'(t) = y - (\mathbf{x}^2 + y^2)\mathbf{x} \\ \mathbf{y}'(t) = -\mathbf{x} - (\mathbf{x}^2 + y^2)y \end{array} \right\}$$

$$\left\{ \begin{array}{l} \mathbf{x}'(t) = y + (\mathbf{x}^2 + y^2)\mathbf{x} \\ \mathbf{y}'(t) = -\mathbf{x} + (\mathbf{x}^2 + y^2)y \end{array} \right\}$$

Both systems have the same unique equilibrium point at  $(0,0)$  and the same linearized system:

$$\begin{pmatrix} x'(t) \\ y'(t) \end{pmatrix} = \begin{pmatrix} 0 & 1 \\ -1 & 0 \end{pmatrix} \begin{pmatrix} x(t) \\ y(t) \end{pmatrix}$$

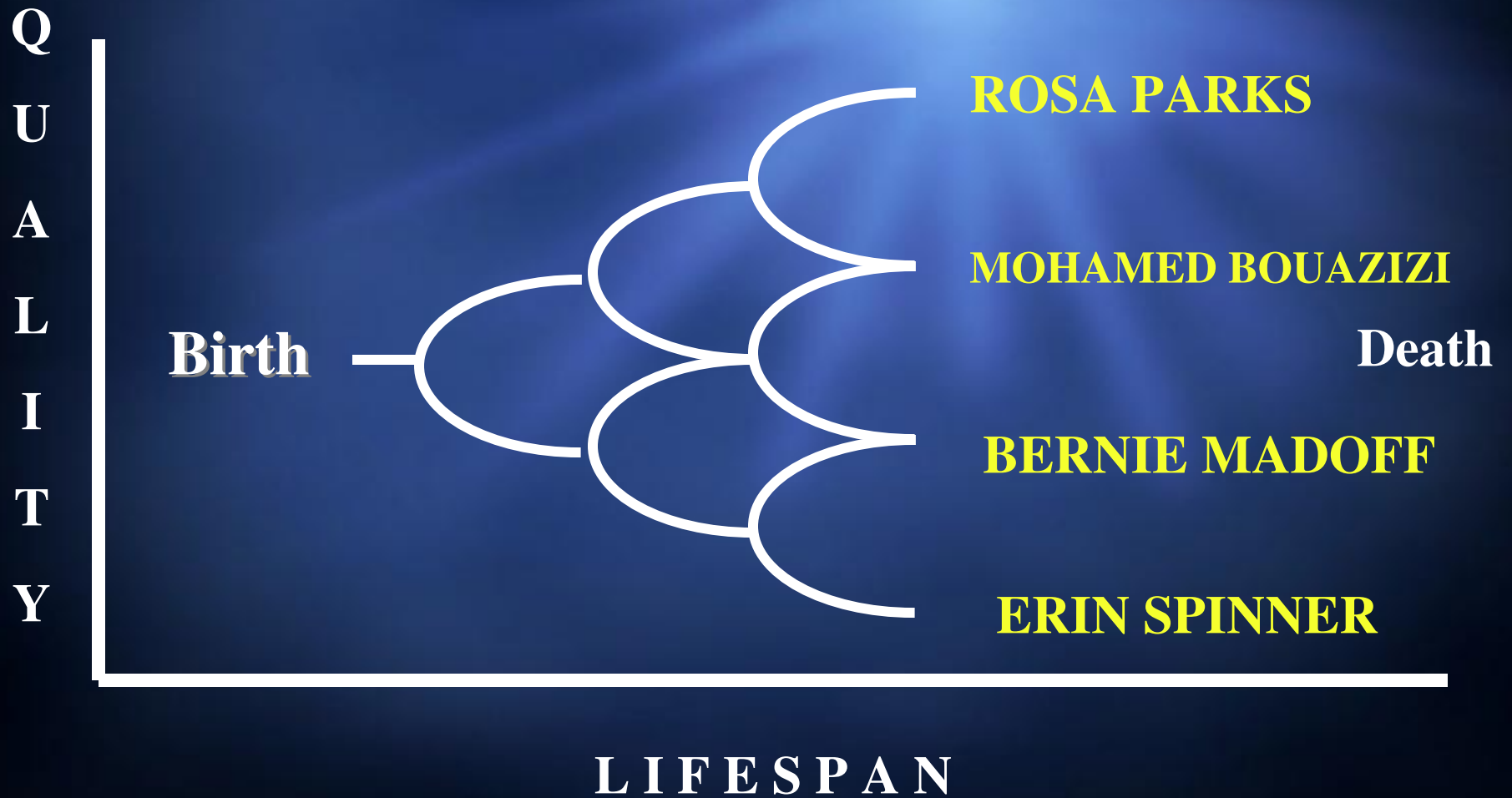
**Also consider the Supercritical Hopf bifurcation.**



