
Curso online
Psiquiatría perinatal
Aplicaciones para la atención psiquiátrica en la gestación, parto y puerperio
Dirigido por
Ibone Olza
inscripciones abiertas
saludmentalperinatal.es
Instituto Europeo de
Salud Mental Perinatal

NURTURESCIENCE:
Implications for society, LIFE HISTORY THEORY

Dr Nils Bergman

MB ChB, DCH, MPH, MD

(USA equiv: MD, MPH ,PhD)

Karolinska Institute, Sweden.

NURTURESCIENCE:
Implications for society, LIFE HISTORY THEORY

Instituto Europeo de
Salud Mental Perinatal

… with focus on attachment, development and evolutionary implications

NURTURESCIENCE

nurture noun

nur·ture | \ ˈnər-chər \

Definition of *nurture* (Entry 1 of 2)

1 : TRAINING, UPBRINGING

// With proper focus during early *nurture*, one can grow into a secure being ...

NURTURESCIENCE

nurture noun

nur·ture | \ ˈnər-chər \

Definition of *nurture* (Entry 1 of 2)

1 : TRAINING, UPBRINGING

// With proper focus during early *nurture*, one can grow into a secure being ...
— Ella Pearson Mitchell

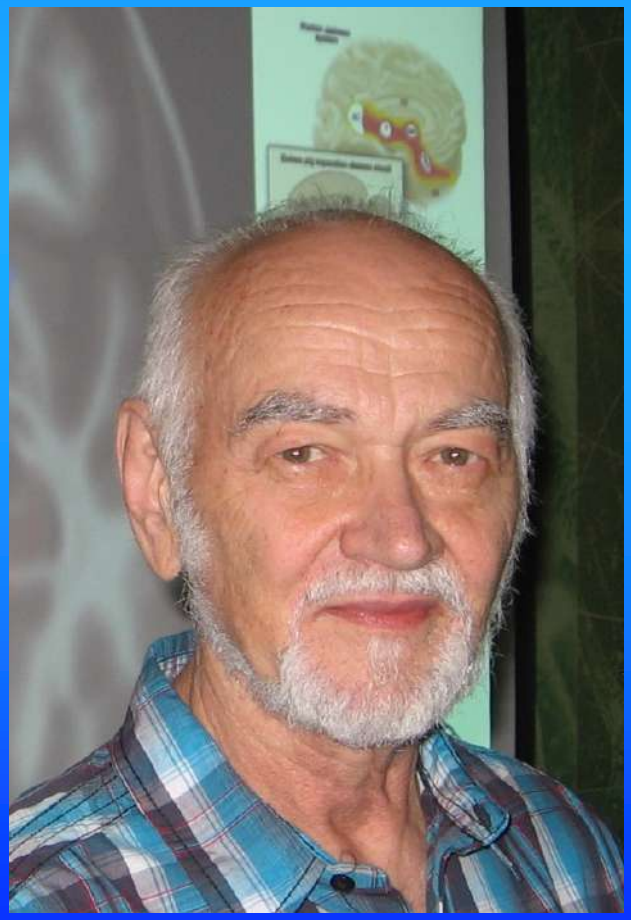
2 : something that nourishes : FOOD

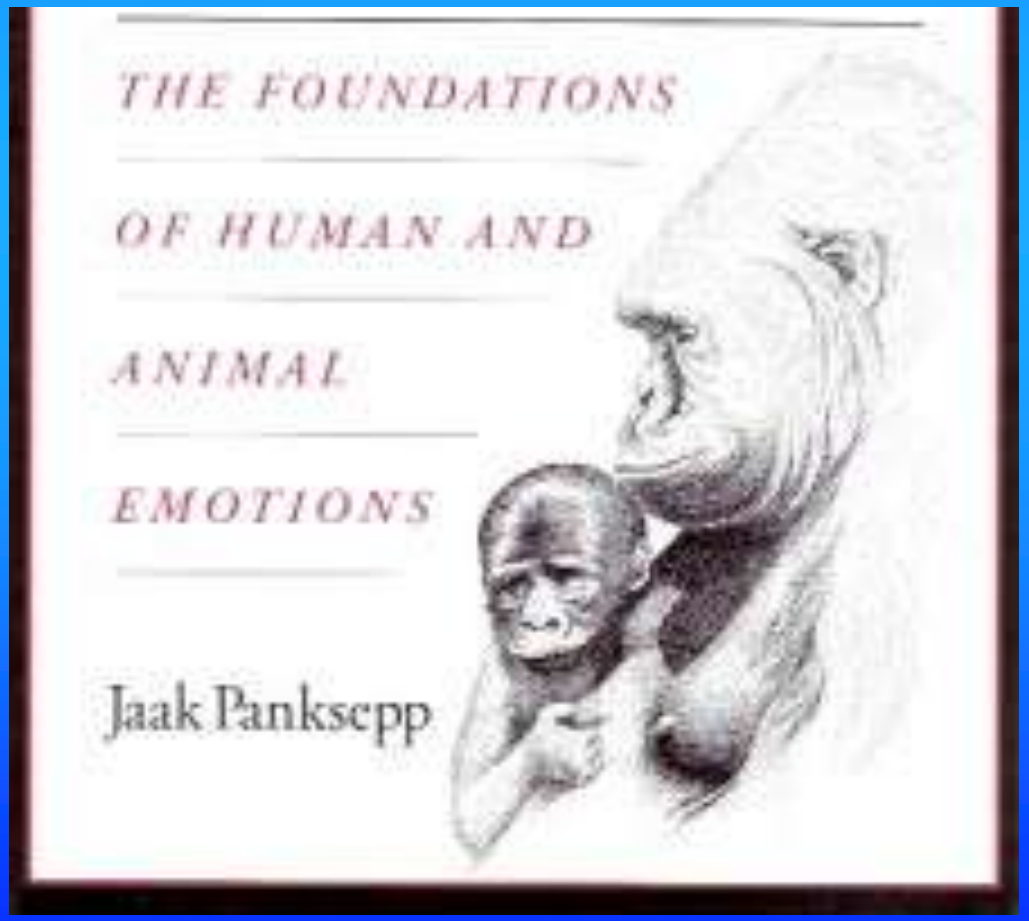
// ... fed him well, and nourished himself, and took *nurture* for the road ...
— R. D. Blackmore

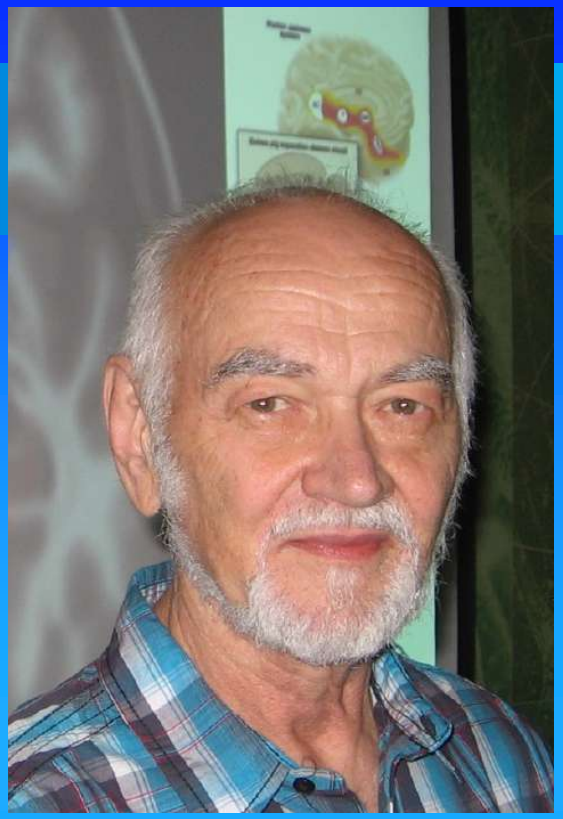
3 : the sum of the environmental factors influencing the behavior and traits expressed by an organism

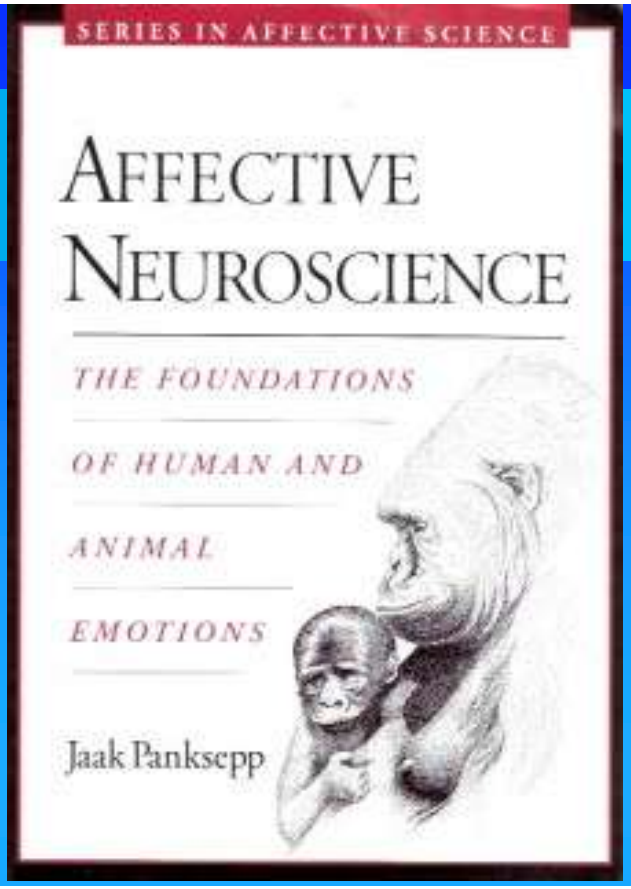
// Is our character affected more by nature or by *nurture*?

NURTURESCIENCE:
Implications for society, LIFE HISTORY THEORY









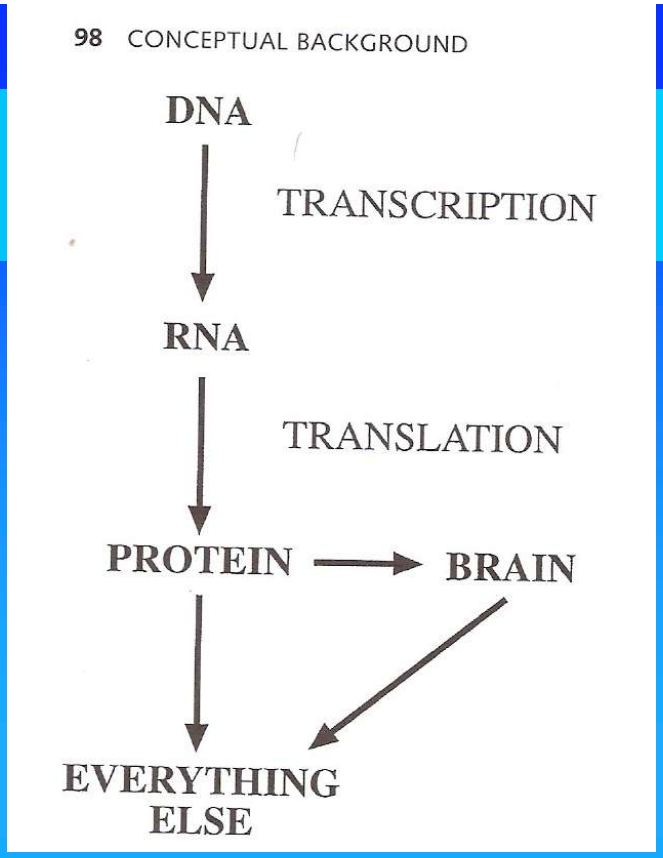
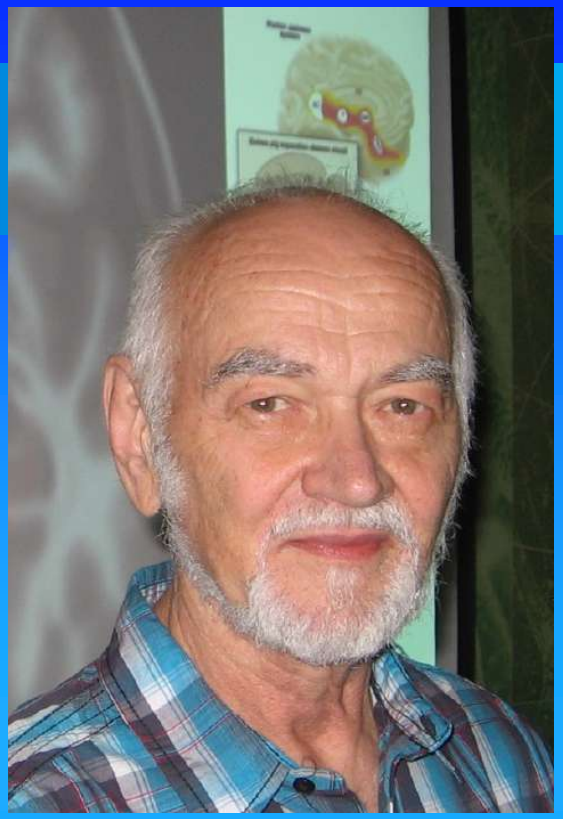
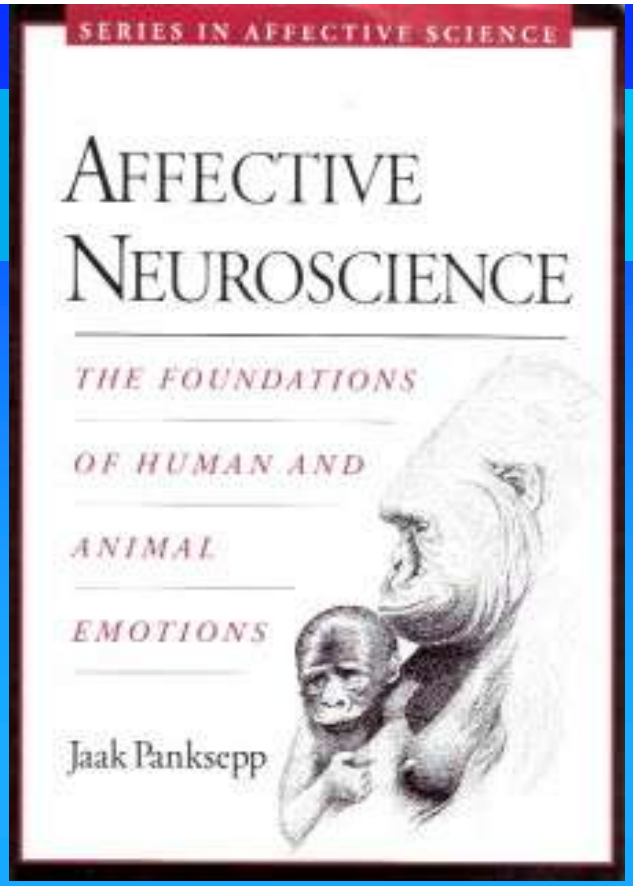


Figure 6.1. Summary of the current "central dogma" that underlies the analysis of all biological processes, including those that mediate basic psychobiological





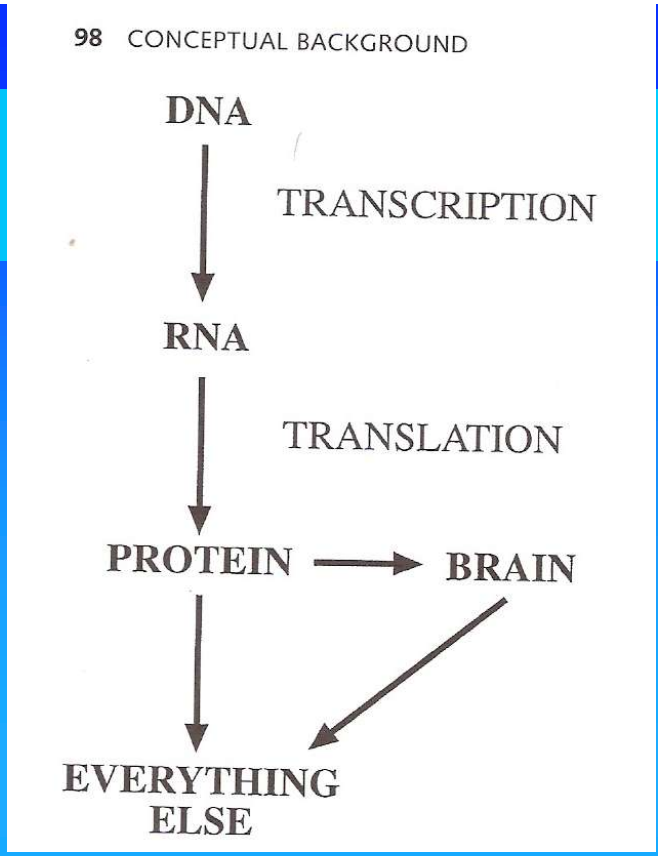
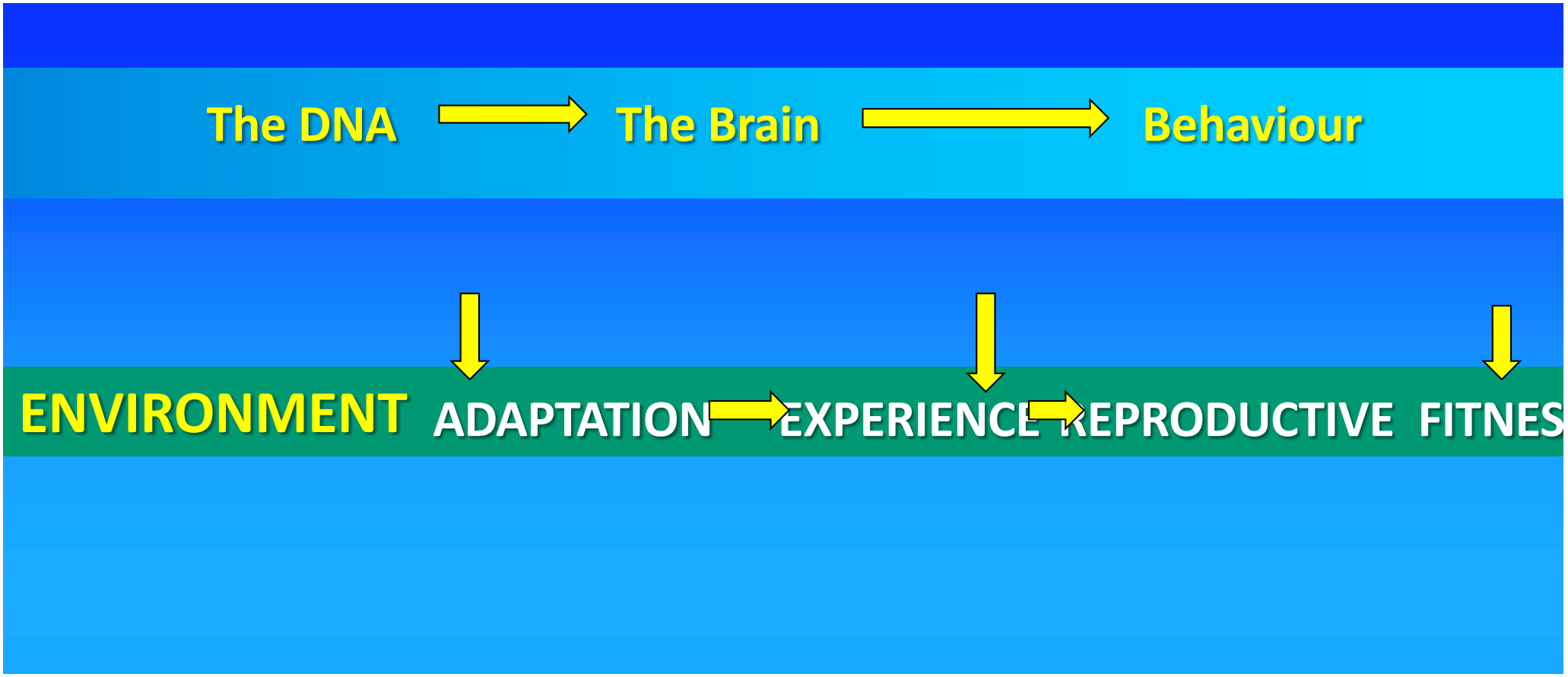


Figure 6.1. Summary of the current "central dogma" that underlies the analysis of all biological processes, including those that mediate basic psychobiological processes. The only major concept missing from this schematic is the environment, and these influences permeate all phases of these transactions.



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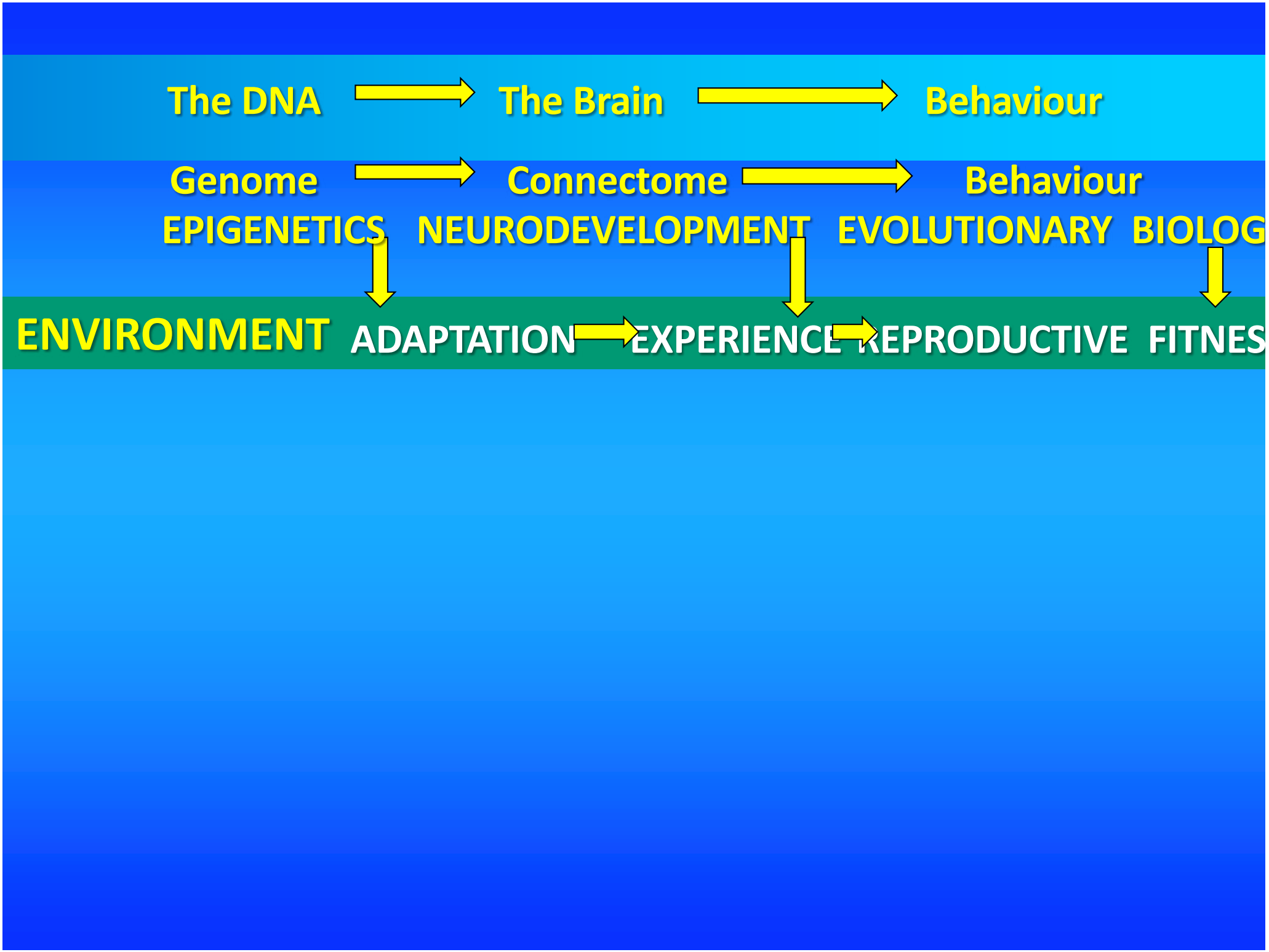
The DNA
The Brain
Behaviour
Genome
Connectome
Behaviour
EPIGENETICS
NEURODEVELOPMENT
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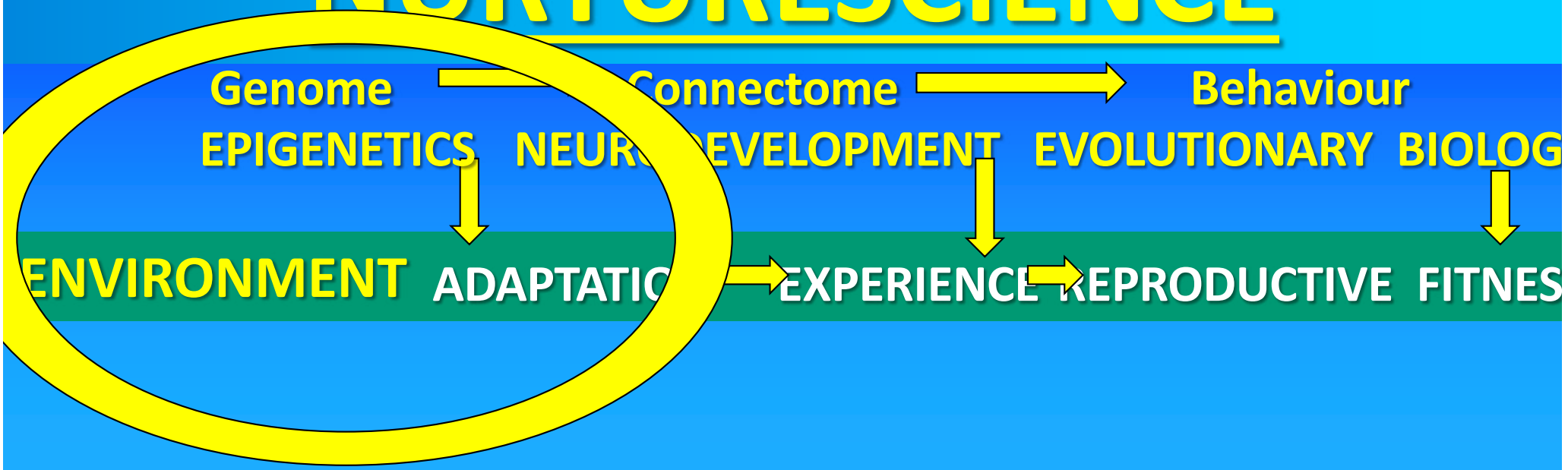
ADAPTATION
EXPERIENCE
REPRODUCTIVE
FITNES

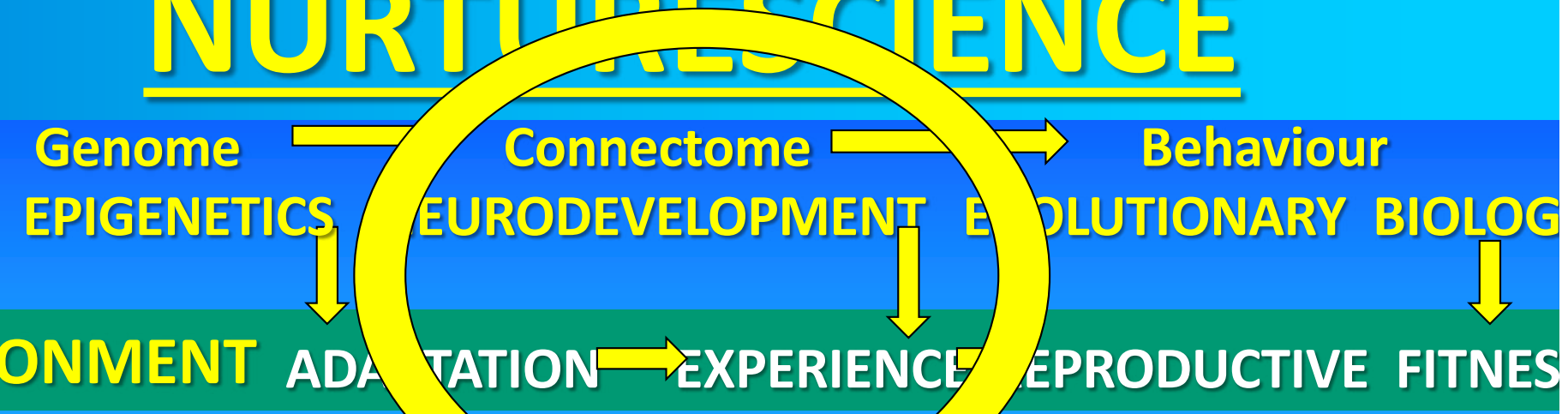
NURTURESCIENCE

NURTURESCIENCE

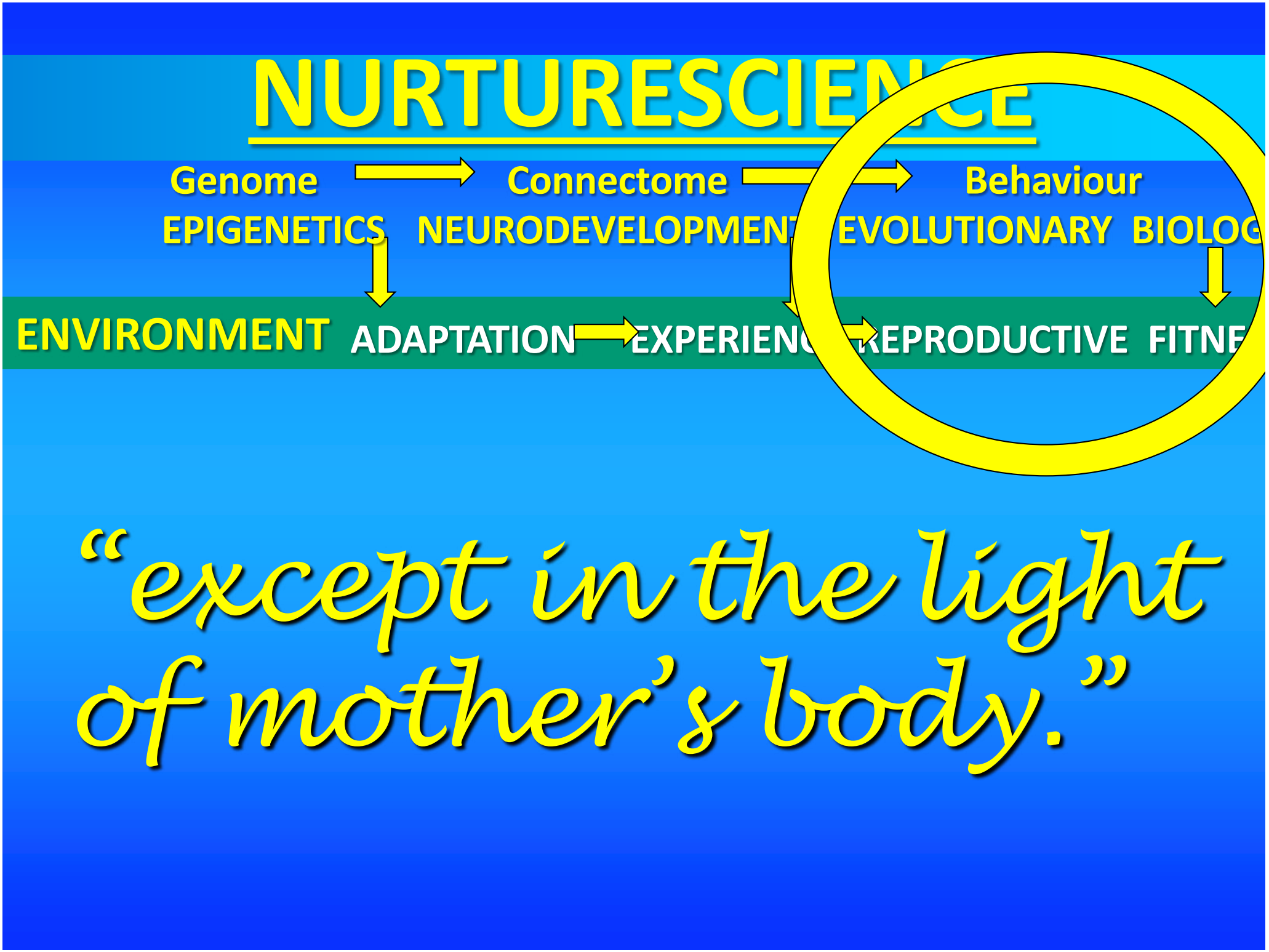


"buffering protection of adult support"

NURTURESCIENCE



"needed neural processes"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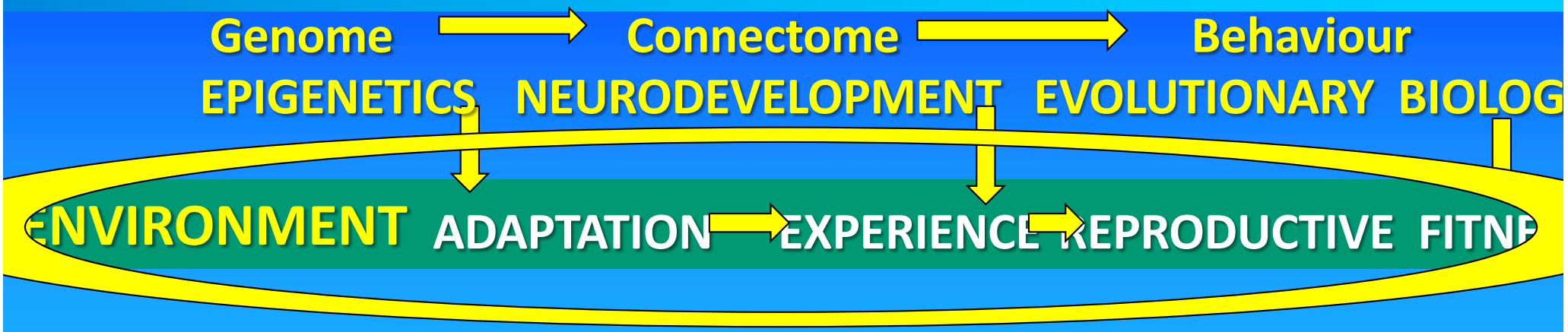
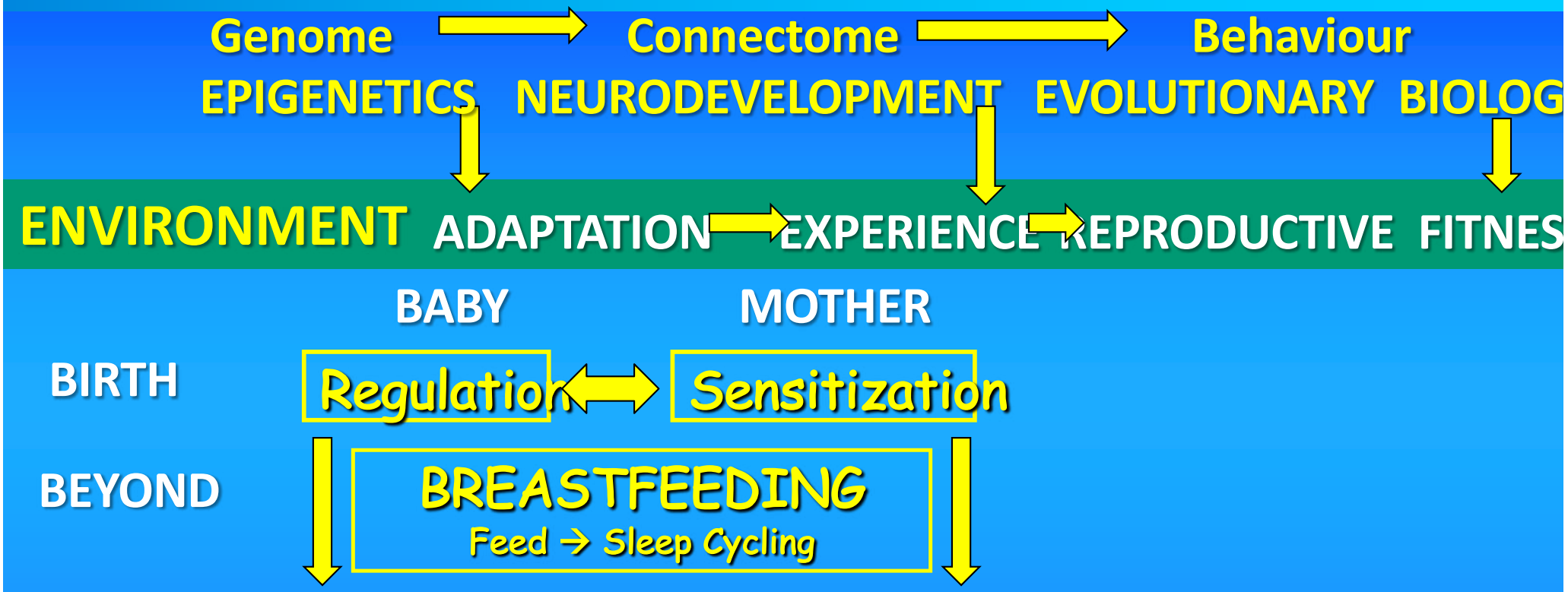
REPRODUCTIVE
FITNE
"except in the light of mother's body."

NURTURESCIENCE



ZERO SEPARATION

NURTURESCIENCE



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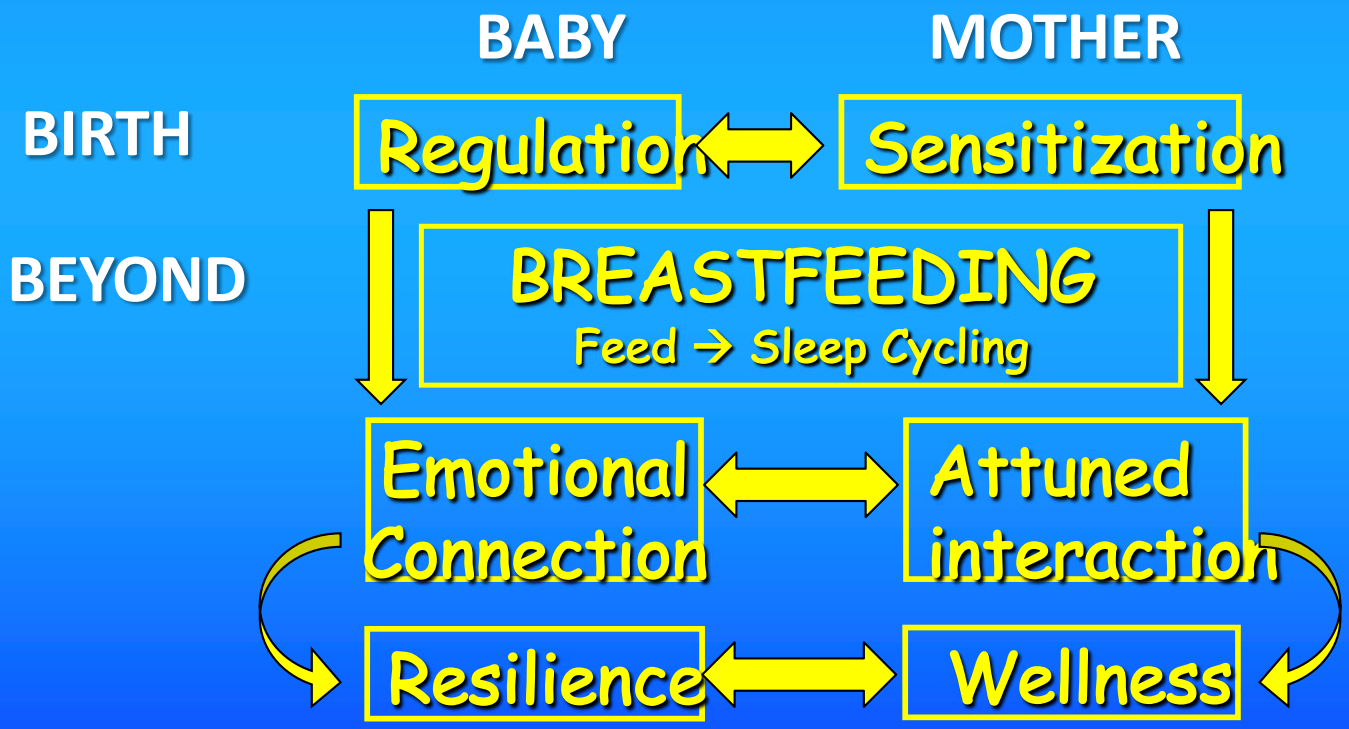

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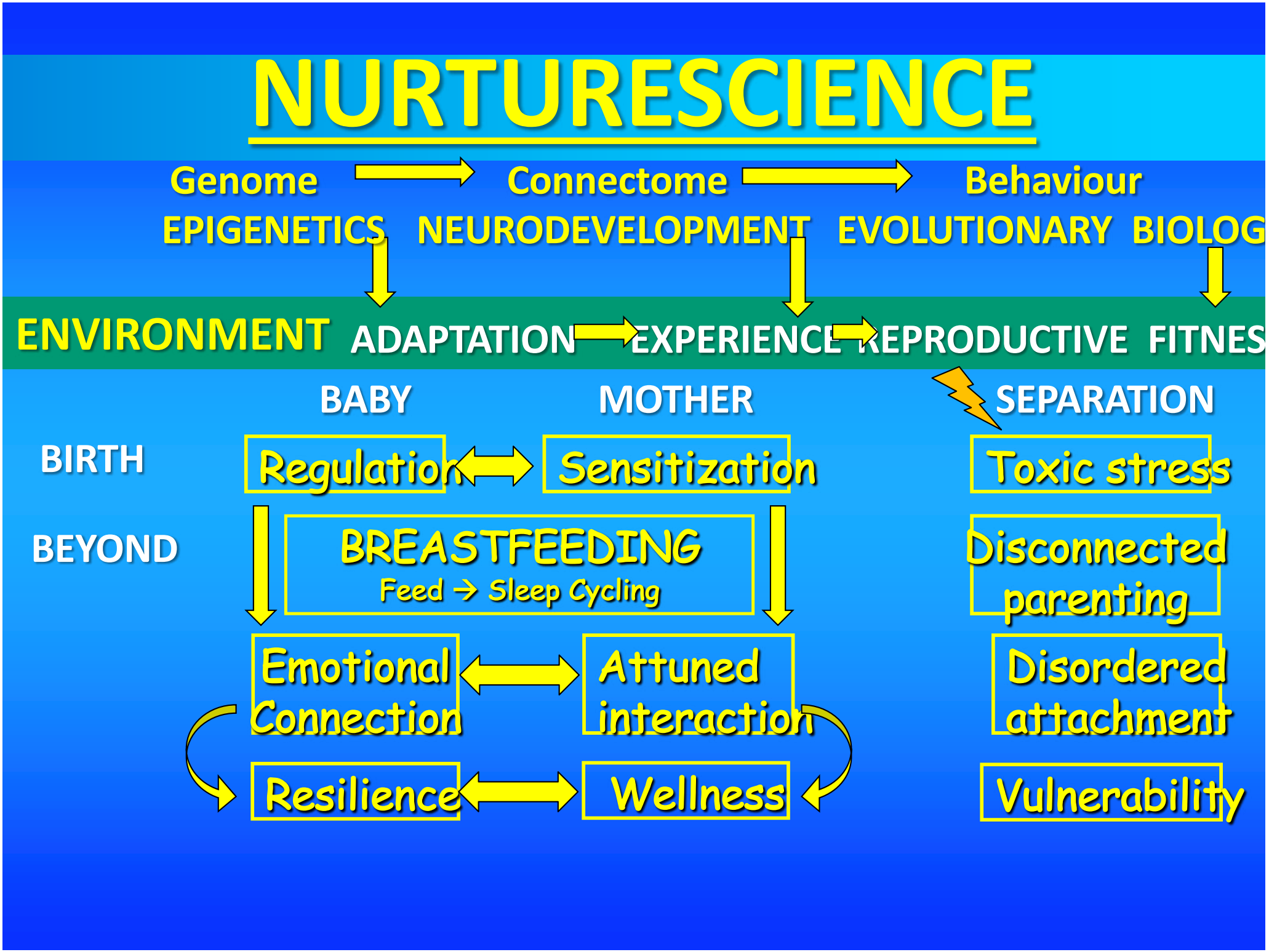

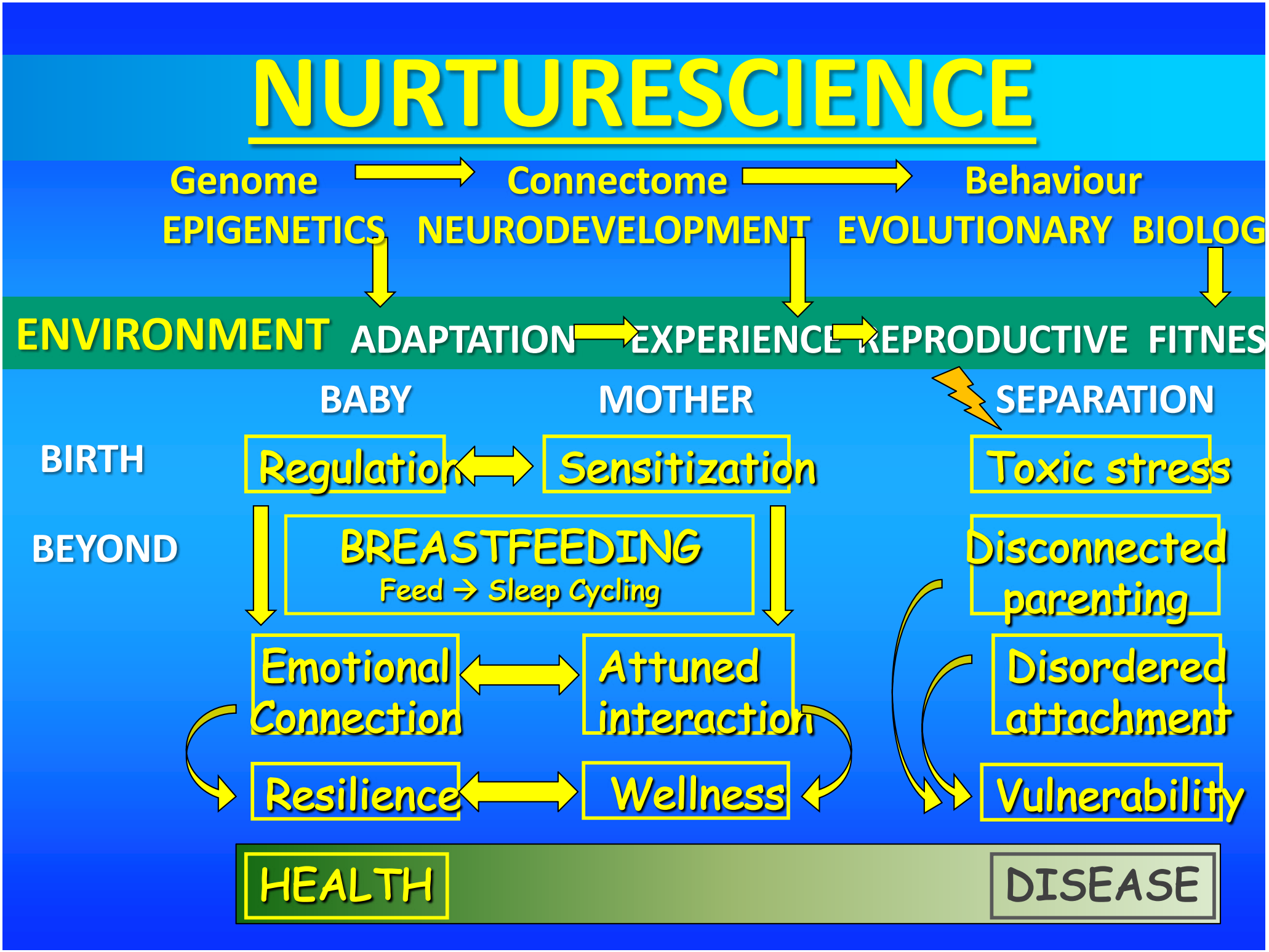
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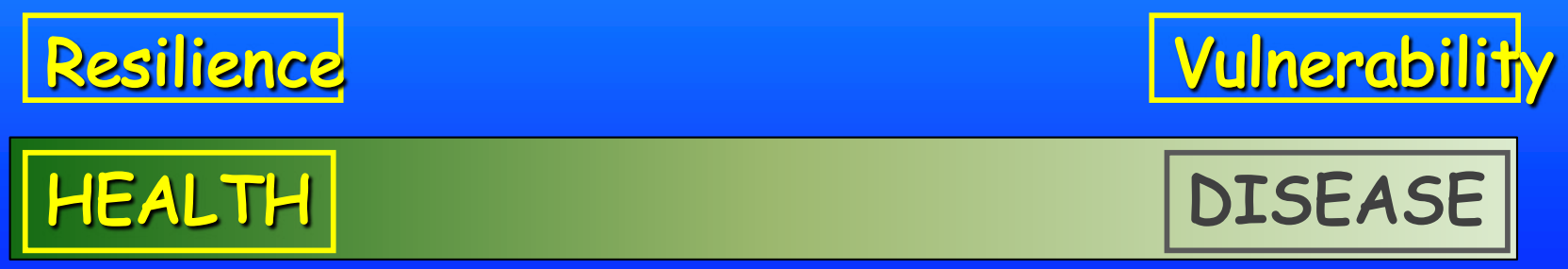
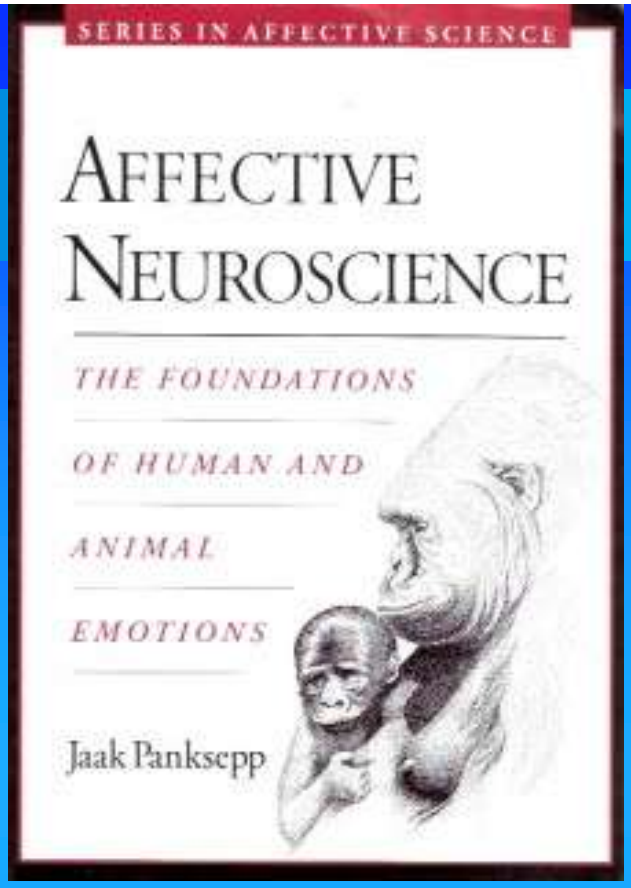
Resilience
Wellness
Vulnerability
HEALTH
DISEASE