# Human Bifurcation Points: Forks in the Road



# Human Bifurcation Points: Forks in the Road



**WE'RE AT WAR**



**ARE YOU DOING  
ALL YOU CAN?**



**Colonel Ted Westhusing**



## *Ted Westhusing*

Competition and cooperation are often in conflict . . . and the bridge between the two is **honor**.

—Ted Westhusing's doctoral dissertation

***ETHICS:***

**THE BIG . . . . .**



*Wilbur Mills (D-AR - Cavorting with Fanne Fox) - Wayne Hays (D-OH - Bully - Sex with secretary who couldn't type) - John Young (D-TX - Sec with secretary) - Allan Howe (D-UT Soliciting sex with policewomen) - Fred Richmond (D-NY - Soliciting sex, cocaine) - John Hinson (R-MS - Gay encounters - soliciting in House bldg) - Robert Bauman (R-MD - Oral sex with boy, drunkenness) - Thomas Evans (R-DE - Sex with lobbyist Paula Parkinson) - Dan Crane (R-IL - Sex with 17-yr old female congressional page) - Gerry Studds (D-MA - Sex with 17-yr old male congressional page) - Ernie Konnyu (R-CA - Bully - sexual harrassment numerous times) - Brock Adams (D-WA - Sex after drugging victims) - Ji Bates (D-CA - Sexual harrassment) - Buz Lukens (R-OH - Having sex with girl since she was 13) - Gus Savage (D-IL - Fondling Peace Corps worker) - Barney Frank (D-MA - Fixed parking tickets for lover) - Chuck Robb (D-VA - Affair with Tai Collins (Miss VA) for several years) - Daniel Inouye (D-HI - Forced sex with hairdresser) - Bob Packwood (D-OR - Sexual harrassment and drunkenness) - Mel Reynolds (D-IL - Sexual assault/child porn/obst of justice - 5 years) John Murtha (D-PA - ABSCAM scandal) - Ozzie Myers (D-NJ ABSCAM scandal) - Ted Kennedy (D-MA - Chappaquidick) - Mark Foley (R-FL - Sexual messages to male pages) - Duke Cunningham (R-CA - Taking bribes for contracts) - Tom Delay (R-TX - Money laundering) - Bob Ney (R-OH - Abramoff scandal) - Richard Pombo (R-CA - Shady dealings to help family business) - William Jefferson (D-LA - Extortion/Using NG vehicles during Hurricane Katrina) - Dan Walker (D-IL - Governor - Fraudulent loans - prinson) - George Ryan (R-IL - Governor - Bribes - rison) - Rod Blagojevich (D-IL - Governor - "Pay to Play" for senate seat) - Mike Easley (R-NC - Governor - False campaign reports) - John Edwards (D-NC - Sex while wife fighting terminal cancer) - Charlie Rangel (D-NY - Misuse of funds and tax fraud) - Ken Lay (CEO of Enron - Illegal accounting - lying to stockholders AND employees) - Jeffrey Skilling (Enron - Illegal accounting - lying to stockholders) - Andrew Fastow (Enron - CFO - Illegal accounting - manipulating stock (lying to stockholders)) - Franklin Raines (CEO Fannie Mae - Prime rate fraud) - Stan O'Neal (CEO Merrill Lynch - bully - unethical decisions - \$16,000,000) - Richard Fuld (CEO Lehman Brothers - Subprime mortgage mess - tried to sell house to wife for \$100 - very abrasive) - Abu Graib (Military), Tailhook Conference (Military - Sexual harassment) - AIG - Bank of America (and Ken Lewis) - HP (Commercial spying) - American Airlines - Deferred Maintenance) - Adelphia (Securities fraud) - Arthur Andersen (Accounting procedures - Enron) - Fannie Mae (Subprime mortgages) - Freddie Mac (Subprime mortgages) - Firestone (Ford rollover issues) - Ford (Rollover - Pinto gas tank) - NBC Dateline (False reporting on Ford Pinto - rigged incendiary devices) - Healthsouth (Exaggerated earnings) - Homestore REIT (Insider trading) ---- Case after case of inside r trading (the little guy gets shafted) -Bhopal chemical release - Hartford Civic Center collapse - Challenger Disaster - Exxon Valdez - Deepwater Horizon Gulf Oil Spill - Boston's "Big Dig"*