RESILIENCE

(= STRESS RESISTANCE)

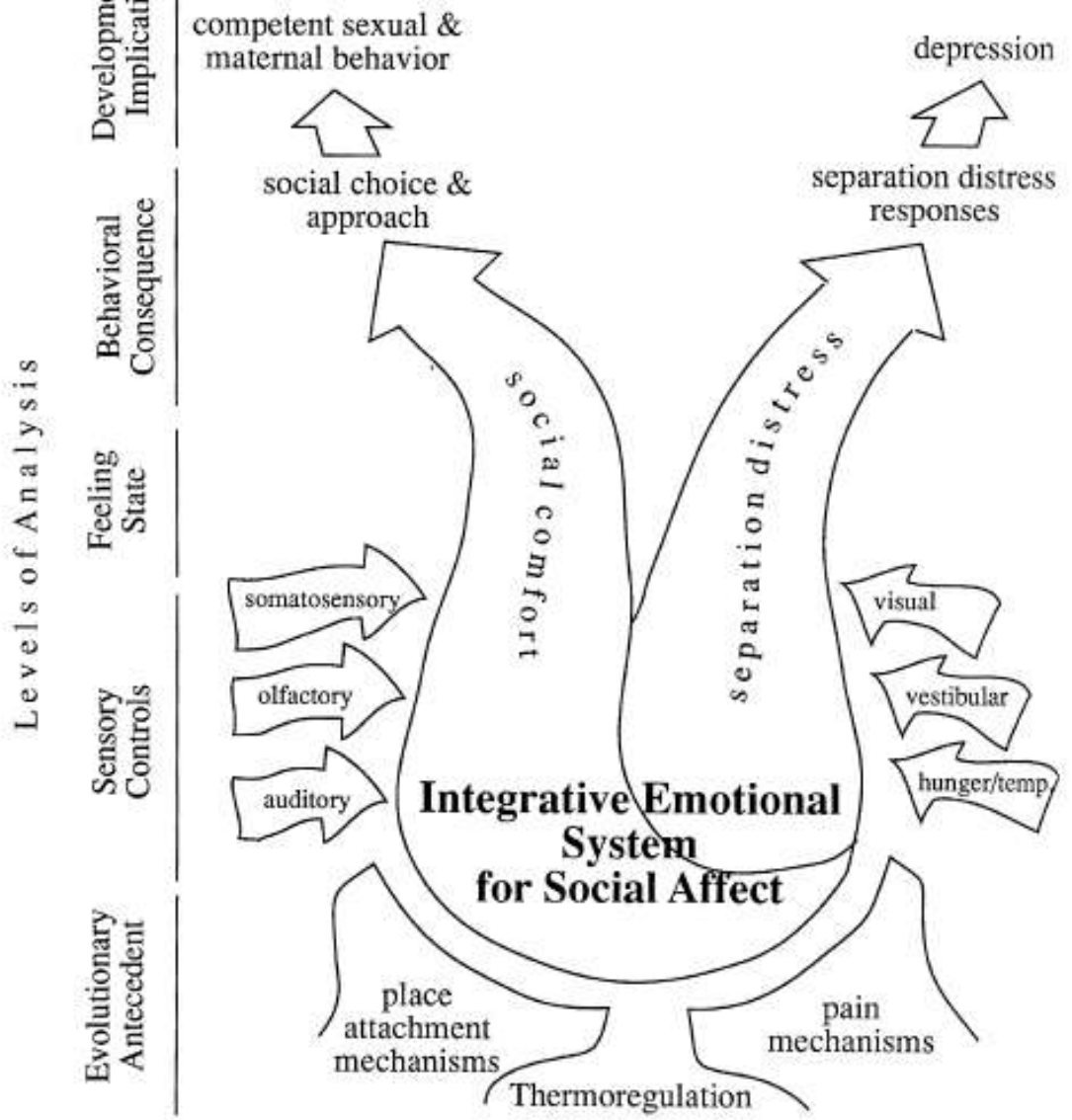
"capacity to maintain healthy emotional functioning in the after-math of stressful experiences"





HEALTH

DISEASE

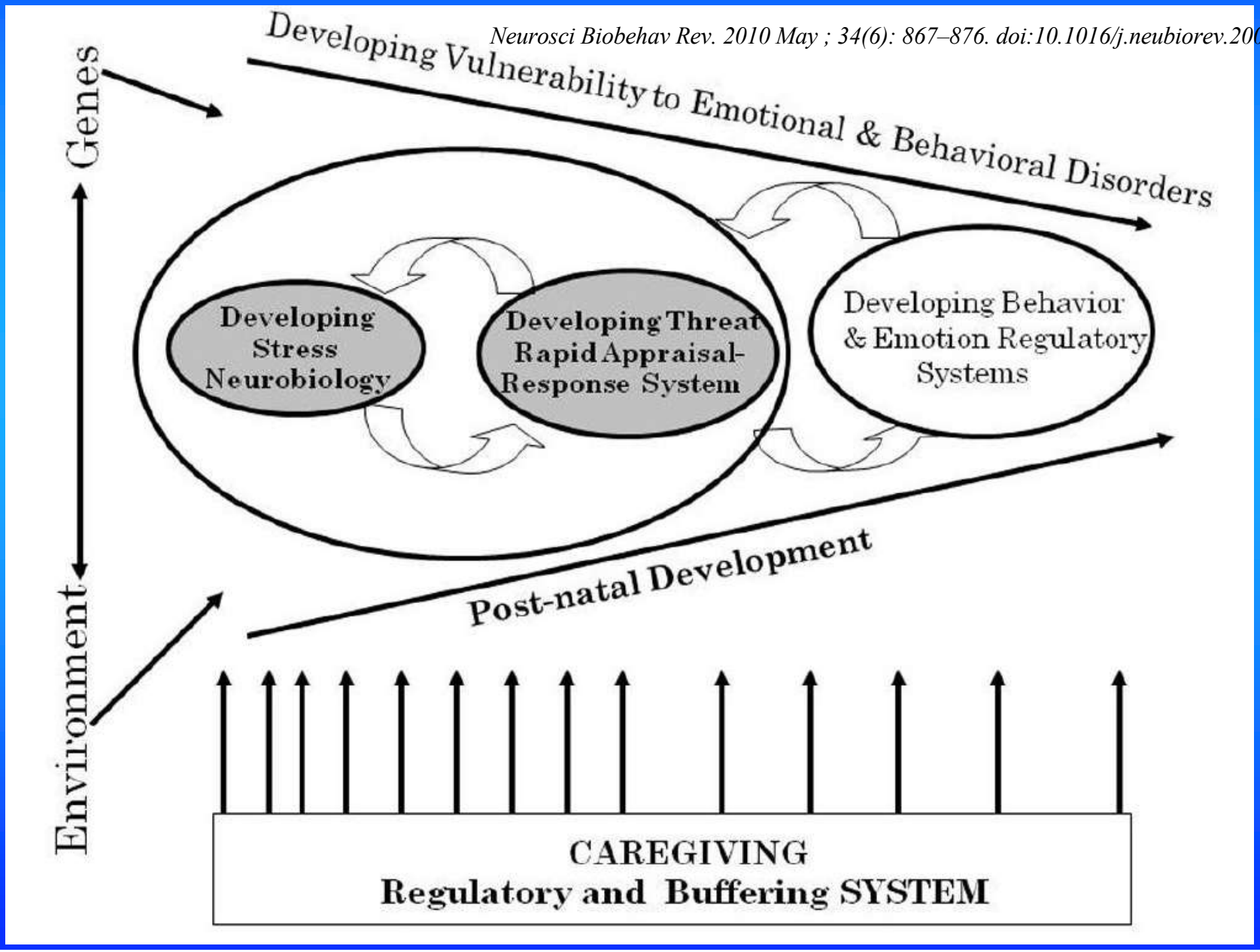


HEALTH

DISEASE

Early Experience and the Development of Stress Reactivity and Regulation in Children (Gunnar 2010)

Neurosci Biobehav Rev. 2010 May ; 34(6): 867–876. doi:10.1016/j.neubiorev.2009.05.007.

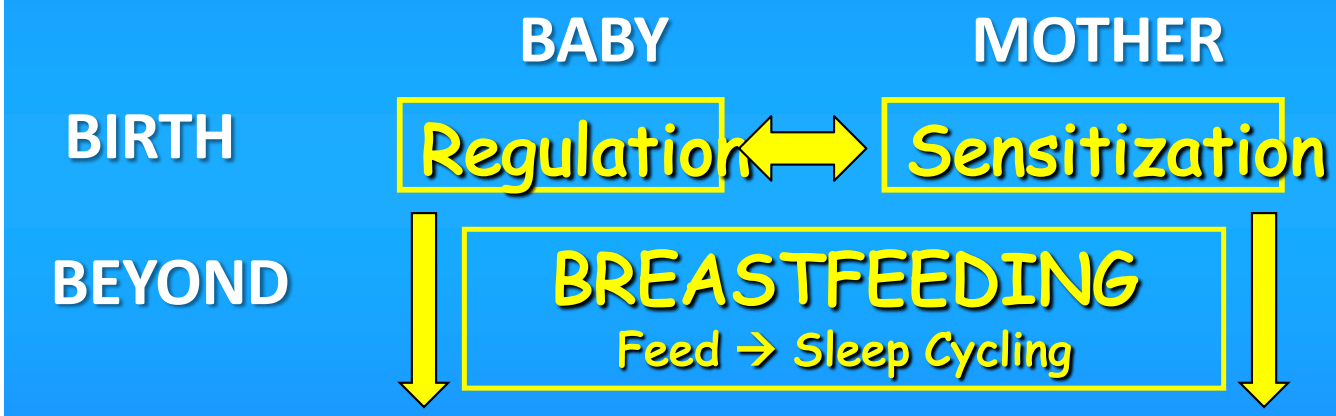


NURTURESCIENCE:
Implications for society, LIFE HISTORY THEORY

NURTURESCIENCE

CAREGIVING
Regulatory and Buffering SYSTEM

NURTURESCIENCE



NURTURESCIENCE

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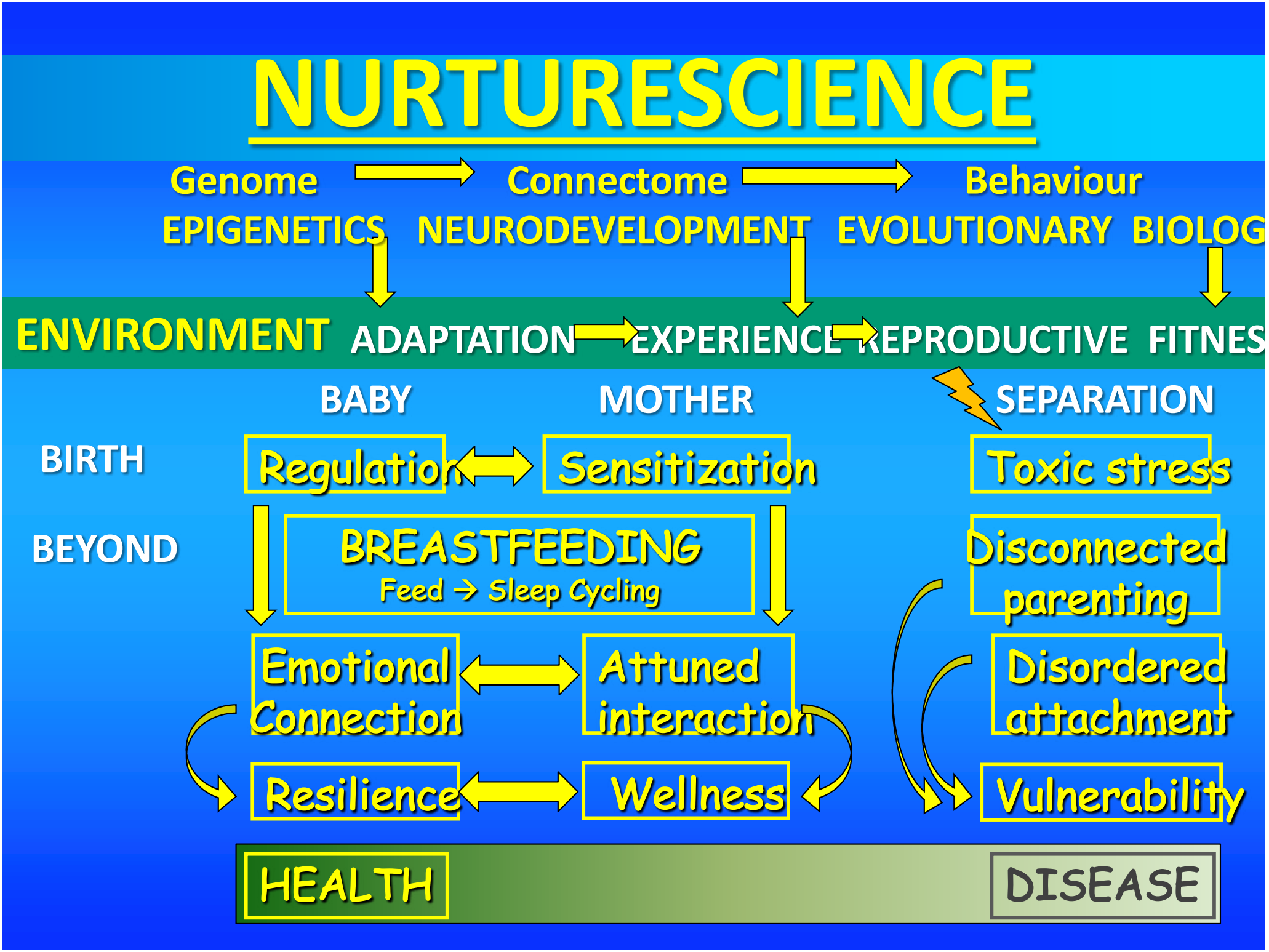
Regulatory and Buffering SYSTEM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Genome → Connectome → Behaviour

EPIGENETICS NEURODEVELOPMENT EVOLUTIONARY BIOLOG

ENVIRONMENT ADAPTATION → EXPERIENCE → REPRODUCTIVE FITNES

BABY MOTHER SEPARATION

Toxic stress

Intrusive parenting

Disordered attachment

Vulnerability

February 19, 2018

Cognitive Outcomes of Children Born Extremely or Very Preterm Since the 1990s and Associated Risk Factors

A Meta-analysis and Meta-regression

E. Sabrina Twilhaar, MSc[1]; Rebecca M. Wade, MSc[1]; Jorrit F. de Kieviet, MD, PhD[1]; et al

HEALTH DISEASE

JAMA Pediatr. 2018 Feb 19. doi: 10.1001/jamapediatrics.2017.5323. [Epub ahead of print]

Cognitive Outcomes of Children Born Extremely or Very Preterm Since the 1990s and Associated Risk Factors: A Meta-analysis and Meta-regression.

Twilhaar ES[1], Wade RM[1], de Kieviet JF[1], van Goudoever JB[2,3], van Elburg RM[2,4], Oosterlaan J[1,2,3].

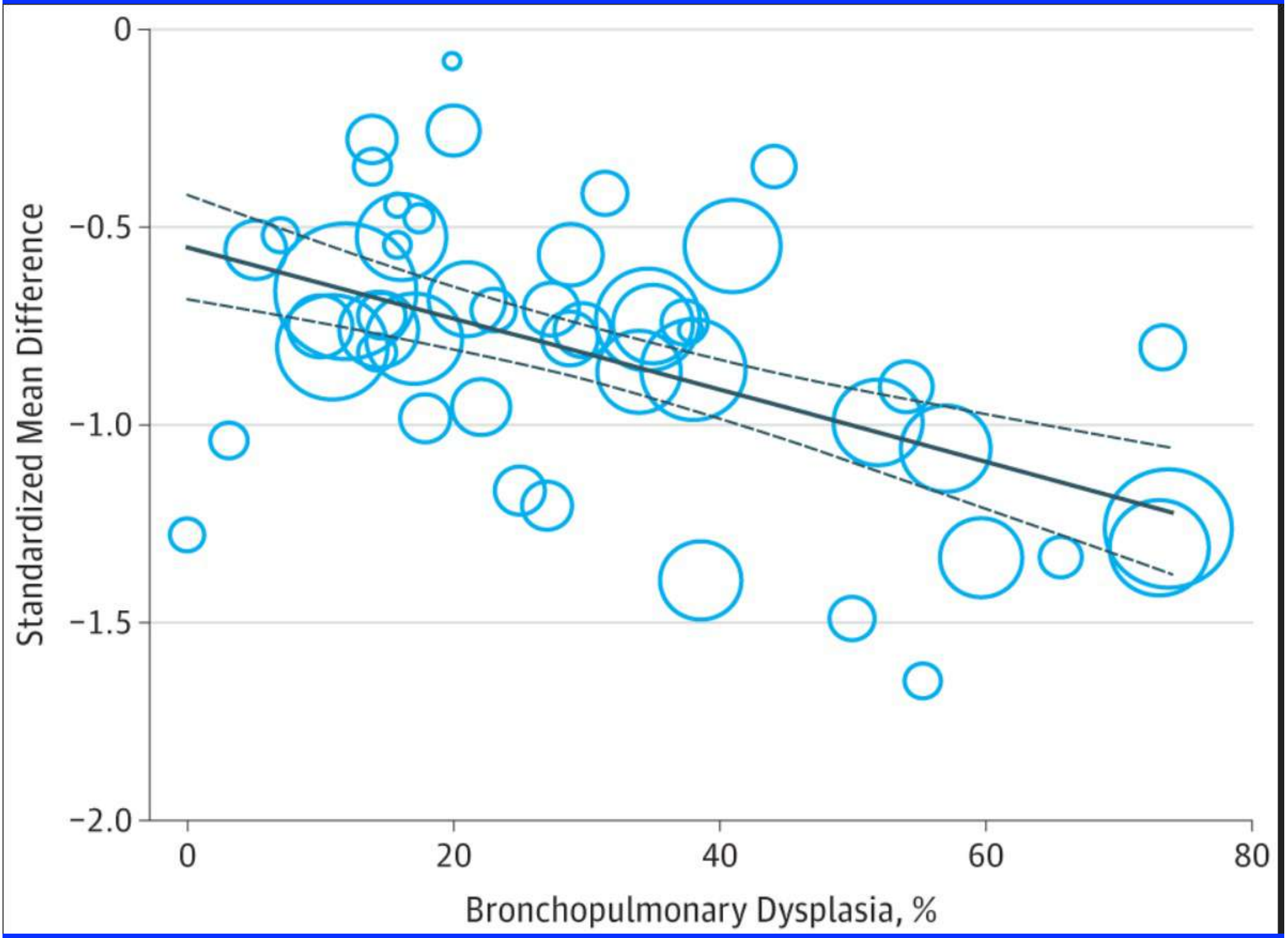
Feb 19, 2018

Conclusions and Relevance:

Extremely or very preterm children born in the antenatal corticosteroids and surfactant era show large deficits in intelligence. No improvement in cognitive outcome was observed between 1990 and 2008.

…

Bronchopulmonary dysplasia was found to be a crucial factor for cognitive outcome. Lowering the high incidence of BPD may be key to improving long-term outcomes after EP/VP birth.


0
−0.5
−1.0
−1.5
−2.0
Standardized Mean Difference
0
20
40
60
80
Bronchopulmonary Dysplasia, %

The Stockholm Neonatal Family Centered Care Study: Effects on Length of Stay and Infant Morbidity

WHAT'S KNOWN ON THIS SUBJECT: Although advances in technology and medical treatment have allowed more infants to survive, morbidity remains high. The NICU environment and early parent-infant interaction have been associated with infant health and length of hospital stay.

WHAT THIS STUDY ADDS: Data from this study indicate that parents staying in the NICU from admission to discharge may reduce the total length of stay for infants born prematurely. An individual-room NICU design could have a direct effect on infant stability and morbidity.

AUTHORS: Annica Örtenstrand, RN, PhD,[a] Björn Westrup, MD, PhD,[b,c] Eva Berggren Broström MD, PhD,[a] Susanne Åkerström, RN Brune, MD,[c] Lene Lindberg, Psych Waldenström, RN, RM, BA, PhD[e]

[a]Department of Clinical Science and Sachs Children's Hospital, [b]Divisions [e]Reproductive and Perinatal Health C and Child Health, and [d]Division of Ap Department of Public Health Science Stockholm, Sweden; and [c]Astrid Lind Danderyd, Karolinska University Hos

n = 366

CONTROL GROUP: parents visit 6 - 10 hours per day

INTERVENTION : parents admitted … present 24 h per day

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[a]Department of Clinical Science and Education, Södersjukhuset, Sachs Children's Hospital, [b]Divisions of Neonatology and [e]Reproductive and Perinatal Health Care, Department of Woman and Child Health, and [d]Division of Applied Public Health, Department of Public Health Sciences, Karolinska Institutet, Stockholm, Sweden; and [c]Astrid Lindgren Children's Hospital, Danderyd, Karolinska University Hospital, Stockholm, Sweden

BPD[f]		
Non-BPD to mild BPD	180 (98.4)	171 (94.0)
Moderate to severe BPD	3 (1.6)	11 (6.0)
Severe morbidity[g] or death		
No severe morbidity	174 (95.1)	167 (91.3)
Severe morbidity	9 (4.9)	16 (8.7)

The Stockholm Neonatal Family Centered Care Study: Effects on Length of Stay and Infant Morbidity

CONCLUSIONS This study demonstrated a reduction in total length of hospital stay for infants born prematurely by providing facilities for parents to stay in the NICU 24 hours/day from admission to discharge. Analyses of secondary outcomes also suggested a reduction in pulmonary morbidity, such as moderate-to-severe BPD.