# ETHICS

- **What you do when no one else is looking.**
- **What you do for someone who can do nothing for you.**

# ***CHARLIE RANGEL***



# ***CHARLIE RANGEL***



*'We (Congress) should be held to a higher standard.'*

**WHO ARE  
THE REAL  
HEROES?**



# Who is This?



**Who is This?**



**Lindsay Lohan**





**STAFF SERGEANT SALVATORE GIUNTA**

*ENGINEERING...*

*ENGINEERING . . .*

An

Honorable

Profession

*ENGINEERING...*

This  
Means  
Us

# *Engineering Rogues Gallery*

- **Noshir Gowadia - Boeing - 32 years**
- **Greg Chung - Boeing - China - 15 years**
- **Andrew Siemaszko - Nuclear Facility**
- **R. B. Makwana - Fannie Mae Computer**
- **Clark Roberts & Sean Howley - Trade secrets - Goodyear**
- **Kevin Crow - Trade Secrets**
- **Ray A. Davezac - Bribing Bill Hubbard**



**... behind every official who takes a bribe there's someone, often a private individual or firm, willing to pay it. They hurt us all as much as the crooked officials.**

**~ Times - Picayune**

*The*

*Engineering*

*Professor*

# The Unethical Professor

- Professor X knows his stuff. He doesn't teach his stuff.
- I don't think I learned anything valuable in his class.
- The most terrible, disrespectful, inefficient, unorganized, incoherent professor I've ever had.

# The Unethical Professor

- This class was horrible. He is a rude man who didn't want to answer out questions.
- . . . arrogant and mean-spirited.
- I felt like he didn't want to be there as much as I didn't.

# The Ethical Professor

- **His presence excites the class making everyone want to learn. Wish I had more classes with him.**
- **Best professor I have ever had. I disagree with his grading sometimes, but I know that I know the material. Knowledge is important, not grades, right?**

# The Ethical Professor

- . . . a big influence on my life. I do honestly feel if Dr. Y was not around I would not be in civil engineering or maybe even college.
- I have never met a man with so much energy and enthusiasm about the school and, most importantly, the students. Dr. Z is a great teacher and a greater man.

# The Class of 2006

# The Class of 2006

- SMART



# The Class of 2006

- SMART
- FUNNY

# The Class of 2006

- **SMART**
- **FUNNY**
- **ENERGETIC**

# The Class of 2006

- **SMART**
- **FUNNY**
- **ENERGETIC**
- **CHALLENGING**

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- **SMART**
- **FUNNY**
- **ENERGETIC**
- **CHALLENGING**
- **IDEALISTIC**

# The Class of 2006

- SMART
- FUNNY
- ENERGETIC
- CHALLENGING
- IDEALISTIC
- HURRICANE KATRINA

# ***HUMAN VALUES***

- **Diligence**
- **Efficiency**
- **Equality**
- **Equity**
- **Freedom**
- **Honesty**
- **Honor**
- **Integrity**
- **Knowledge**
- **Loyalty**
- **Pleasure**
- **Safety**
- **Security**
- **Trust**

# **ETHICAL VALUES**

- **Integrity**
- **Honesty**
- **Fidelity**
- **Charity**
- **Responsibility**
- **Loyalty**

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**HONOR**



# **NSPE FUNDAMENTAL CANONS: RULES OF PRACTICE**

- **Be a faithful agent or trustee in representing employer or client**
- **Avoid deception in solicitation of professional employment**

# **NSPE FUNDAMENTAL CANONS: RULES OF PRACTICE**

- **Shall maintain safety, health & public welfare**
- **Shall perform services only in area of competence**
- **Public statements must be objective and truthful**

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➤ **DEEPWATER HORIZON**

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➤ **KANSAS CITY HYATT REGENCY**

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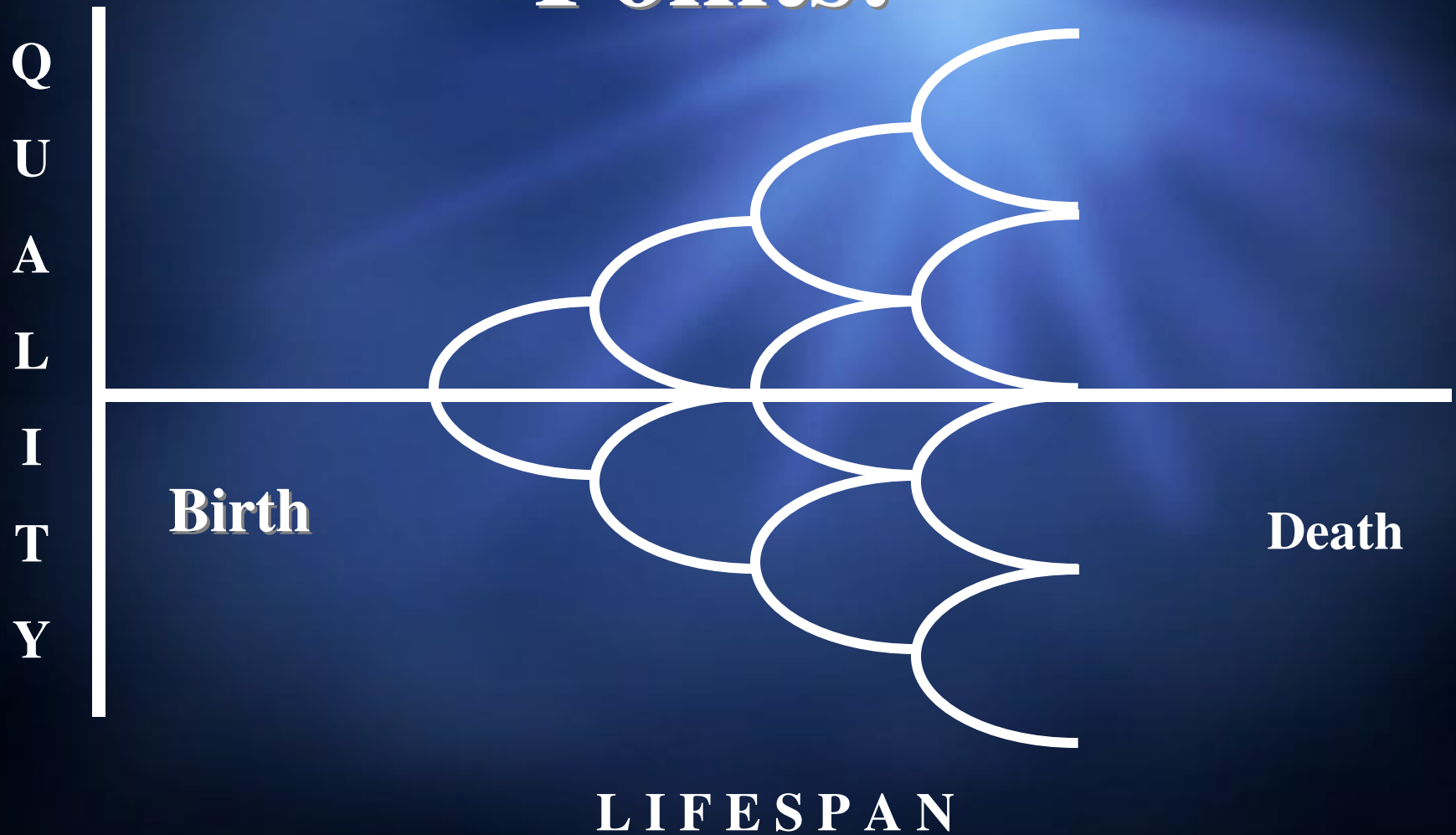
➤ **HARTFORD CIVIC CENTER**