INTERVENTION : parents admitted … present 24 h

→ BUFFERING PROTECTION OF ADULT SUPPORT

→ ZERO SEPARATION REDUCES TOXIC STRESS

HEALTH DISEASE

NURTURESCIENCE

Genome → Connectome → Behaviour

EPIGENETICS NEURODEVELOPMENT EVOLUTIONARY BIOLOG

ENVIRONMENT ADAPTATION → EXPERIENCE → REPRODUCTIVE FITNES

BABY MOTHER SEPARATION

Toxic stress

Disconnected parenting

Disordered attachment

Vulnerability

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Cognitive Outcomes of Children Born Extremely or Very Preterm Since the 1990s and Associated Risk Factors

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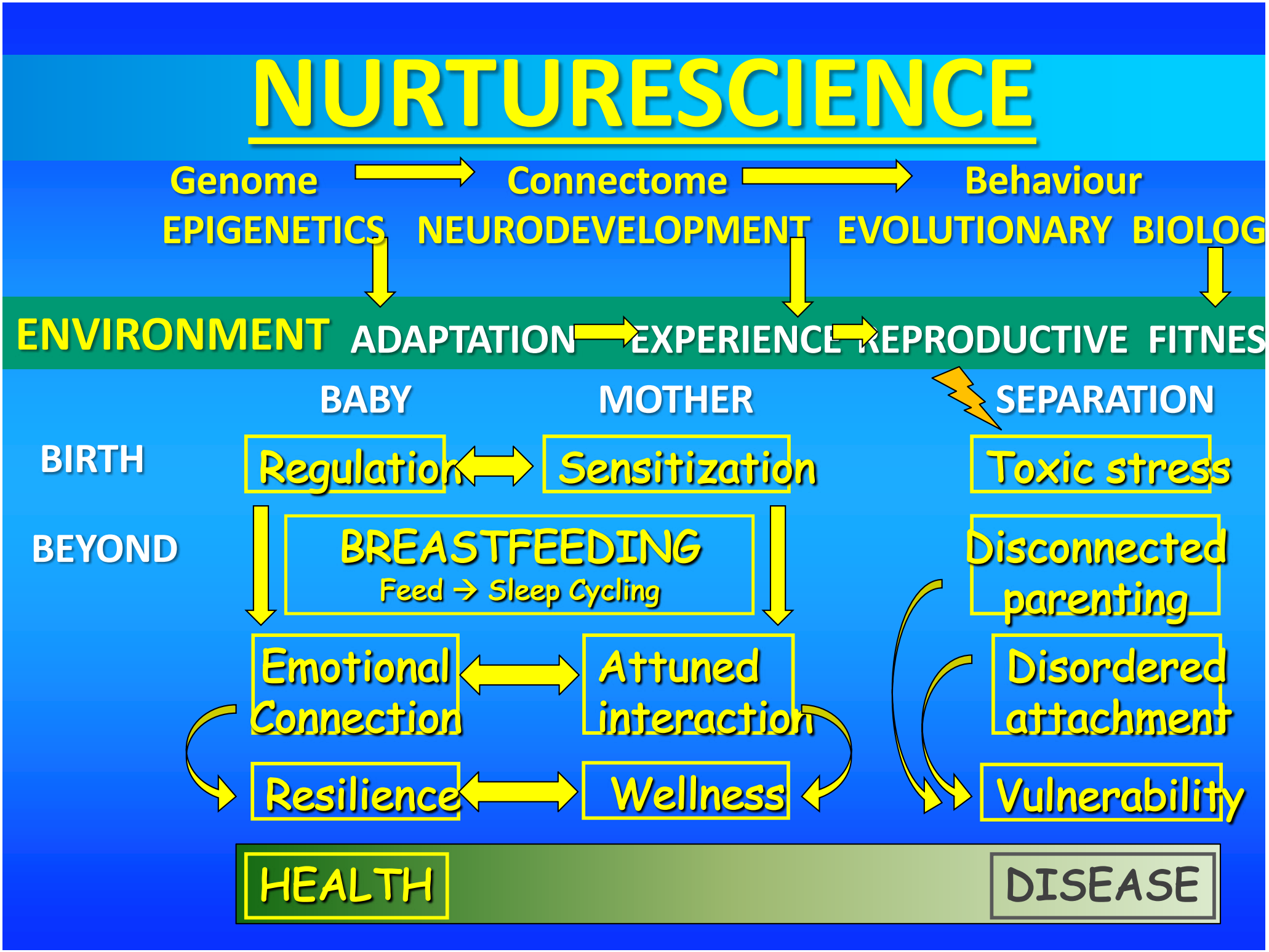
HEALTH

DISEASE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DISEASE

DOI: 10.1002/bdr2.1529

Birth Defects Research | The Teratology Society | WILEY

REVIEW ARTICLE

Nurturescience versus neuroscience: A case for rethinking perinatal mother–infant behaviors and relationship

Nils J. Bergman[1] | Robert Ludwig[2] | Björn Westrup[1] | Martha Welch[2,3,4]

DOI: 10.1002/bdr2.1530

Birth Defects Research | The Teratology Society | WILEY

REVIEW ARTICLE

Birth practices: Maternal-neonate separation as a source of toxic stress

Nils J Bergman

NURTURESCIENCE

Neuroscience developed
in the old paradigm of
maternal-infant separation.

a new model with ancient roots.

NURTURESCIENCE

Nurturescience now engulfed or embedded in current neuroscience paradigms,

Needs dissecting out →

a new model with ancient roots.

Comparison of nurturescience and neuroscience

	NURTURESCIENCE	NEUROSCIENCE
Key time period	Perinatal, conception to birth to 1 month	1 month – 3 years (ECD)

→ First 1000 days

Early Childhood Development

Comparison of nurturescience and neuroscience

	NURTURESCIENCE	NEUROSCIENCE
Key time period	Perinatal, conception to birth to 1 month	1 month – 3 years (ECD)

Immediate **AT BIRTH**

First 1000 seconds (1st hour) TRANSITION
MICROBIOTA
SENSITISATION

→ First 1000 days Early Childhood Development

Comparison of nurturescience and neuroscience

	NURTURESCIENCE	NEUROSCIENCE
Key time period	Perinatal, conception to birth to 1 month	1 month – 3 years (ECD)

Immediate **AT BIRTH**

First 1000 seconds (1st hour) TRANSITION
First 1000 minutes (1st day) REGULATION
CONNECTION
SUCKLING / BREAST
First 1000 hours (6 weeks) CONSOLIDATION

Comparison of nurturescience and neuroscience

	NURTURESCIENCE	NEUROSCIENCE
Key time period	Perinatal, conception to birth to 1 month	1 month – 3 years (ECD)

Immediate **AT BIRTH**

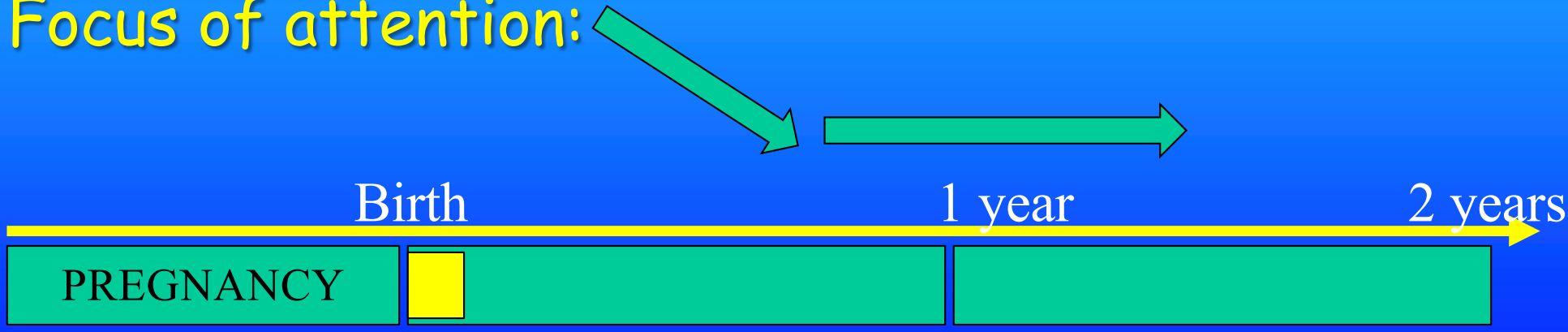
First 1000 seconds (1st hour) TRANSITION
First 1000 minutes (1st day) CONNECTION
First 1000 hours (6 weeks) CONSOLIDATION
→ First 1000 days Early Childhood Development

The first 1000 days begins with the first 1000 minutes

"ECD" Early Childhood Development

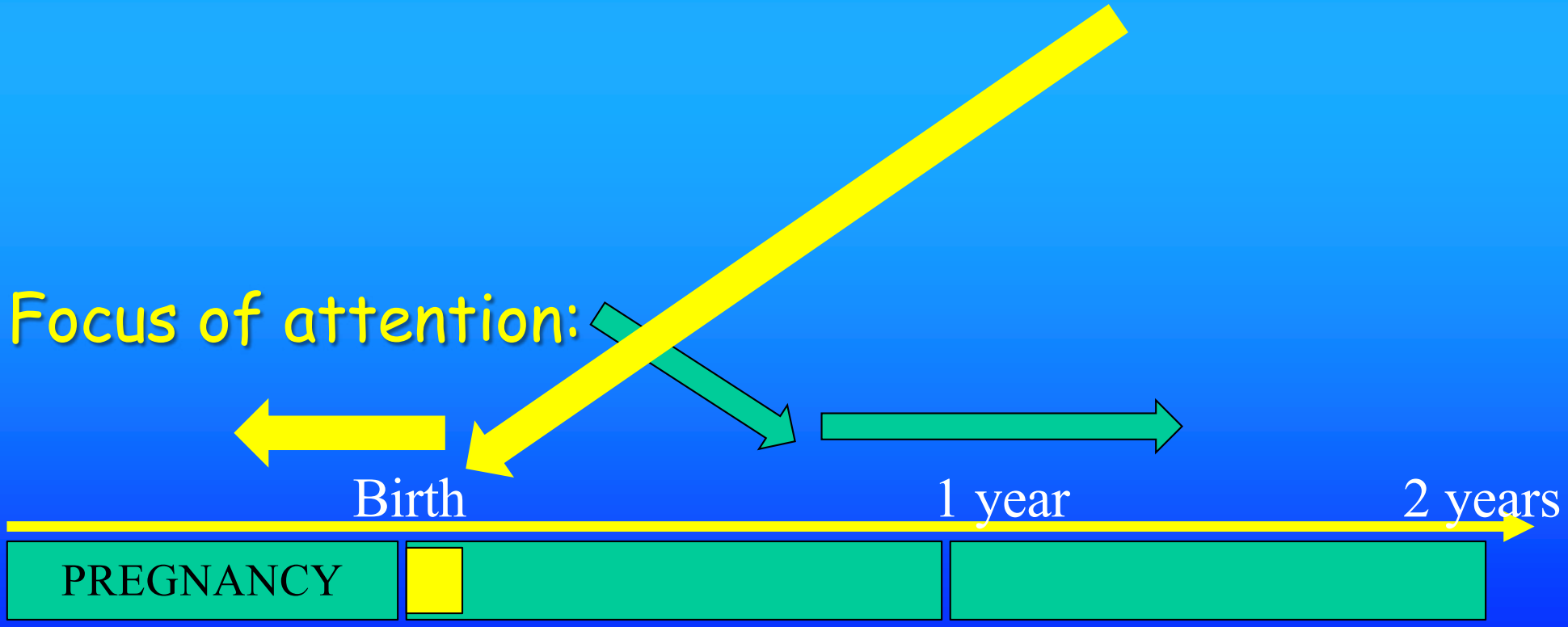
gestation	270
year one	365
year two	365
total	1000 days

Focus of attention:



The first 1000 days begins with the first 1000 minutes

"Developmental programming"
is DETERMINING outcomes

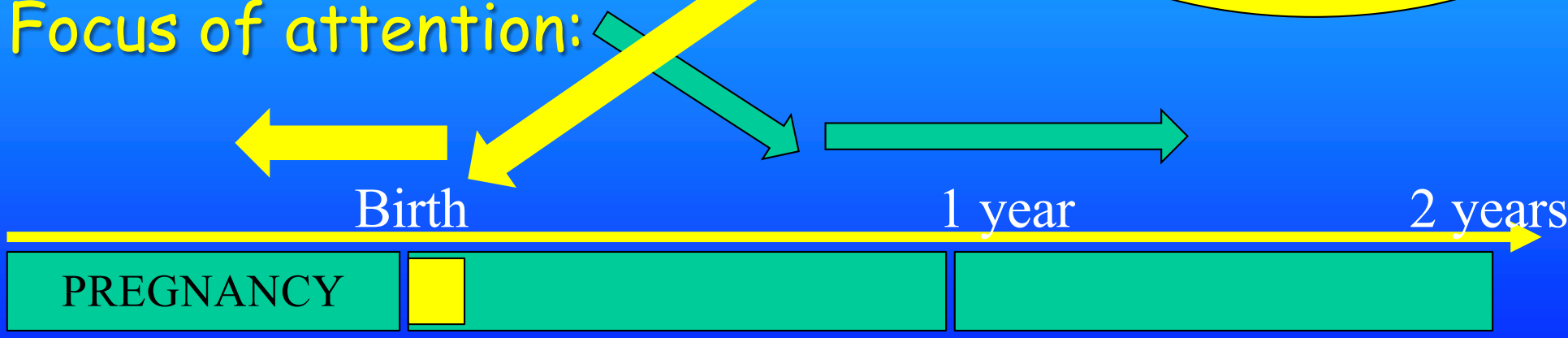


The first 1000 days begins with the first 1000 minutes

"Developmental programming"
is DETERMINING outcomes

1000 minutes
16,6 hours =
First day of life

Focus of attention:



The first 1000 days begins with the first 1000 minutes

"Developmental programming"
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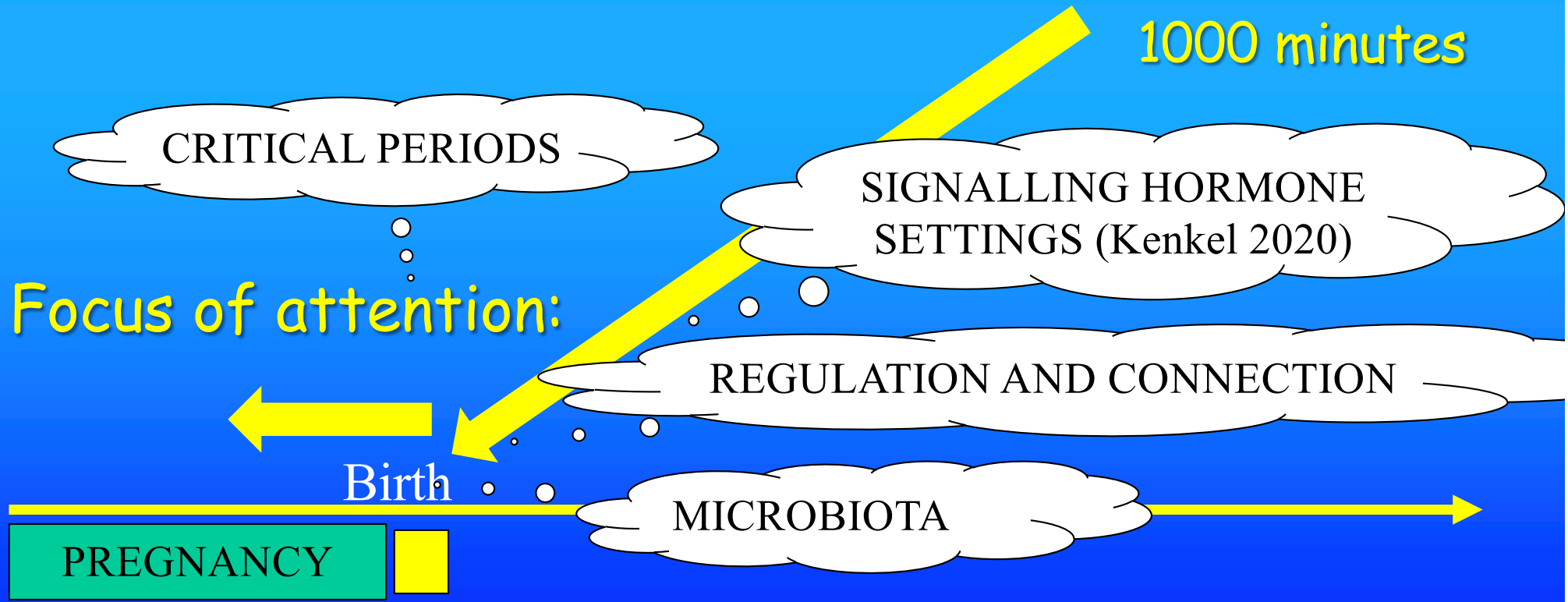
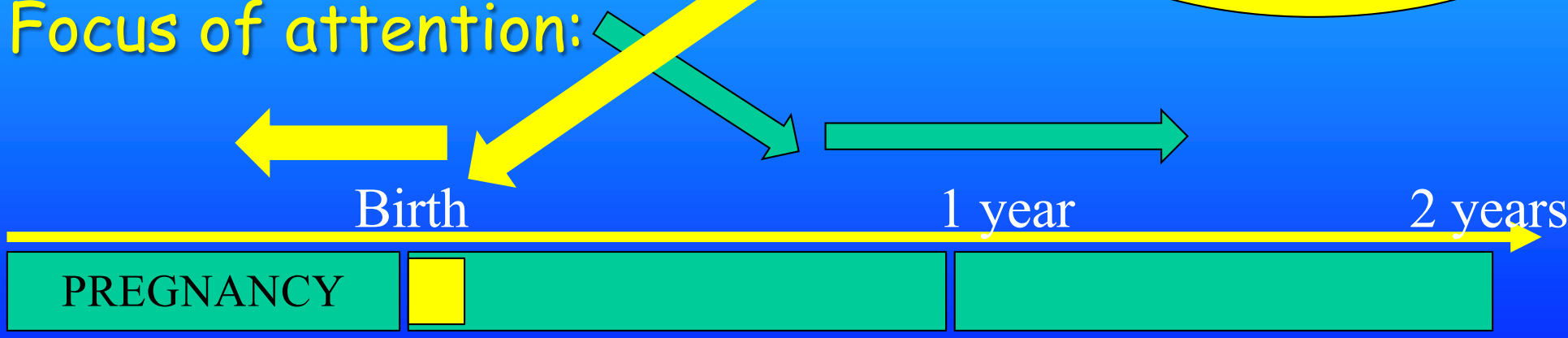


The first 1000 days begins with the first 1000 minutes

"Developmental programming"
is DETERMINING outcomes

1000 minutes
16,6 hours =
First day of life

Focus of attention:



Comparison of nurturescience and neuroscience

	NURTURESCIENCE	NEUROSCIENCE
Key time period	Perinatal, conception to birth to 1 month	1 month – 3 years (ECD)
	First 1000 minutes	First 1000 days
ANS purpose	HOMEORHESIS	HOMEOSTASIS

REGULATION vs STIMULATION

Expected vs Unexpected
Ecologic salience vs Potential threat
Resource growth vs threat readiness

OXYTOCIN vs CORTISOL
HOMEORHESIS vs HOMEOSTASIS
MOTHER vs OTHER

Resilience

Comparison of nurturescience and neuroscience

	NURTURESCIENCE	NEUROSCIENCE
Key time period	Perinatal, conception to birth to 1 month	1 month – 3 years (ECD)
Emotions Regulatory mechanism	Viscera / ANS / limbic brain	Limbic brain / neocortex
	Maternal regulation then co-regulation	Self-regulation (within self)
	Ope	self)

REGULATION vs STIMULATION

Expected vs Unexpected
Ecologic salience vs Potential threat
Resource growth vs threat readiness

OXYTOCIN vs CORTISOL
HOMEORHESIS vs HOMEOSTASIS
MOTHER vs OTHER

Comparison of nurturescience and neuroscience

	NURTURESCIENCE	NEUROSCIENCE
	Dyadic / family (plural)	Individual (singular)
	Dynamic systems theory	Reductionistic logic

Necessary,

Randomized controlled trials (R
Evidence Based Medicine (E

Comparison of nurturescience and neuroscience

	NURTURESCIENCE	NEUROSCIENCE
	Dyadic / family (plural)	Individual (singular)
	Dynamic systems theory	Reductionistic logic

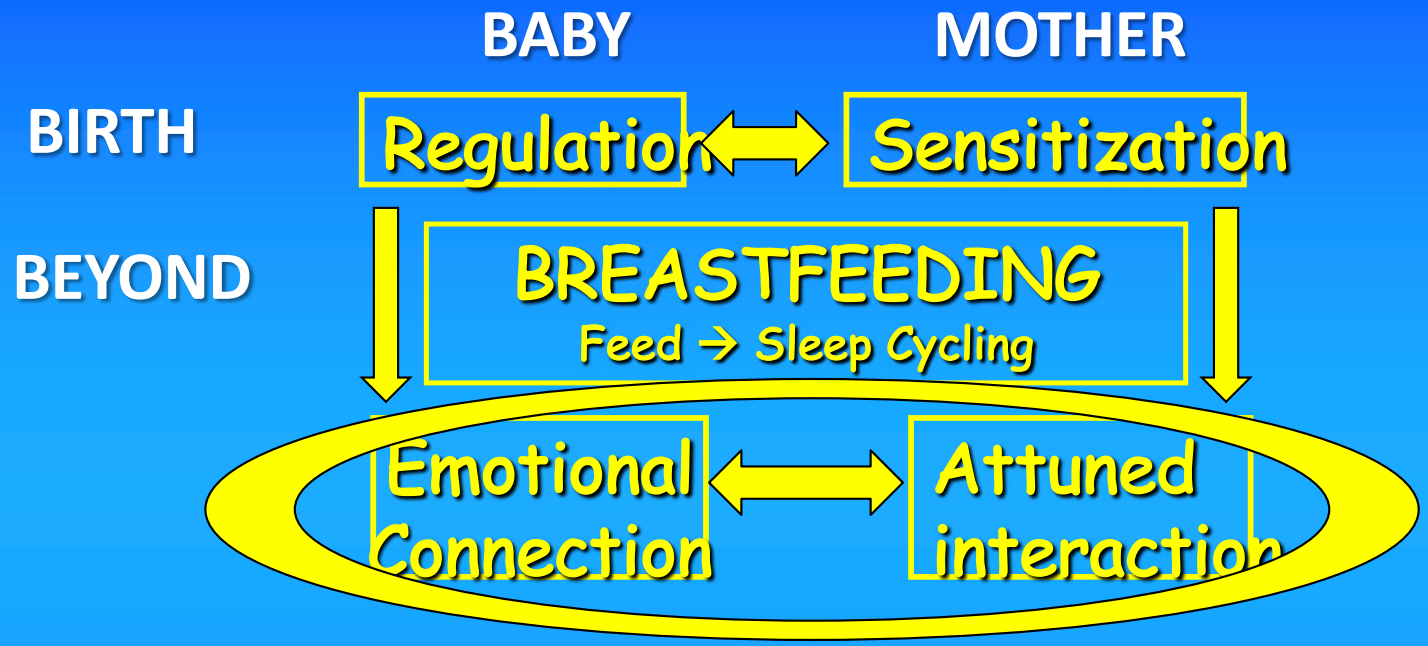
Necessary, but not sufficient

Randomized controlled trials (RCT)
Evidence Based Medicine (EBM)

"Womb ecology becomes world ecology."

Comparison of nurturescience and neuroscience

	NURTURESCIENCE	NEUROSCIENCE
Key time period	Perinatal, conception to birth to 1 month	1 month – 3 years (ECD)
	First 1000 minutes	First 1000 days
ANS purpose	HOMEORHESIS	HOMEOSTASIS
	Dyadic / family (plural)	Individual (singular)
	Dynamic systems theory	Reductionistic logic
KEY OUT-COME	CONNECTION RESILIENCE	ATTACHMENT COGNITION



KEY OUT-COME	CONNECTION RESILIENCE	ATTACHMENT COGNITION

Table 1: Comparison of nurturescience and neuroscience

	*Nurture*science	*Neuro*science
Relevant time period	Perinatal, conception to birth to 1 year First 1000 minutes	1 month – 3 years (ECD) First 1000 days
	Critical periods (brief)	Brain maturation, sensitive periods (long)
Autonomic objective	Homeorhesis	Homeostasis; Allostasis
Emotions regulatory mechanism	Viscera / ANS / Limbic	Limbic brain / neocortex
	Fetus/neonate acutely aware of threat	Infant and toddler develop threat awareness
	Co-regulation, buffering of stress	Self-regulation of stress (within self)
Emotional learning mechanism	ANS primary influence on behavior	CNS primary influence on behavior
	Autonomic learning or conditioning	CNS conditioning, operant
	Fetal & neonatal connectome	Prolonged infant brain maturation
	Maternal peripartum neuroplasticity	Maternal learning of competence
	Open feedback loop (with others)	Closed feed-back loop (within self)
	Dyadic / family (plural)	Individual (singular)

DOI: 10.1002/bdr2.1529

REVIEW ARTICLE

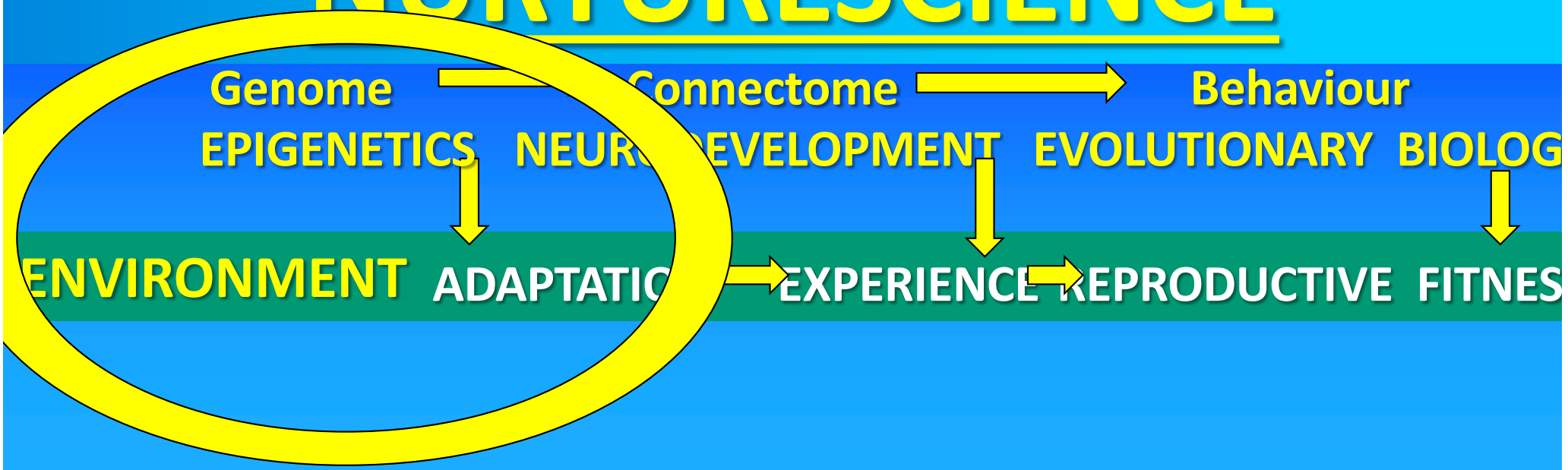
Birth Defects Research | The Teratology Society | WILEY

Nurturescience versus neuroscience: A case for rethinking perinatal mother–infant behaviors and relationship

Nils J. Bergman[1] | Robert Ludwig[2] | Björn Westrup[1] | Martha Welch[2,3,4]

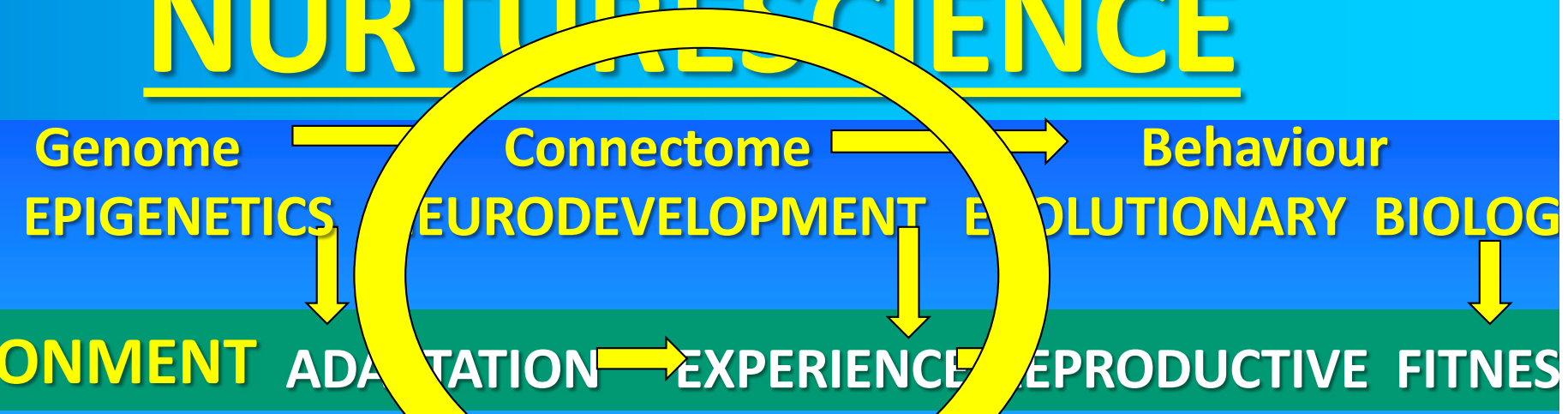
Theoretical roots	Dynamic systems theory, ecology	Reductionistic logic, isolationist
	Biology, ethology, anthropology	Sociology (Maslow, Dunbar)
	Physiology, polyvagal theory	Psychology,
	Epigenetics	Genetics-Epigenetics
	Epigenetic adaptation / maladaptation	Toxic stress, allostatic load
Intervention target	Boost parasympathetic, calming ANS and emotional behavior	Counter sympathetic, excitability CNS and cognition
KEY OUTCOMES	EMOTIONAL CONNECTION RESILIENCE	ATTACHMENT COGNITION
KEY OBJECTIVES	RELATIONAL HEALTH Sociality Interdependence	SELF-ACTUALIZATION (Maslow) Individualistic Independence

NURTURESCIENCE

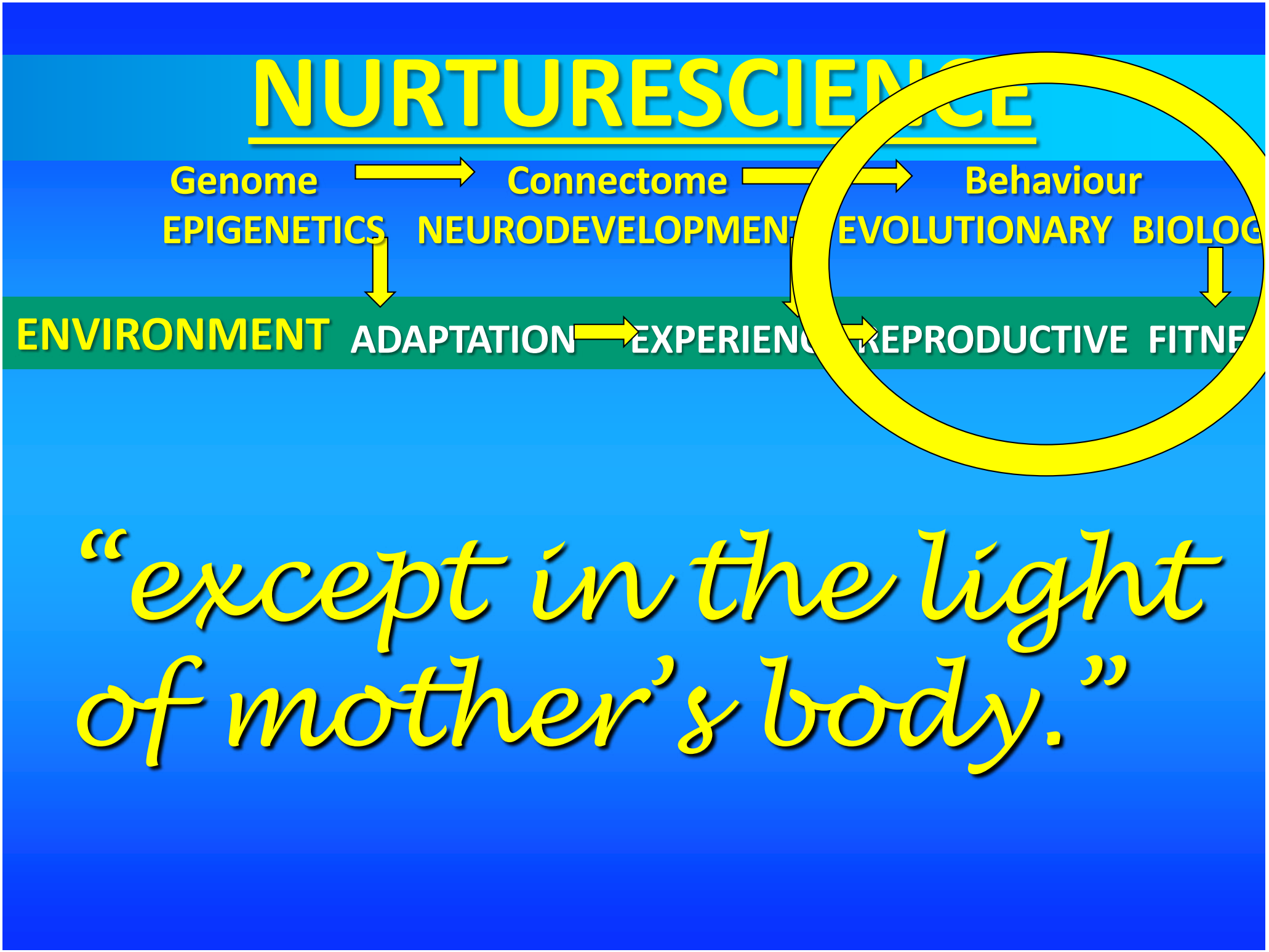


"buffering protection of adult support"

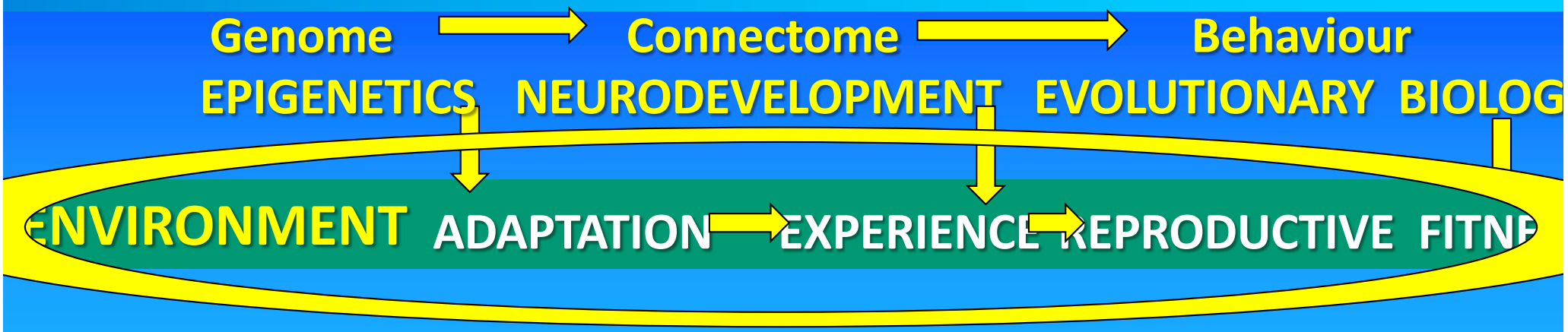
NURTURESCIENCE



"needed neural processes"


NURTURESCIENCE
Genome
Connectome
Behaviour
EPIGENETICS
NEURODEVELOPMENT
EVOLUTIONARY
BIOLOG
ENVIRONMENT
ADAPTATION
EXPERIENC
REPRODUCTIVE
FITNE
"except in the light of mother's body."

NURTURESCIENCE



ZERO SEPARATION

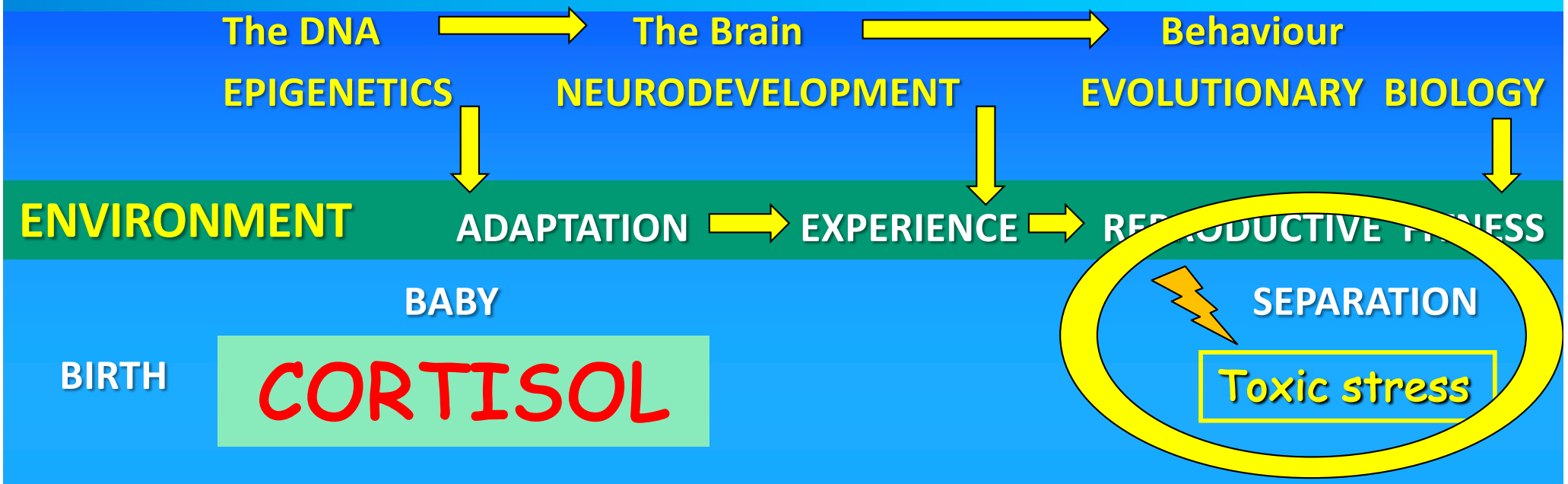
Toxic Stress

- **Strong and prolonged activation of the body's stress management systems in the absence of the buffering protection of adult support.**

JACK SHONKOFF

"Absence of buffering protection of adult support"

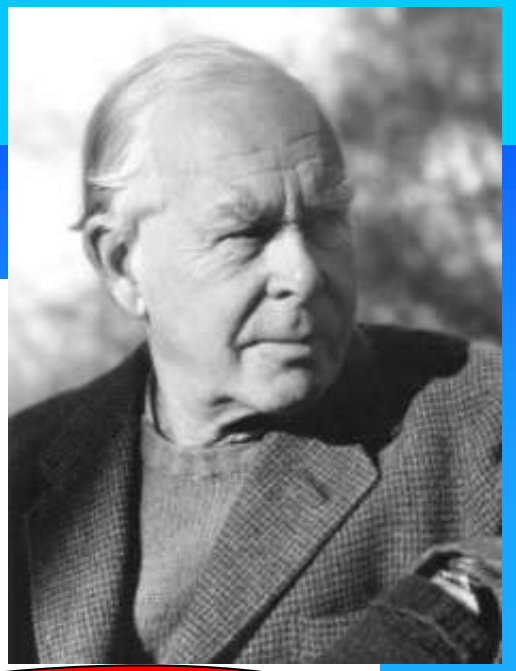
The Neuroscience of Birth & Breastfeeding



- **Disrupts brain architecture**

and leads to stress management systems that respond at relatively lower thresholds, thereby **increasing the risk** of stress-related physical and mental illness.

PROTEST -DESPAIR



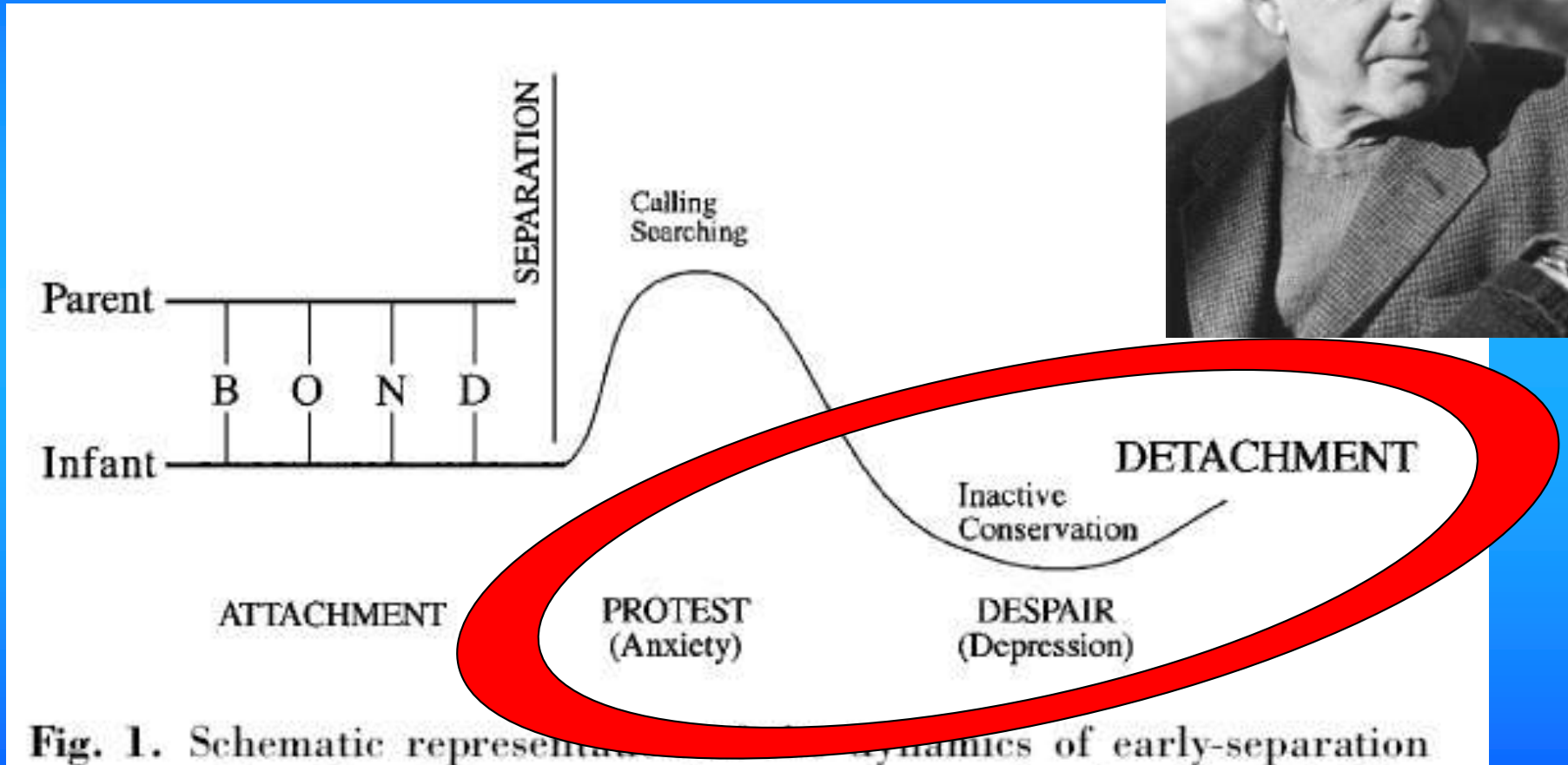
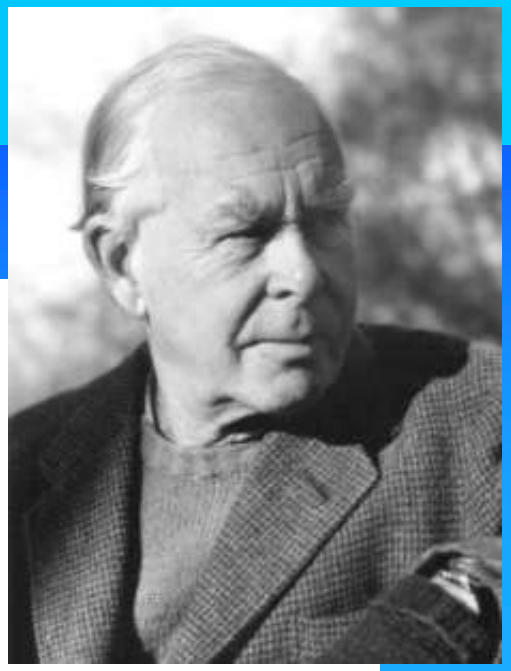
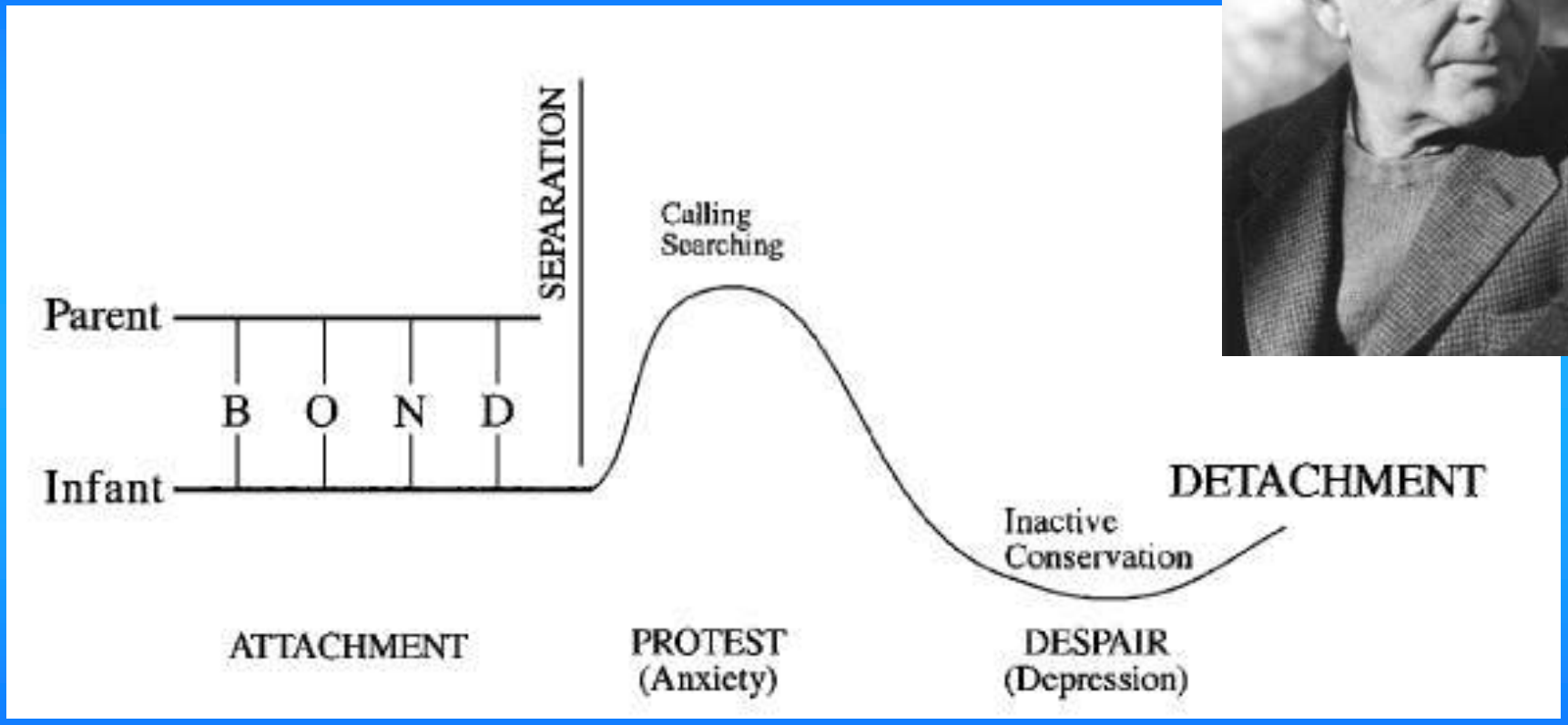


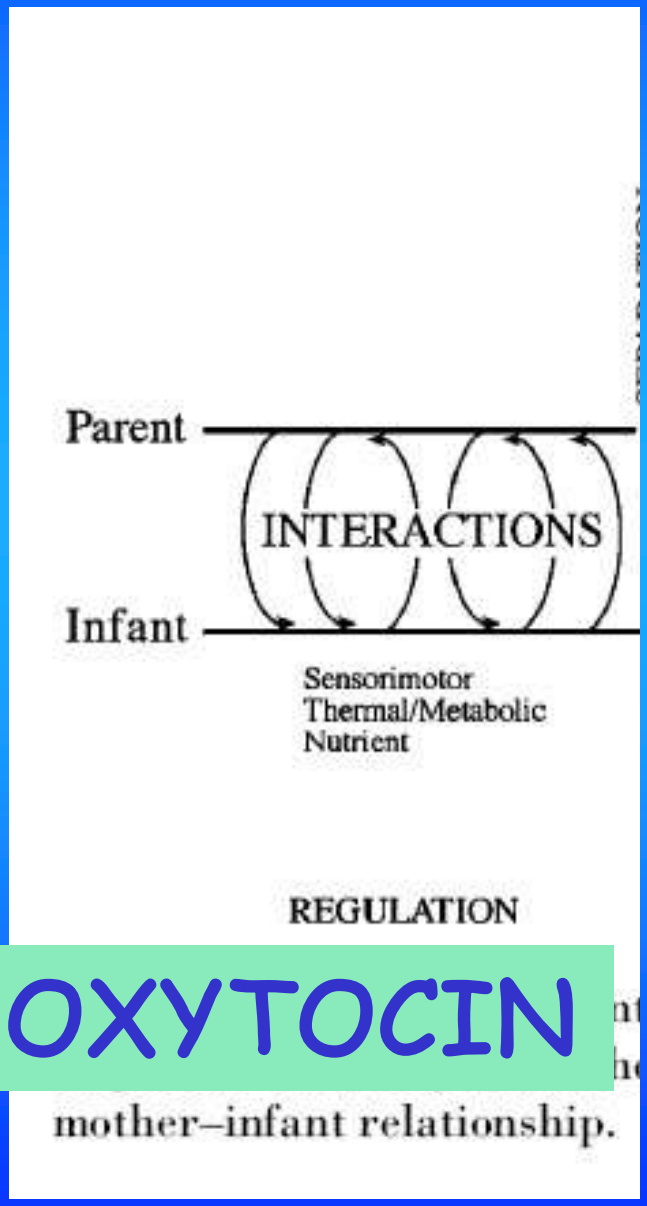
Fig. 1. Schematic represent[illegible]ynamics of early-separation responses based on the concept of an attachment bond as described by John Bowlby (Bowlby, 1982).