# **NSPE FUNDAMENTAL CANONS: RULES OF PRACTICE**

- **HURRICANE KATRINA**
- **MINNEAPOLIS BRIDGE  
COLLAPSE**
- **CHALLENGER DISASTER**
- **DEEPWATER HORIZON**
- **BHOPAL, INDIA**
- **HARTFORD CIVIC CENTER**
- **HYATT REGENCY**

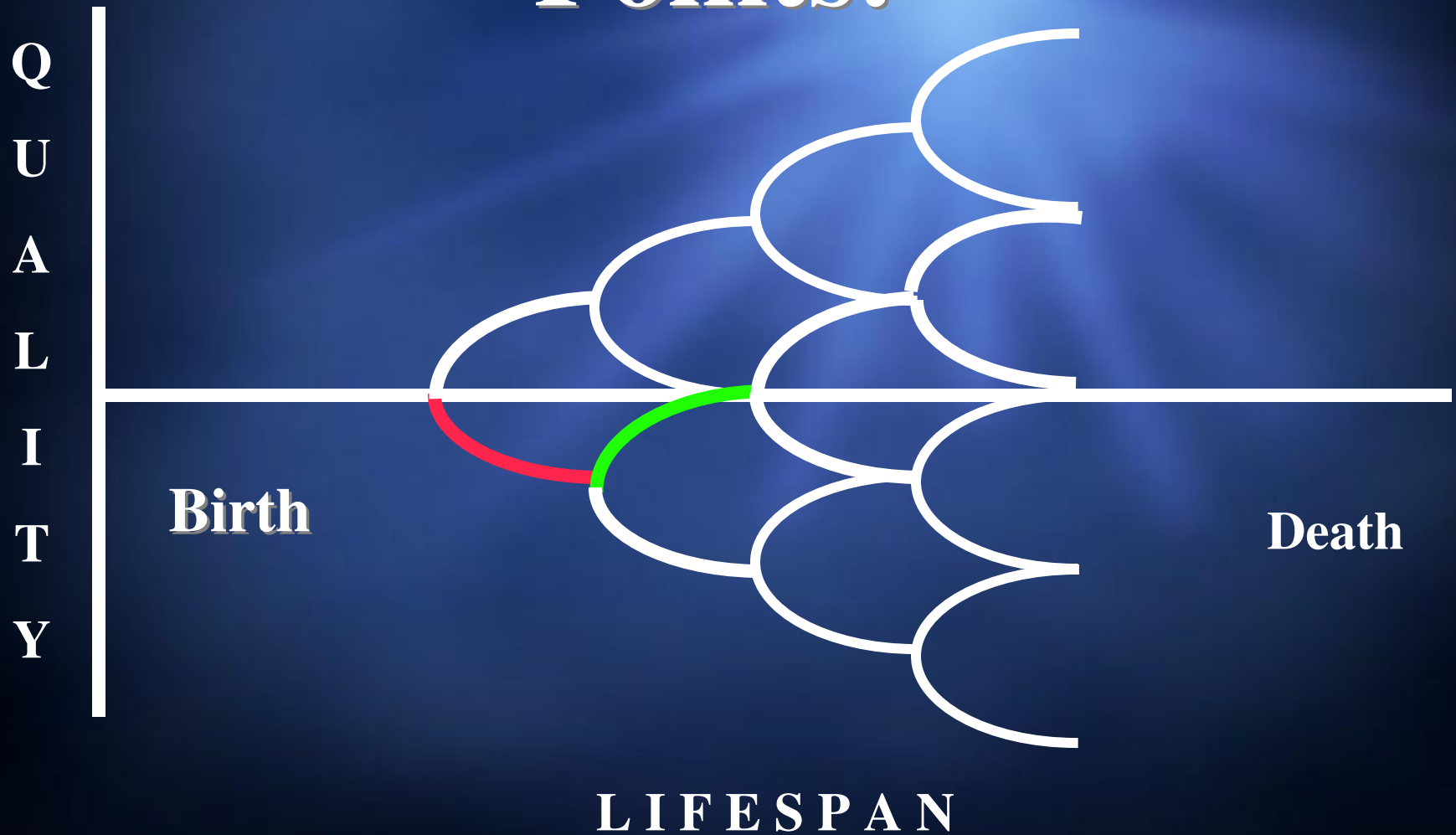
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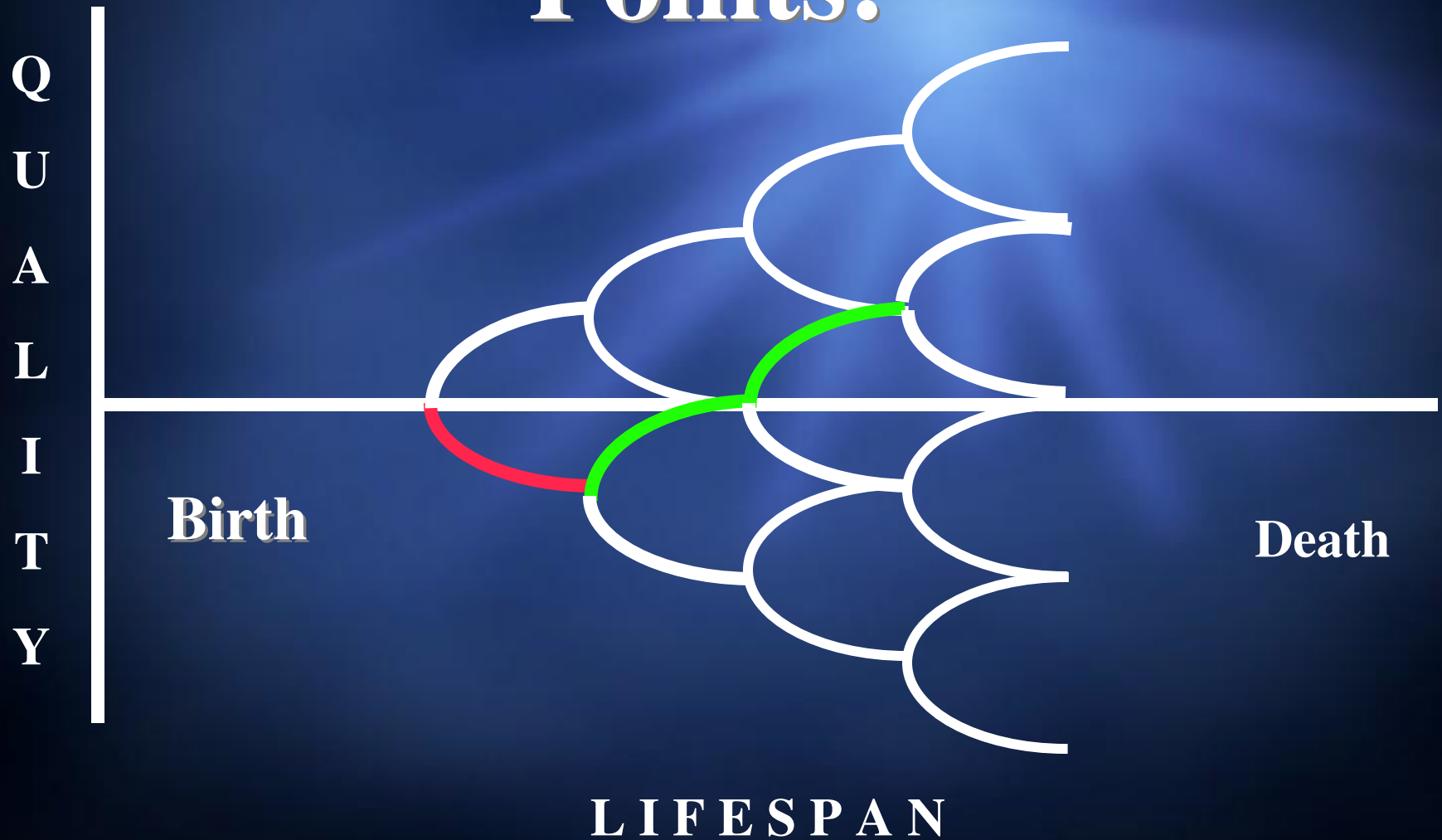
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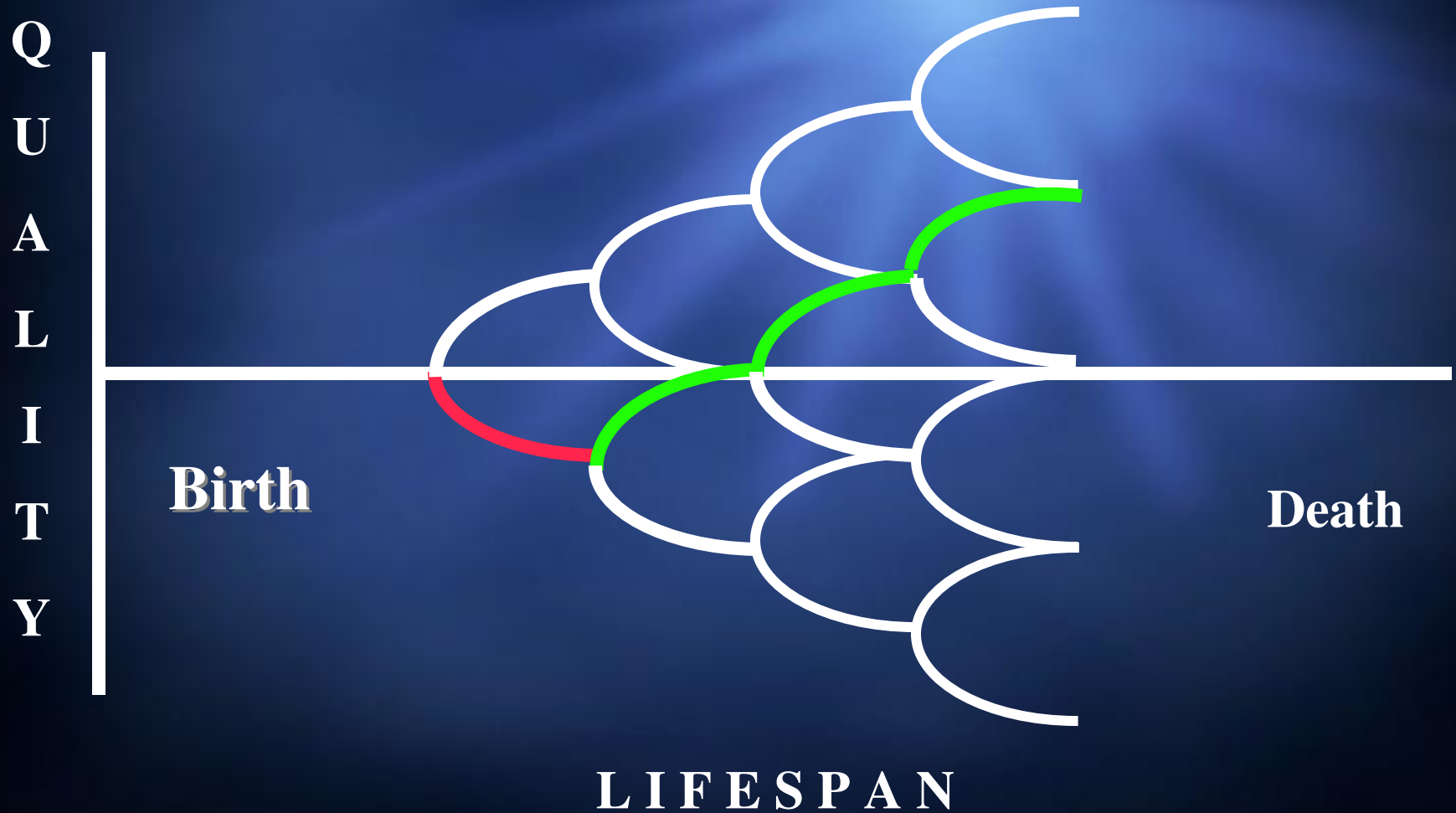
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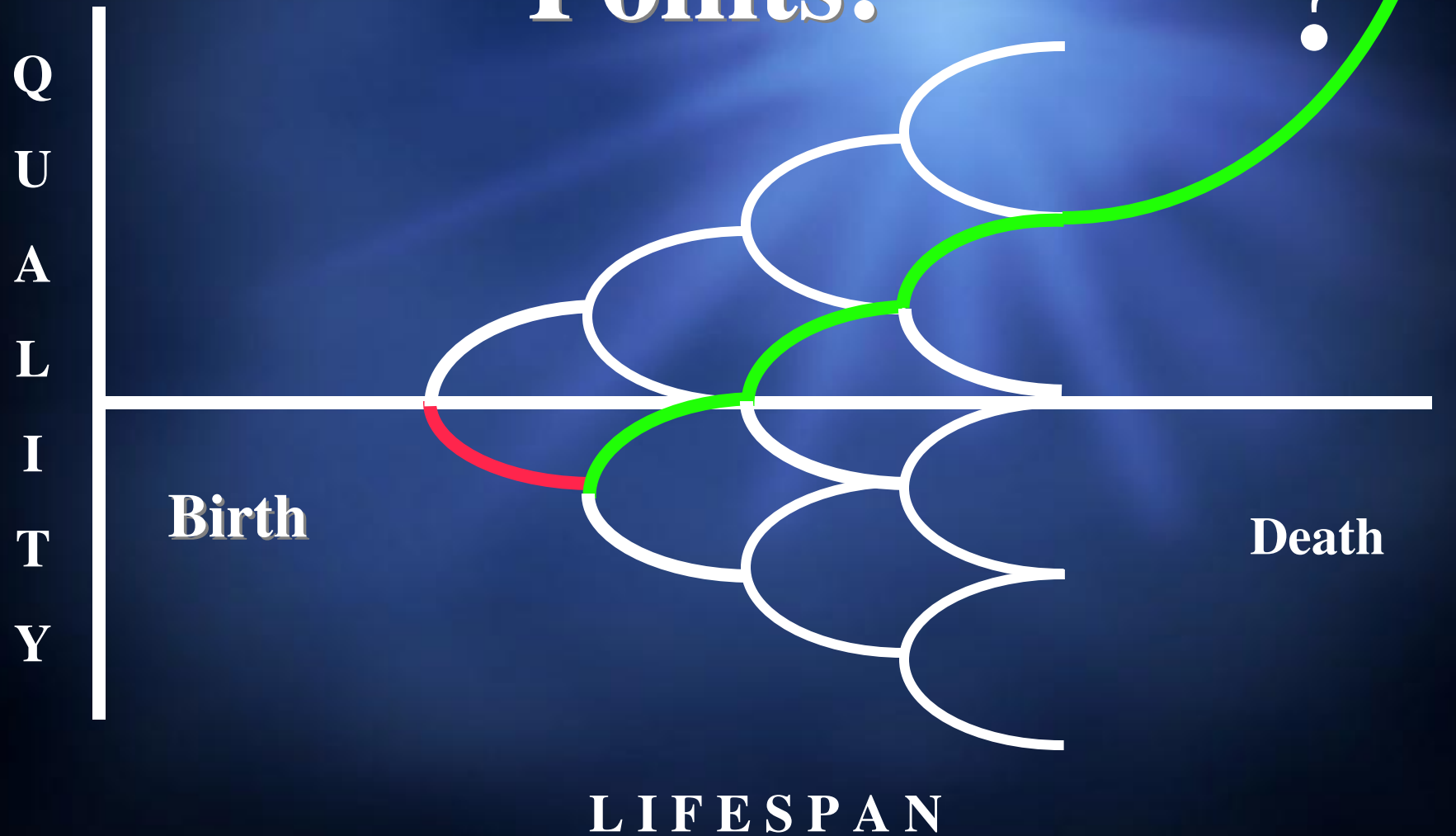
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# Back to Bifurcation Points:



# *Reprise: Erin Spinner*





**WE'RE AT WAR**



**ARE YOU DOING  
ALL YOU CAN?**

**STAND UP TO THE  
MOB**

**PRACTICE ETHICS**

**FIGHT THE GOOD  
FIGHT !!**

**“In this world  
everything changes  
except good deeds and  
bad deeds; these follow  
you as the shadow  
follows the body.”**

**- Author unknown**



Image by: [Streckl, Nelson, Heiler](#)  
Laboratory for Atmospheres  
Goddard Space Flight Center  
<http://md.gsfc.nasa.gov/mad>



Hurricane Linda west of Mexico  
September 9, 1997 17:45 UTC  
Data from: NASA, NOAA, USGS