OXYTOCIN

CORTISOL


Parent
INTERACTIONS
Infant
Sensorimotor
Thermal/Metabolic
Nutrient
REGULATION
mother–infant relationship.

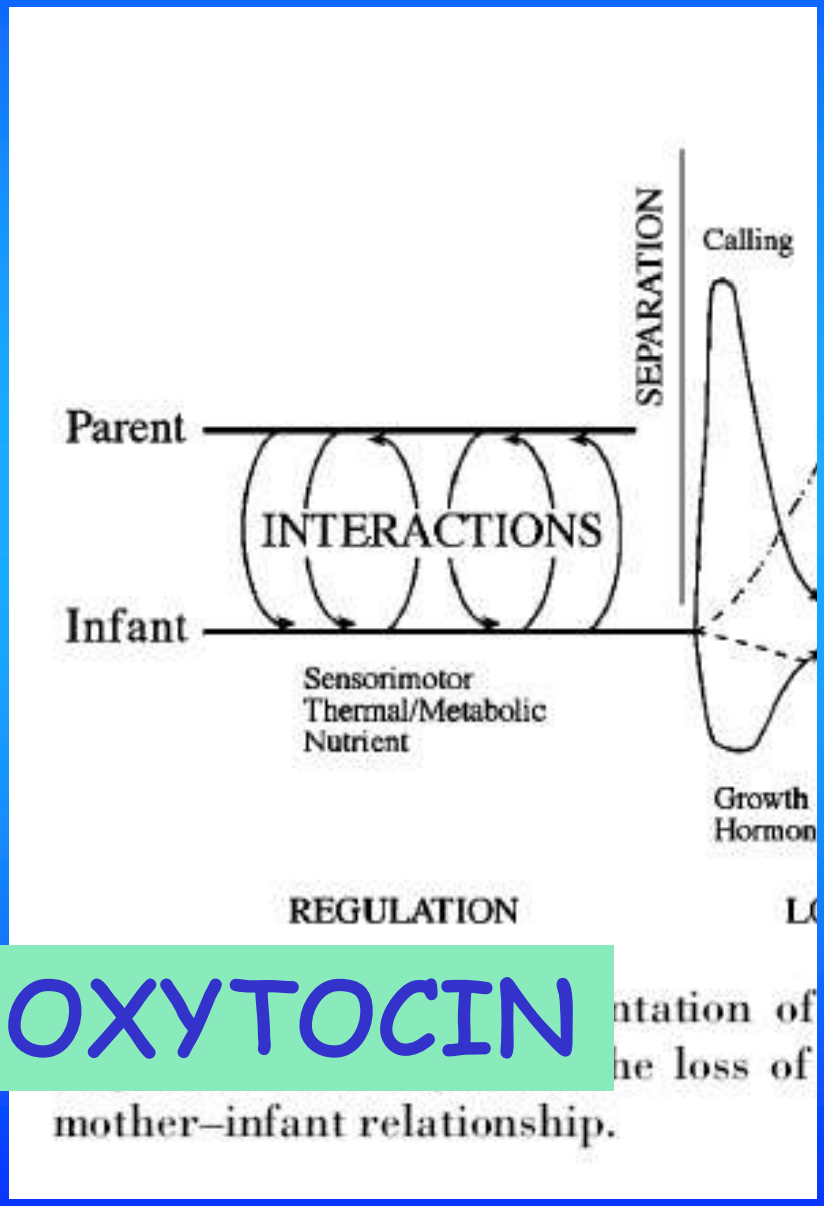
OXYTOCIN

Toxic Stress

- Strong and prolonged activation of the body's stress management systems in the absence of the buffering protection of adult support.

- Disrupts brain architecture and leads to stress management systems that respond at relatively lower thresholds, thereby increasing the risk of stress-related physical and mental illness.

Slide by: Jack P. Shonkoff, M.D.



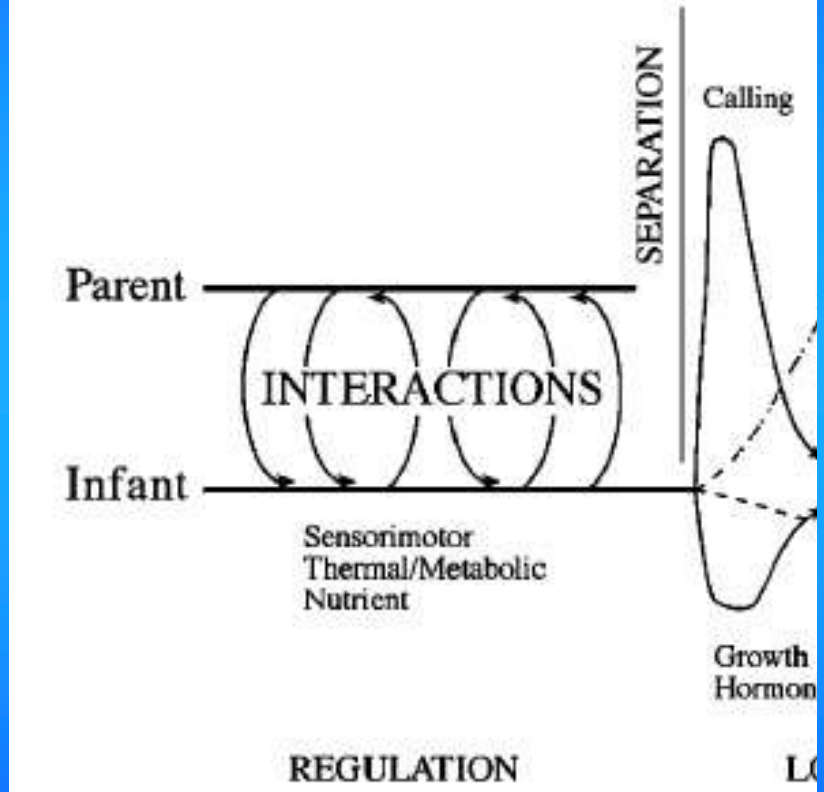
OXYTOCIN

absence

SEPARATION

WHY IS EARLY MATERNAL SEPARATION STRESSFUL?

SEPARATION



OXYTOCIN

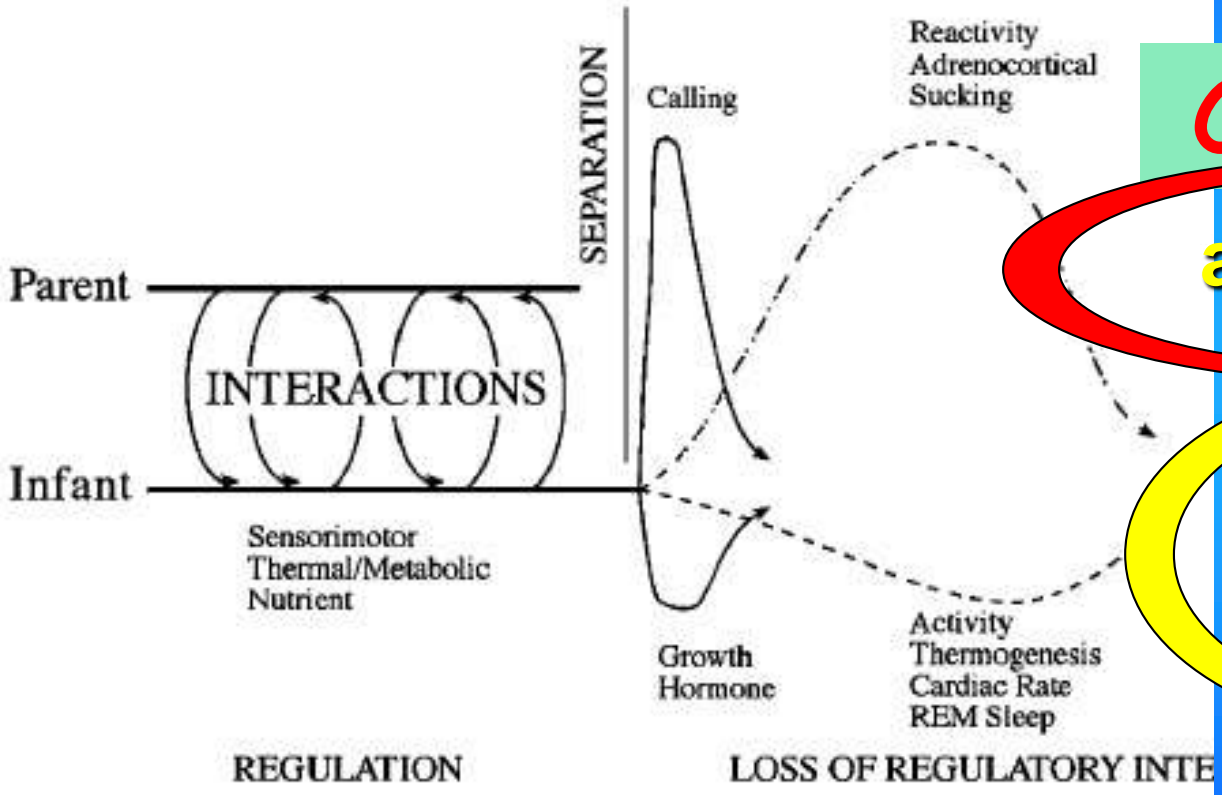
ntation of
he loss of
mother–infant relationship.

absence

SEPARATION

WHY IS EARLY MATERNAL SEPARATION STRESSFUL?

SEPARATION DYSREGULATES



ntation of the dynamics of ear
he loss of regulatory interactio
mother–infant relationship.

CORTISOL

absence

SEPARATION

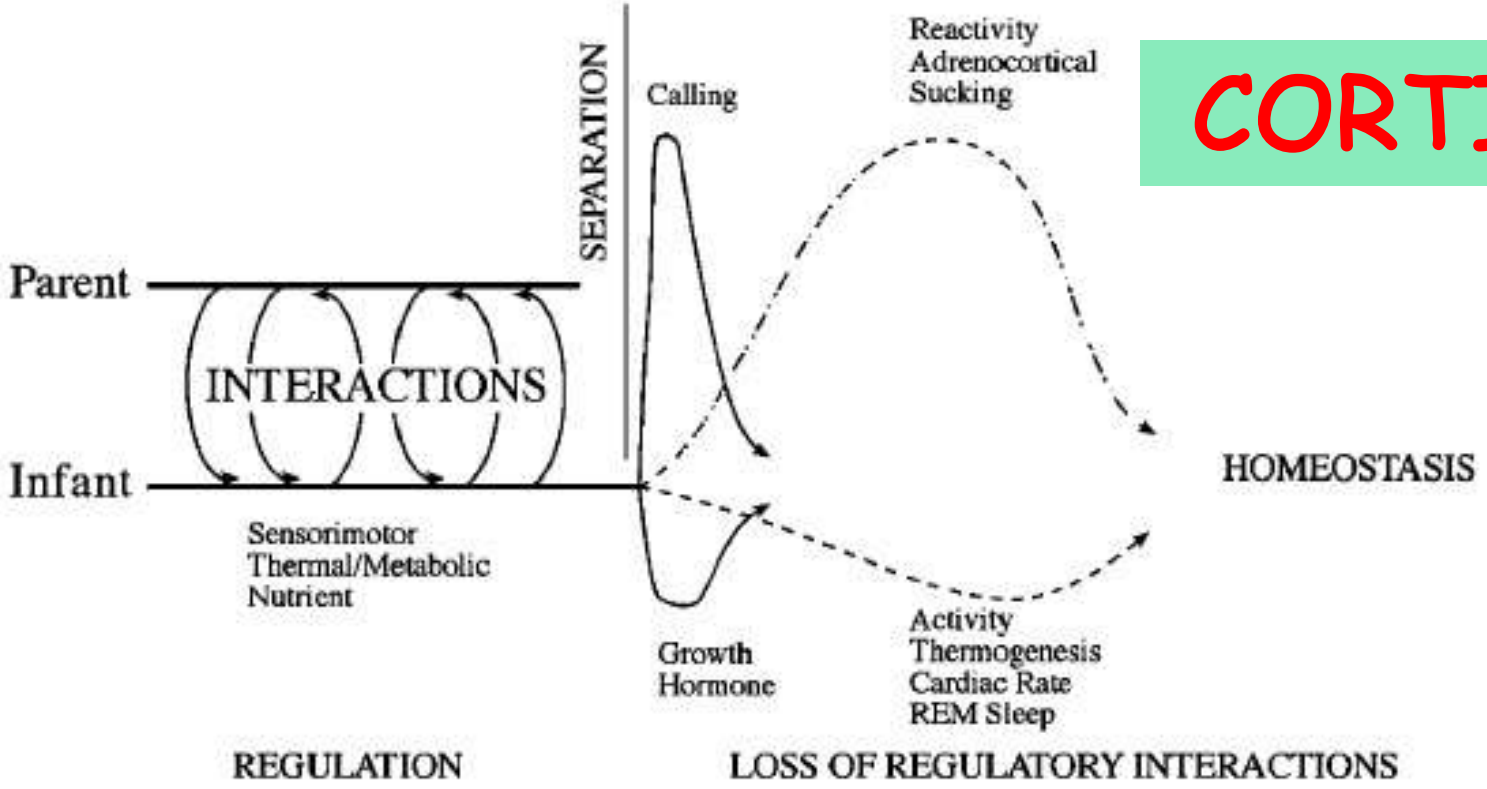
Toxic stress

OXYTOCIN

WHY IS EARLY MATERNAL SEPARATION STRESSFUL?

SEPARATION DYSREGULATES

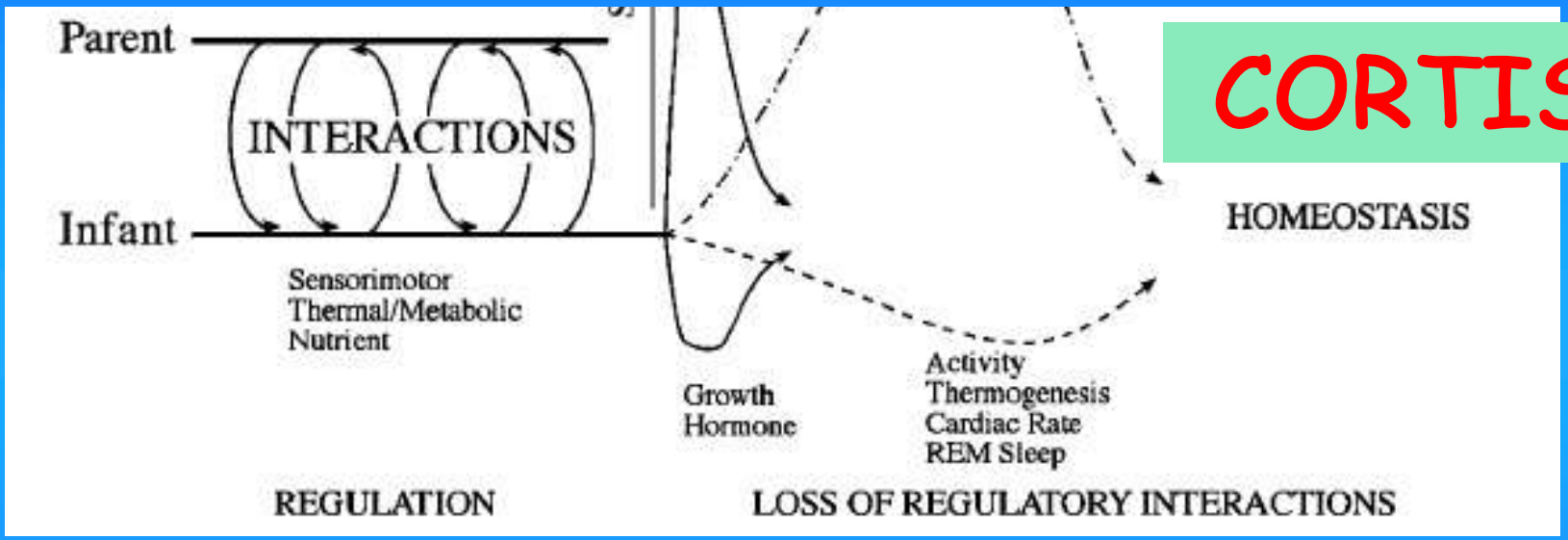
CORTISOL



OXYTOCIN

ntation of the dynamics of early-separation
he loss of regulatory interactions within the
mother–infant relationship.

WHY IS EARLY MATERNAL SEPARATION STRESSFUL?



CORTISOL

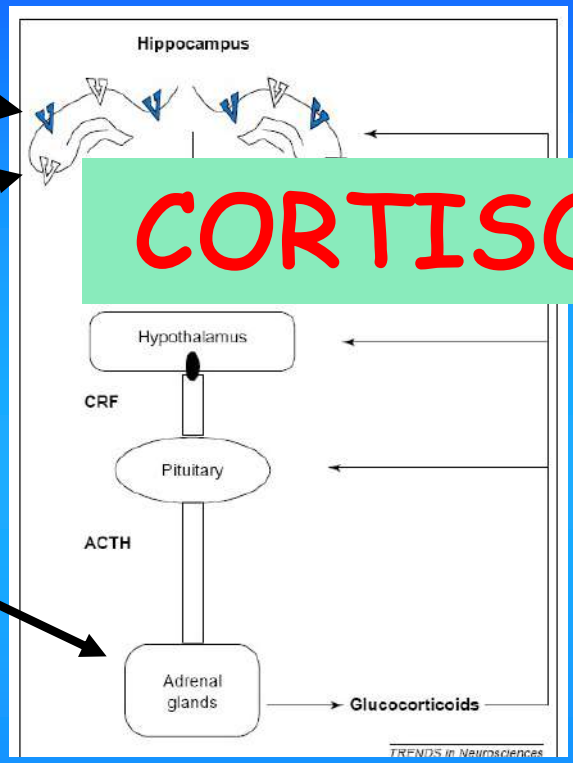
components (e.g., nutrient, thermal/metabolic, or sensorimotor) of the infant's previous interaction with its mother and that the complex response to separation was due to the withdrawal of all these components at once.

80% cortisol receptors in hippocampus

Not all possible receptors activated

Negative feedback loop

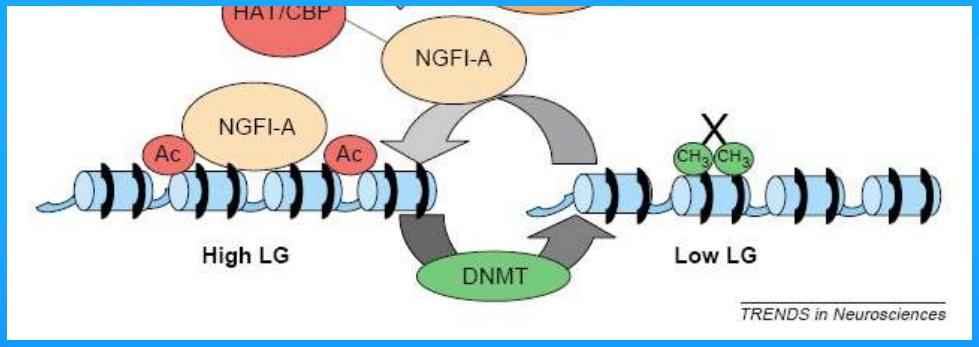
More receptors, sooner cortisol lowered

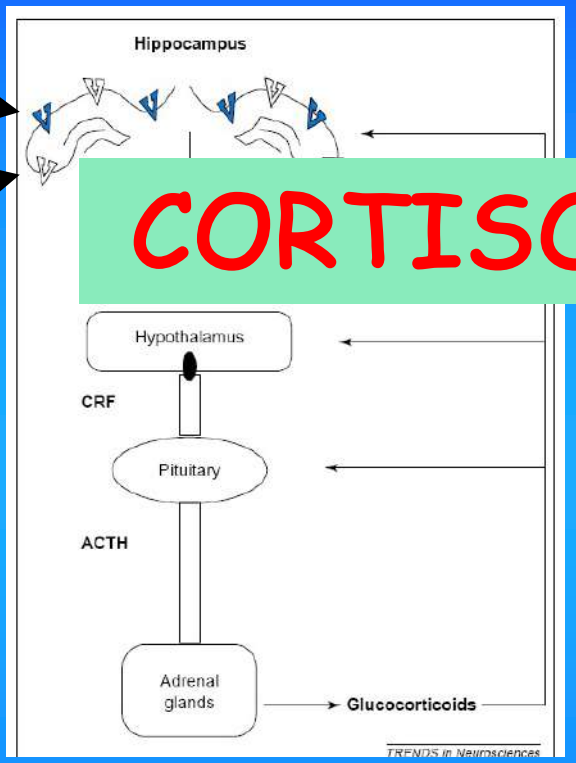


Unsafe environment activates HPA axis (autonomic nervous system, ANS).

80% cortisol receptors in hippocampus

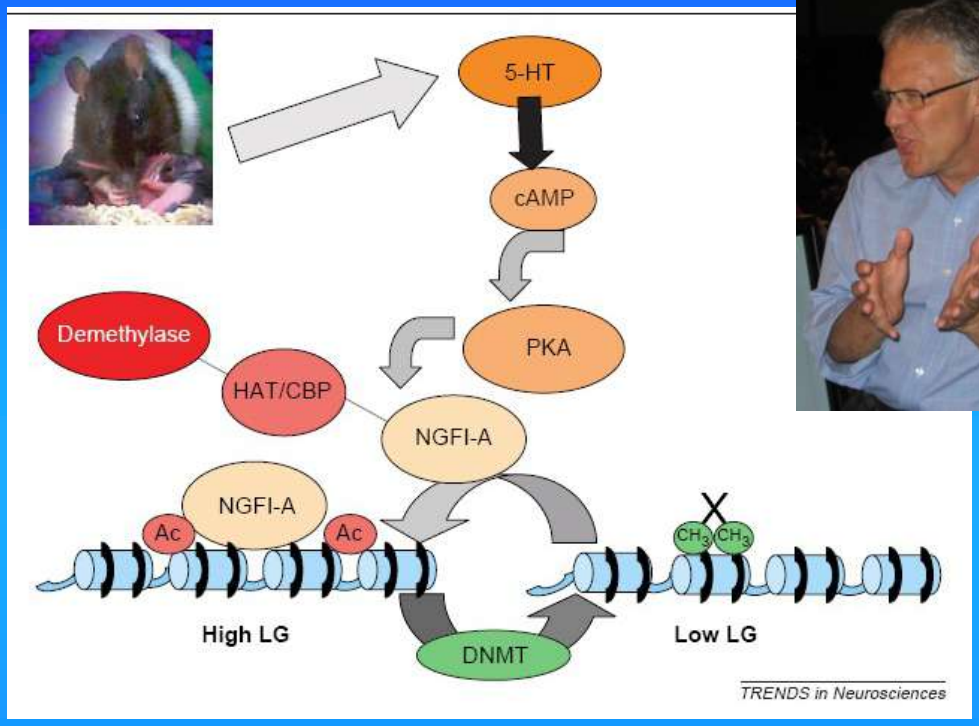
Not all possible receptors activated

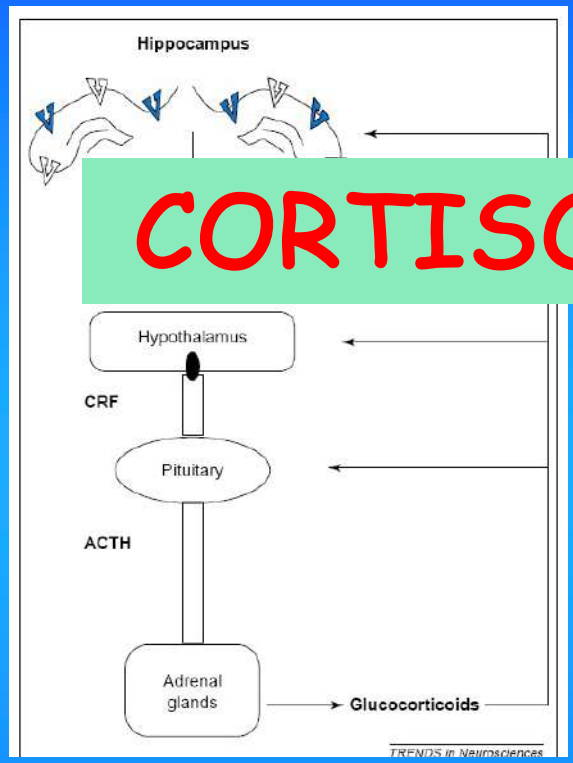




Unsafe environment activates HPA axis (autonomic nervous system, ANS).

MICHAEL MEANEY epigenetics





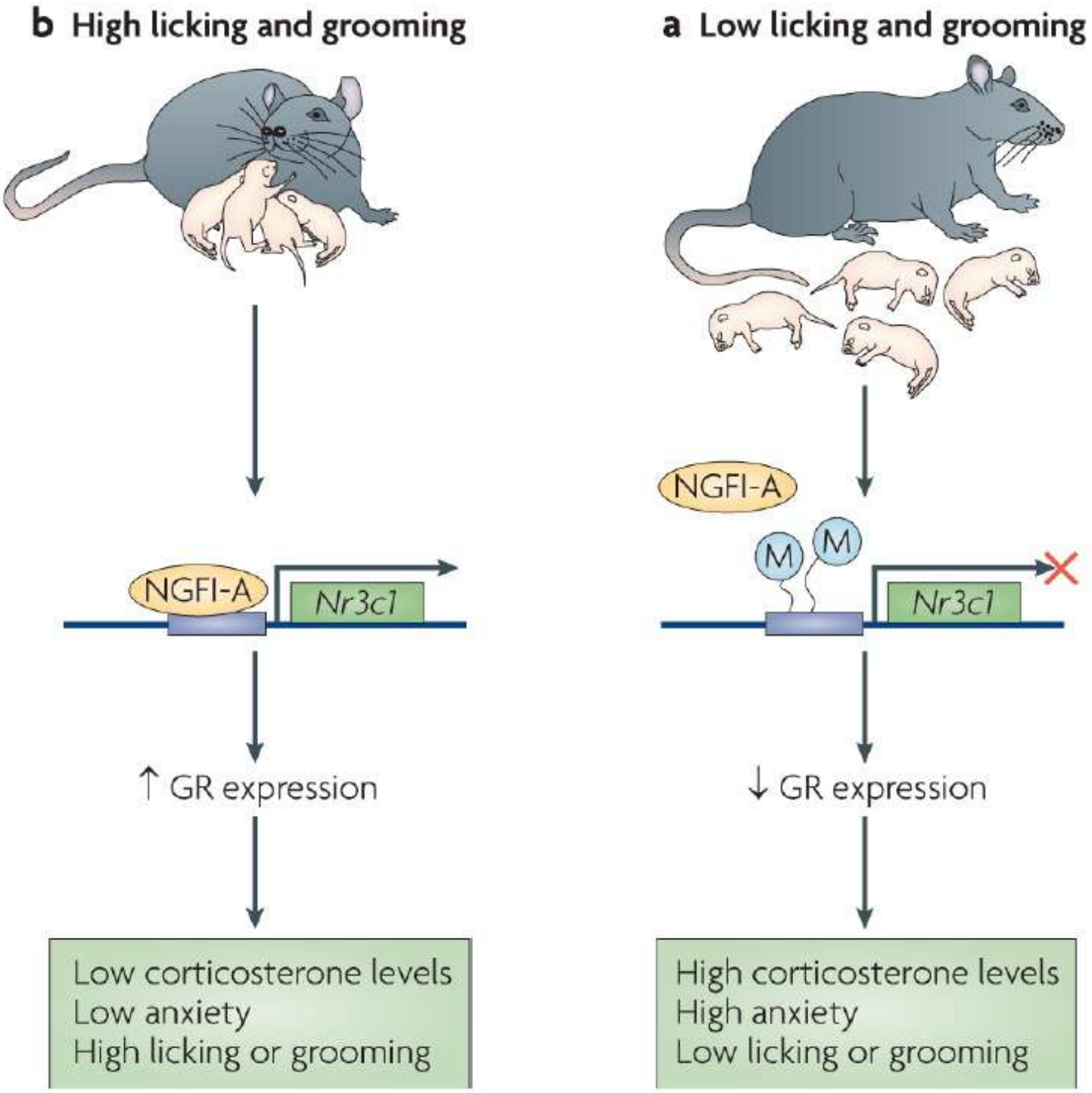
CORTISOL

Unsafe environment activates HPA axis (autonomic nervous system, ANS).

Psychobiology and molecular genetics of resilience

Adriana Feder*, Eric J. Nestler‡, and Dennis S. Charney‡

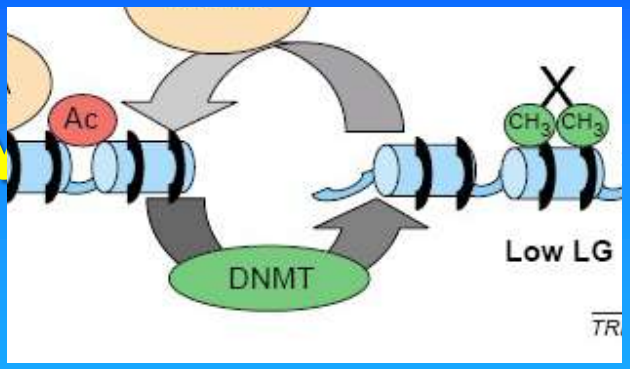
is associated with lower levels of baseline and post-
like behaviour and, in females, high levels of groo



MOTHER
HG - High Grooming

MOTHER
Low Grooming LG

HG BABY



LG BABY

Healthy adult

unhealthy adult

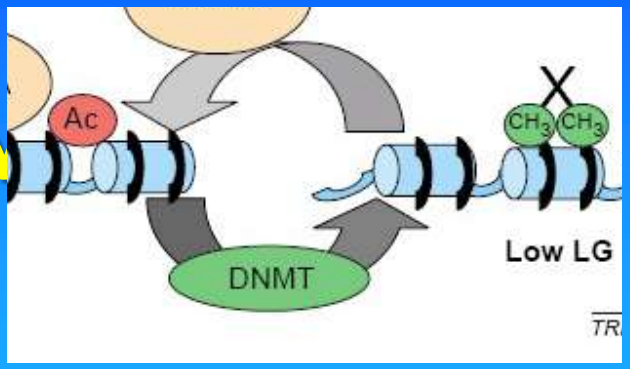
Makes MOTHER
HG – High Grooming

Makes MOTHER
Low Grooming - LG

MOTHER
HG - High Grooming

MOTHER
Low Grooming LG

HG BABY



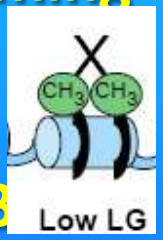
LG BABY

Healthy adult

UNHEAL
adult

Makes MOTHER
HG – High Grooming

Makes MOTHER
Low Grooming - LG



HG BABY

HG B

LOW Grooming care

CORTISOL

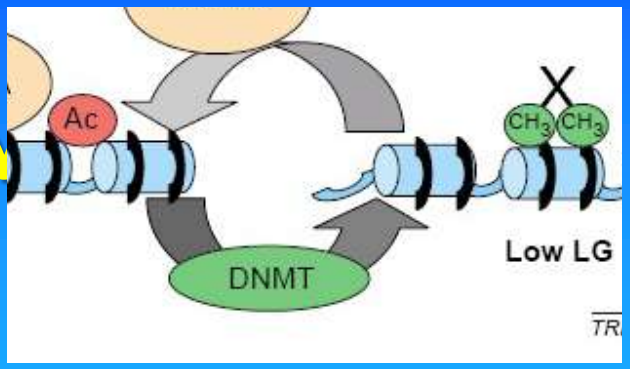
UNHEALTHY adult

Makes MOTHER
LOW Grooming LG

MOTHER
HG - High Grooming

MOTHER
Low Grooming LG

HG BABY



LG BABY

Healthy adult

Makes MOTHER
HG – High Grooming

UNHEAL adult

Makes MOTHER
Low Grooming - LG

Early stress alters gene expression, with health impact across lifespan.

REGULATION

Barak Morgan 2013

In simple system

ONLY environment → reversible

ice – water – steam

Early stress alters gene expression, with health impact across lifespan.

REGULATION

Barak Morgan 2013

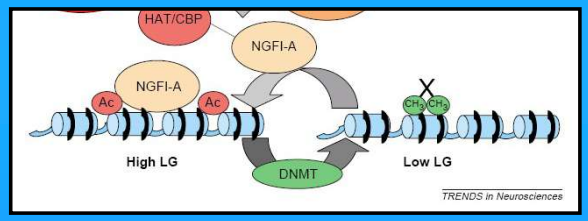
In simple system

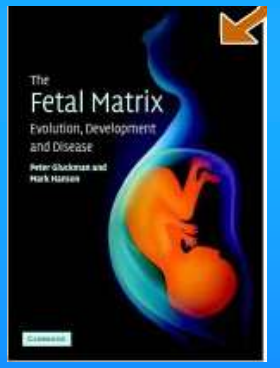
ONLY environment → reversible

ice – water – steam

In complex system –

irreversible = development



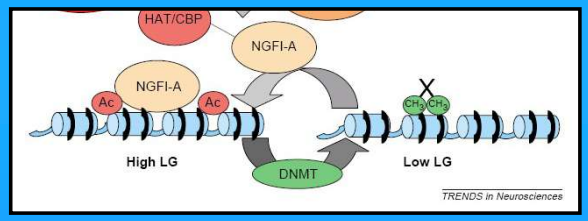


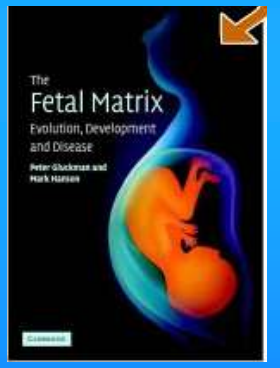
Early stress alters gene expression, with health impact across lifespan.

(PREDICTIVE ADAPTIVE RESPONSE)

CANALISATION Barak Morgan 2013

Developmental programming
is therefore
VERY EARLY
ONCE OFF
FOREVER





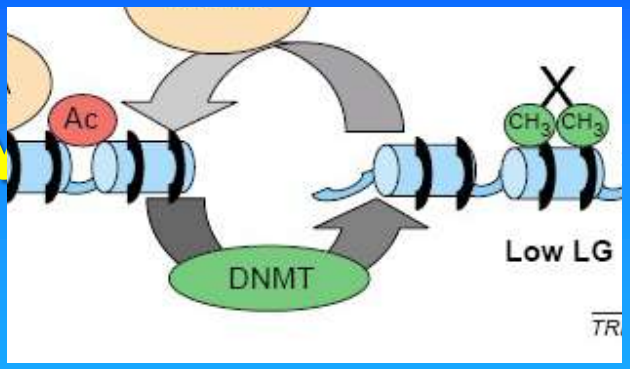
Early stress alters gene expression, with health impact across lifespan.

(PREDICTIVE ADAPTIVE RESPONSE)

MOTHER
HG - High Grooming

MOTHER
Low Grooming LG

HG BABY



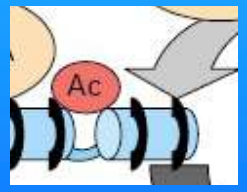
LG BABY

Healthy adult

UNHEAL adult

Makes MOTHER
HG – High Grooming

Makes MOTHER
Low Grooming - LG



LG BABY

LG BABY

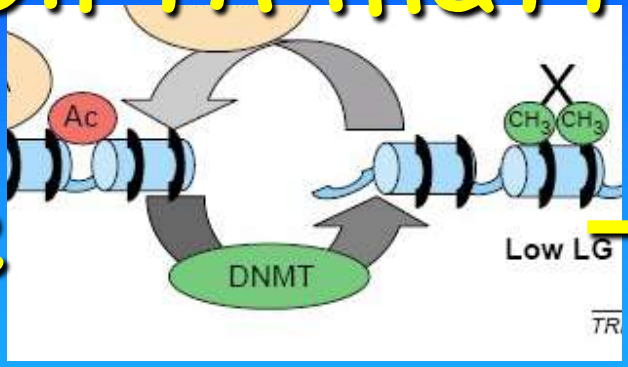
HIGH grooming care

HEALTHY adult

Makes MOTHER
HIGH Grooming HG

OXYTOCIN

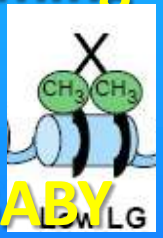
Earliest care at birth matters

Same gene 

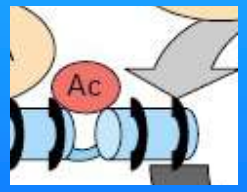
→ switched

Makes MOTHER
HG – High Grooming

Makes MOTHER
Low Grooming - LG



LG BABY



LG BABY

HIGH grooming care

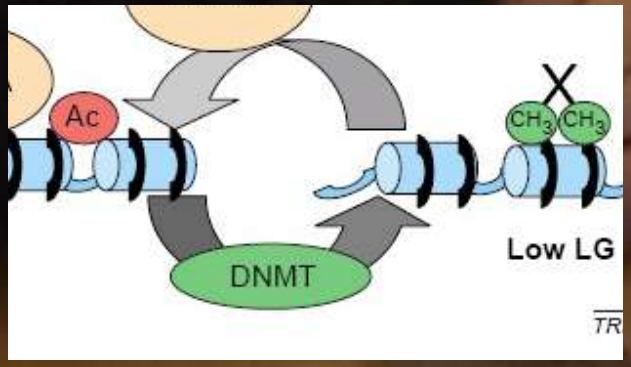
HEALTHY adult

Makes MOTHER
HIGH Grooming HG

OXYTOCIN

SEPARATION

Toxic stress



OXYTOCIN

CORTISOL

The Neuroscience of Birth & Breastfeeding

The DNA → The Brain → Behaviour

EPIGENETICS — NEURODEVELOPMENT — EVOLUTIONARY BIOLOGY

ENVIRONMENT → ADAPTATION → EXPERIENCE → REPRODUCTIVE FITNESS

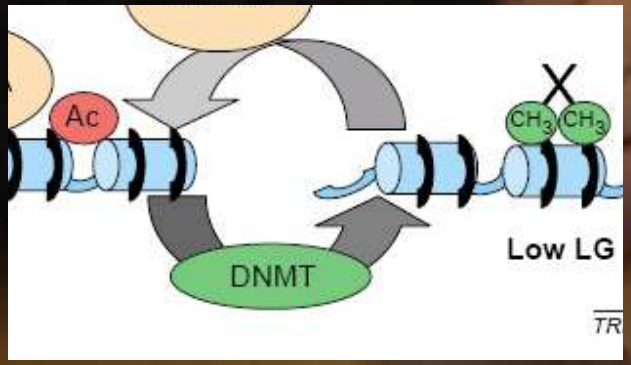
BABY

BIRTH

BONDING

SEPARATION

Toxic stress



OXYTOCIN

CORTISOL

The Neuroscience of Birth & Breastfeeding

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EPIGENETICS NEURODEVELOPMENT EVOLUTIONARY BIOLOGY

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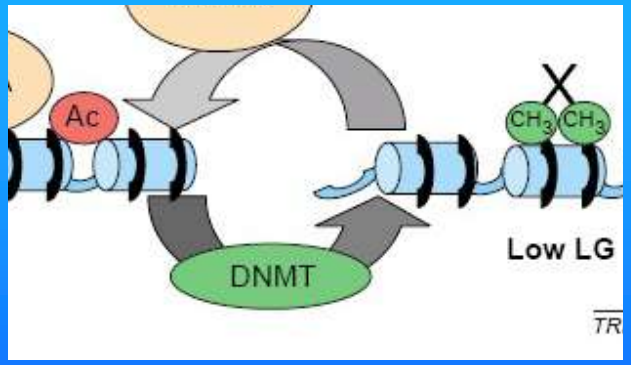
BABY

BIRTH

BONDING

SEPARATION

Toxic stress



OXYTOCIN

CORTISOL

Th Neuroscience f Birth & Breastfeeding

e DNA → Th Brain → Behaviour

EPIGEN NEURODEVELOPMENT EVOLUTIONARY BIOLOGY

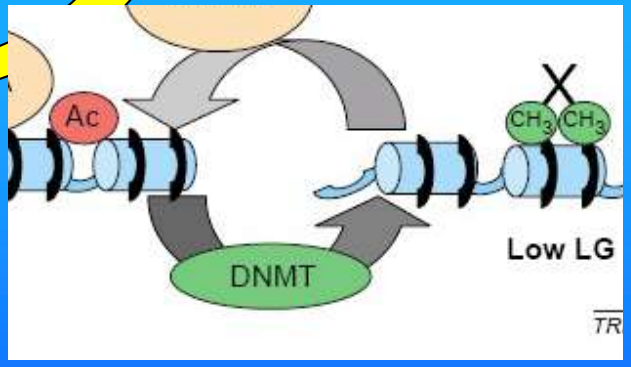
ENVIRONMENT ADAPTATION → EXPERIENCE → REPRODUCTIVE FITNESS

BABY

BIRTH BONDING

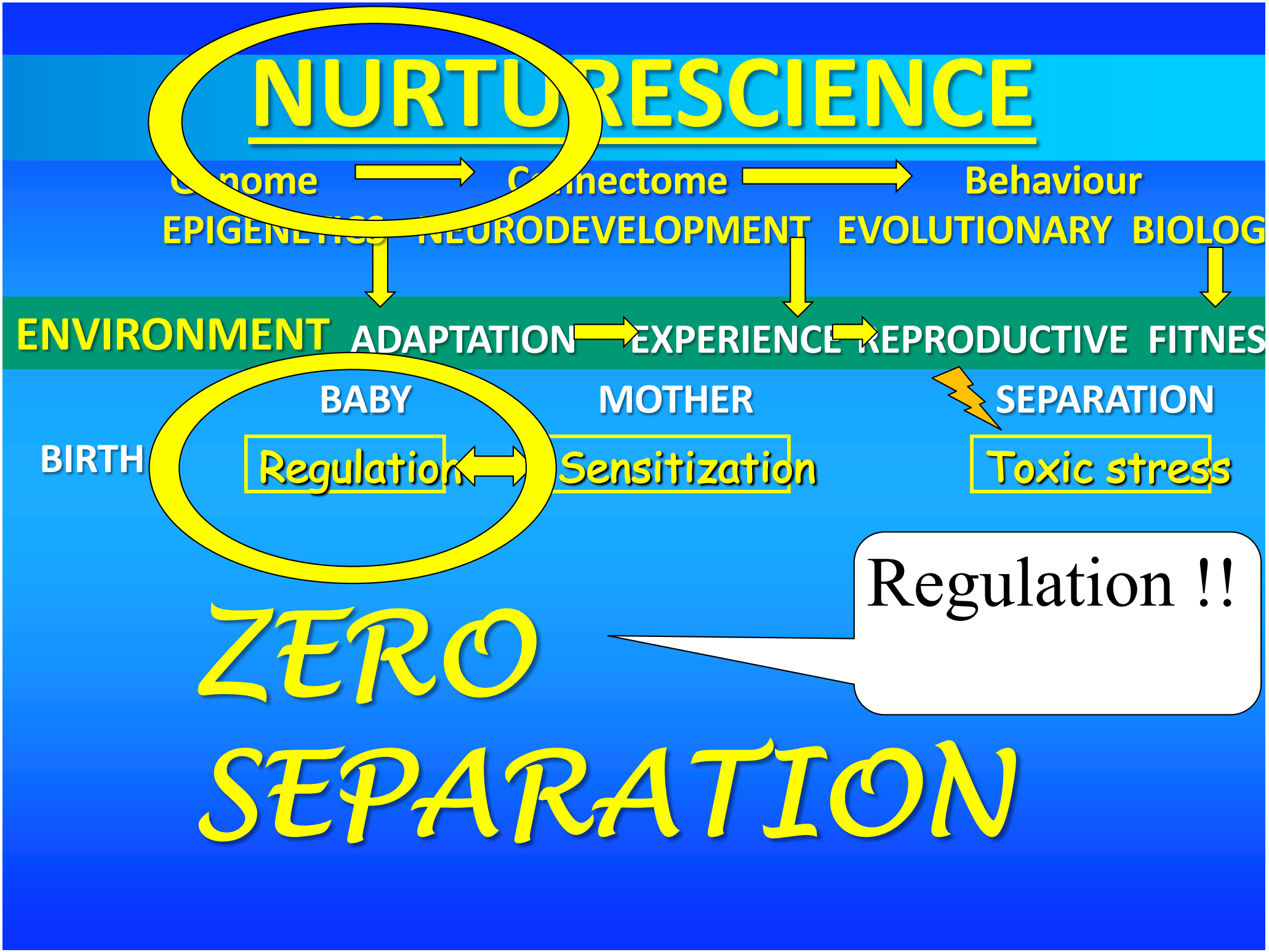
SEPARATION

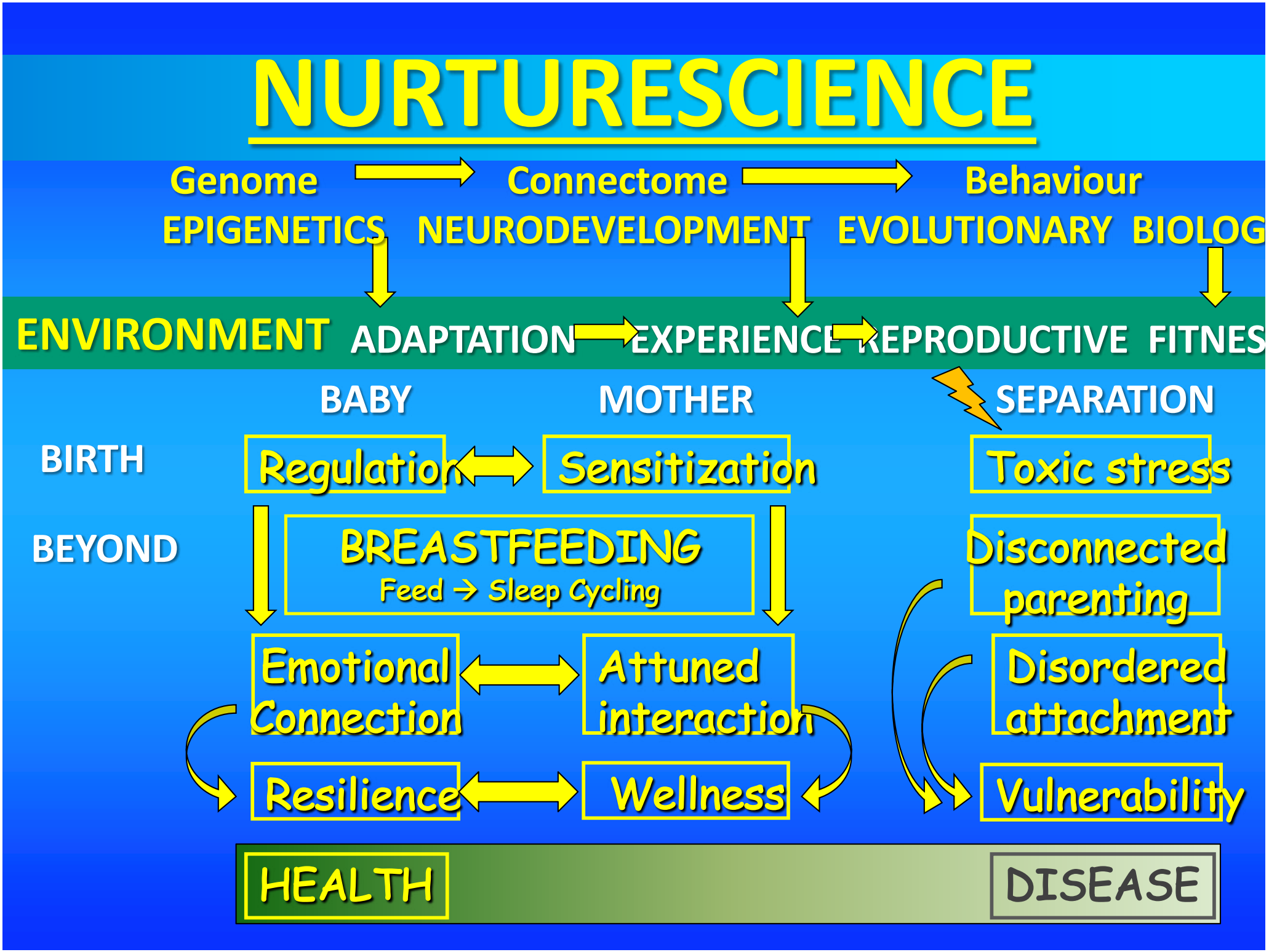
Toxic stress



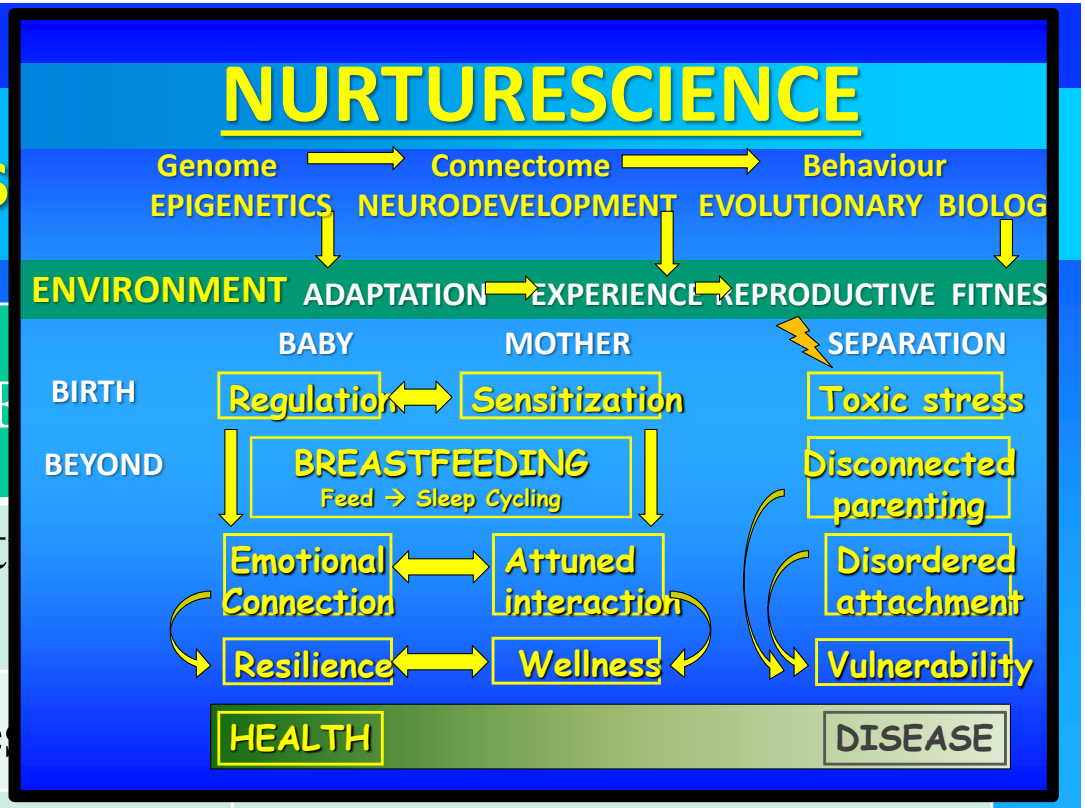
OXYTOCIN

CORTISOL


NURTURESCIENCE
Genome
Connectome
Behaviour
EPIGENETICS
NEURODEVELOPMENT
EVOLUTIONARY
BIOLOG
ENVIRONMENT
ADAPTATION
EXPERIENCE
REPRODUCTIVE
FITNES
BABY
MOTHER
SEPARATION
BIRTH
Regulation
Sensitization
Toxic stress
Regulation !!
ZERO
SEPARATION


NURTURESCIENCE
Genome
Connectome
Behaviour
EPIGENETICS
NEURODEVELOPMENT
EVOLUTIONARY
BIOLOG
ENVIRONMENT
ADAPTATION
EXPERIENCE
REPRODUCTIVE
FITNES
BABY
MOTHER
SEPARATION
BIRTH
Regulation
Sensitization
Toxic stress
BEYOND
BREASTFEEDING
Feed → Sleep Cycling
Disconnected parenting
Emotional Connection
Attuned interaction
Disordered attachment
Resilience
Wellness
Vulnerability
HEALTH
DISEASE

Comparison of nurtures

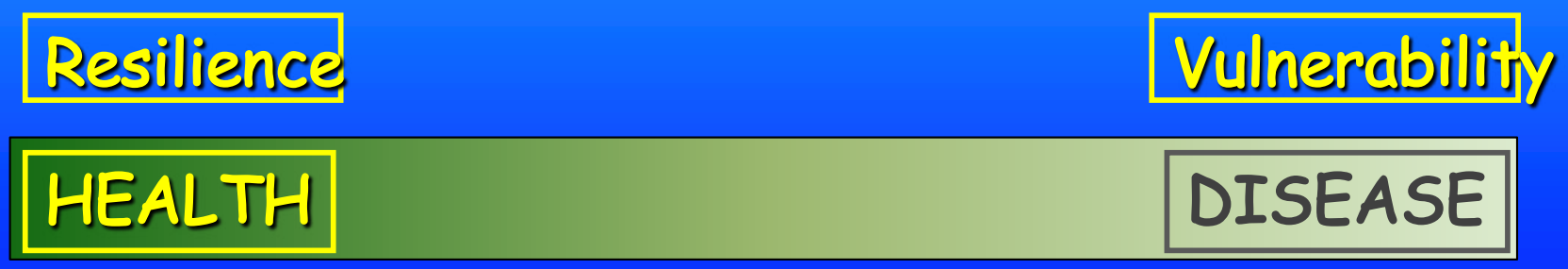


	NURTURESCIE	
Key time period	Perinatal, concept birth to 1 month	
	First 1000 minute	
ANS purpose	HOMEORHESIS	HOMEOSTASIS
	Dyadic / family (plural)	Individual (singular)
	Dynamic systems theory	Reductionistic logic
KEY OUT-COME	CONNECTION RESILIENCE	ATTACHMENT COGNITION

RESILIENCE

(= STRESS RESISTANCE)

"capacity to maintain healthy emotional functioning in the after-math of stressful experiences"

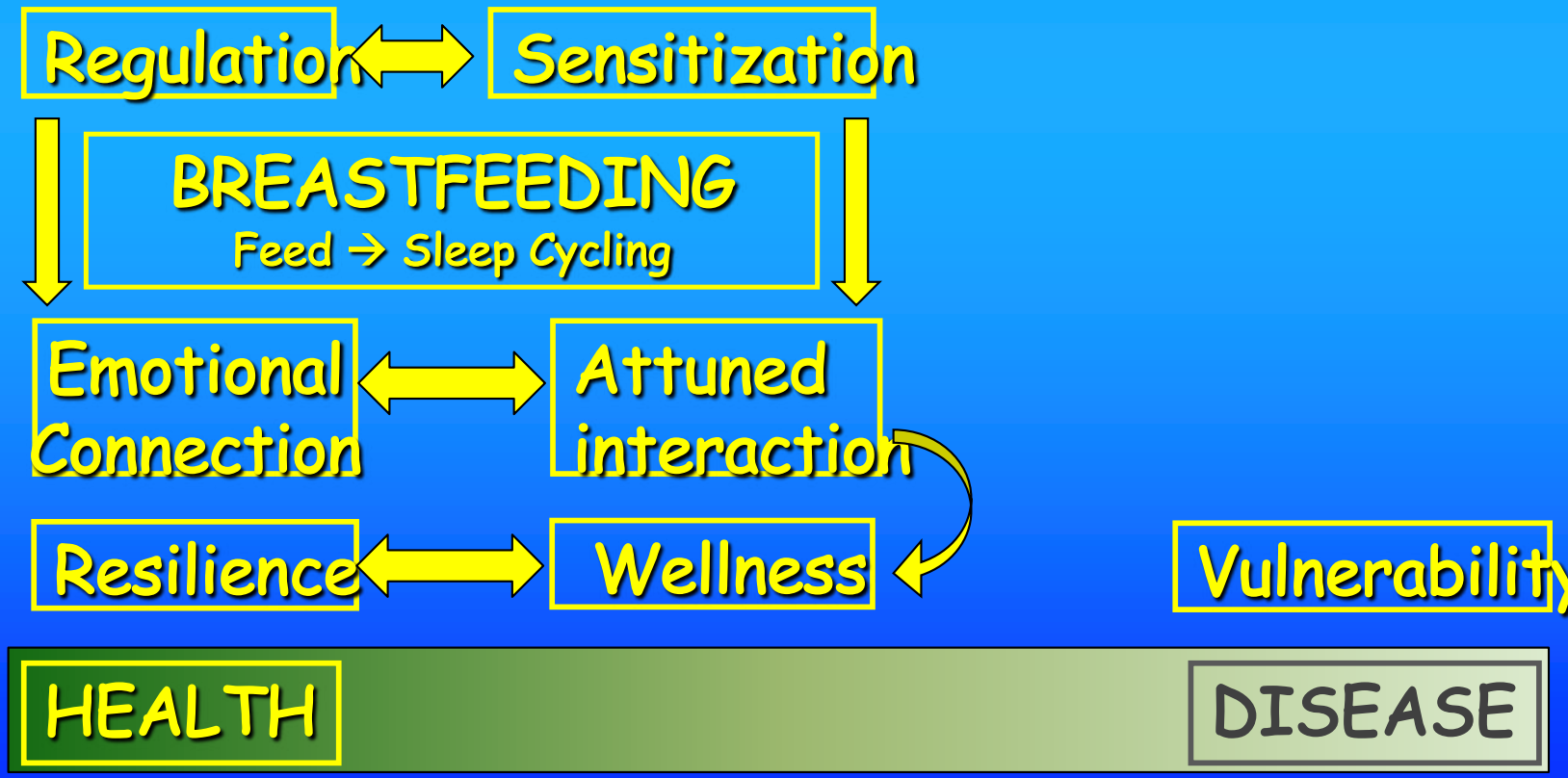


RESILIENCE

(= STRESS RESISTANCE)

REGULATION

Barak Morgan 2013



REGULATION

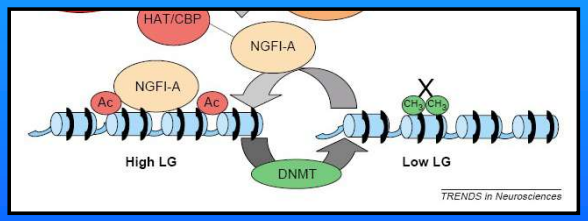
Barak Morgan 2013

In simple system

ONLY environment → reversible

ice – water – steam

In complex system –



irreversible = development

REGULATION

Barak Morgan 2013

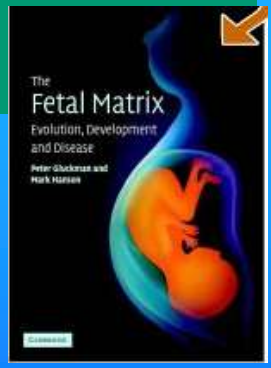
In simple system

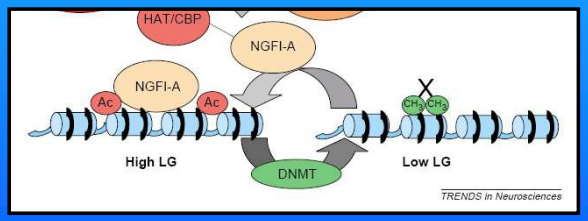
ONLY environment → reversible

ice – water – steam

The Place FITNESS EXPERIENCE ADAPTATION ENVIRONMENT

(PREDICTIVE ADAPTIVE RESPONSE)





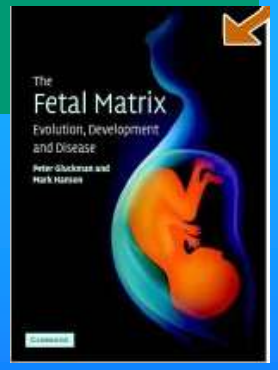
In complex system –

irreversible = development

CANALISATION Barak Morgan 2013

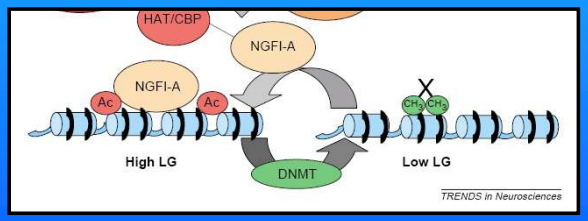
Developmental programming is therefore

The Place ENVIRONMENT **FITNESS** **EXPERIENCE** **ADAPTATION**

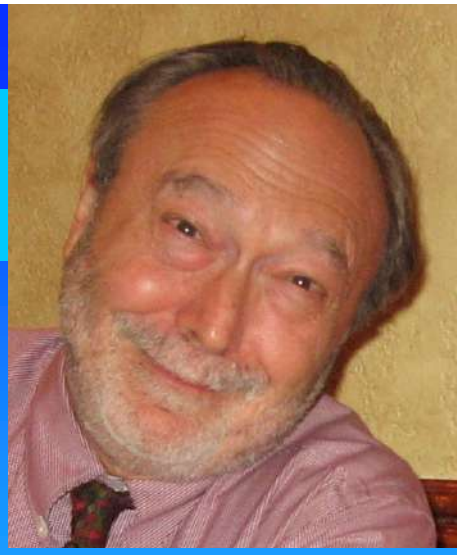


(PREDICTIVE ADAPTIVE RESPONSE)

VERY EARLY
ONCE OFF
FOREVER



CANALISATION



Porges proposes term :

"neuroception"

→ neural process that evaluates risk

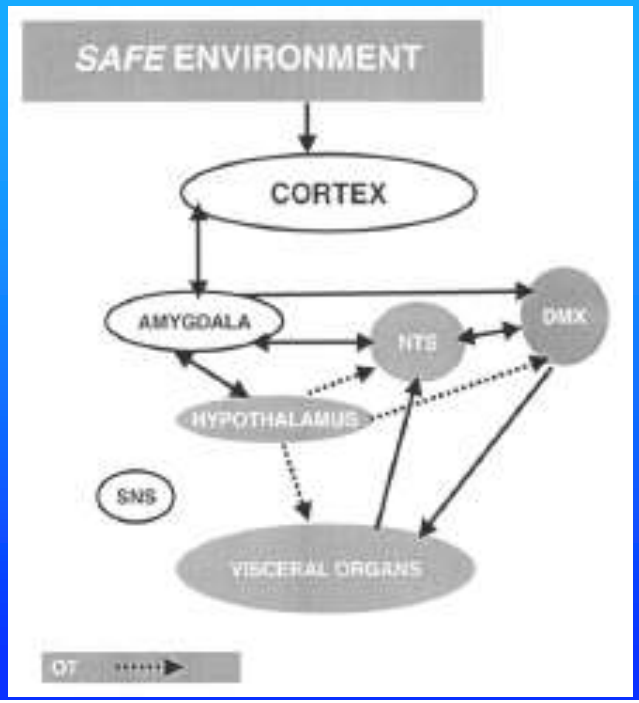
safe
dangerous
life threatening

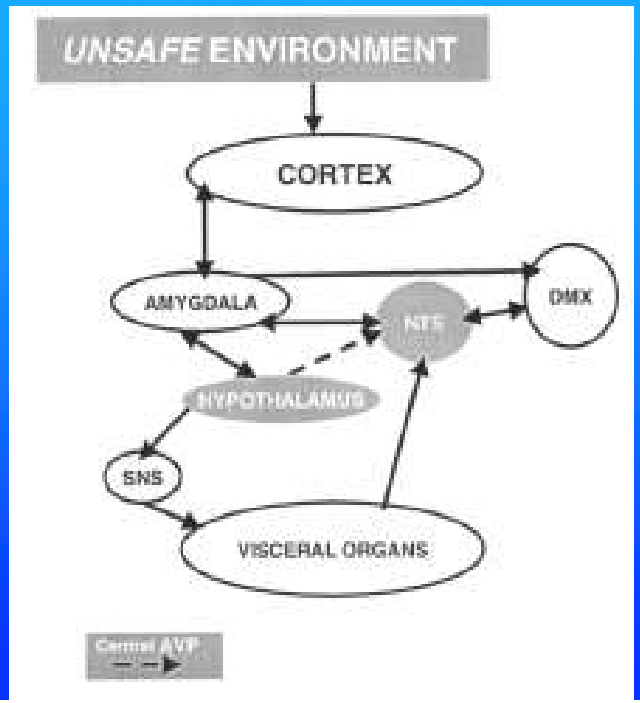
(5) A proposed neural process, neuroception, that evaluates risk and modulates vagal output via higher brain structures.

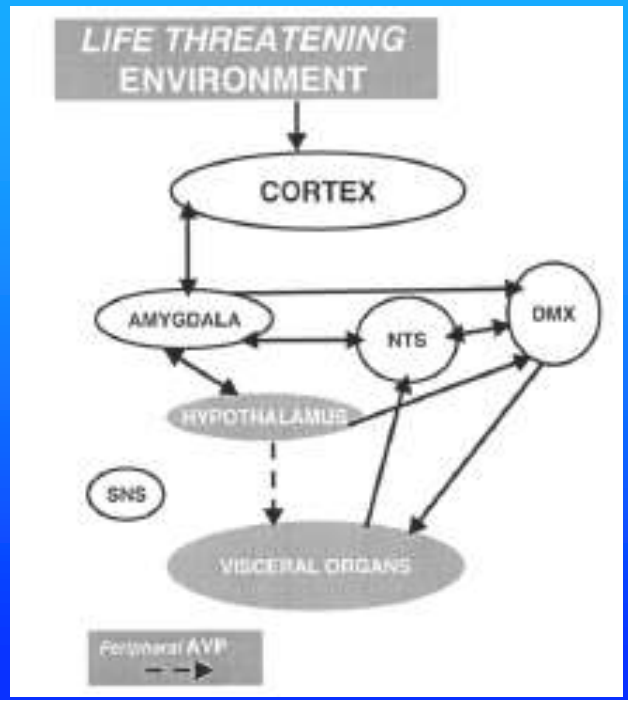
CANALISATION

Porges →
same neural circuitry,
adapted to circumstance

OXYTOCIN VASOPRESSIN CORTISOL







Perry: Responses to threat

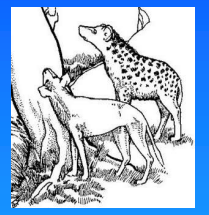
Adaptative Response	**REST (Adult Male)**
Hyperarousal Continuum	**REST (Male Child)**
Dissociative Continuum	**REST (Female Child)**
PRIMARY secondary Brain Areas	**NEOCORTEX Subcortex**
Cognition	**ABSTRACT**
Mental State	**CALM**

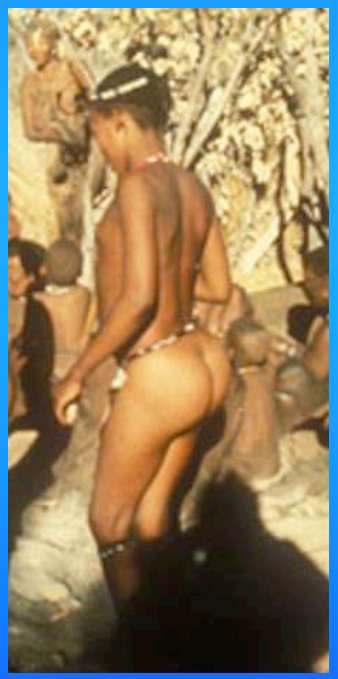
OXYTOCIN

Perry: Responses to threat - FAR

Adaptative Response	**REST (Adult Male)**	**VIGILANCE**
Hyperarousal Continuum	**REST (Male Child)**	**VIGILANCE (Crying)**
Dissociative Continuum	**REST (Female Child)**	**AVOIDANCE (Crying)**
PRIMARY secondary Brain Areas	**NEOCORTEX Subcortex**	**SUBCORTEX Limbic**
Cognition	**ABSTRACT**	**CONCRETE**
Mental State	**CALM**	**AROUSAL**

Vasopressin



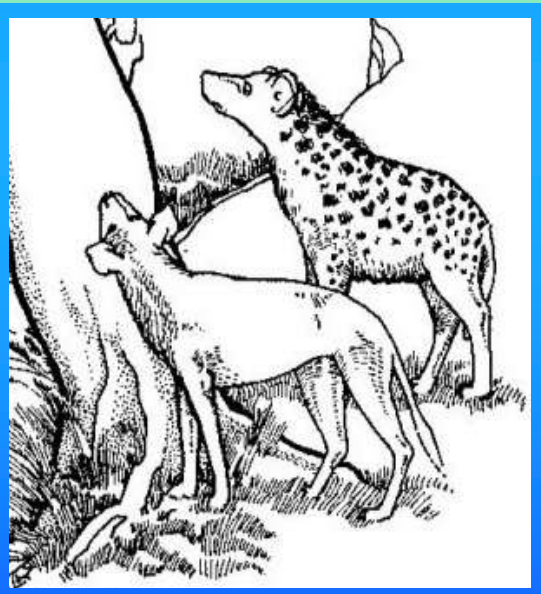


VIGILANCE

Perry: Responses to threat - NEAR

Adaptative Response	**REST (Adult Male)**	**VIGILANCE**	**FREEZE**
Hyperarousal Continuum	**REST (Male Child)**	**VIGILANCE (Crying)**	**RESISTANCE Freeze**
Dissociative Continuum	**REST (Female Child)**	**AVOIDANCE (Crying)**	**COMPLIANCE Freeze**
PRIMARY secondary Brain Areas	**NEOCORTEX Subcortex**	**SUBCORTEX Limbic**	**LIMBIC Midbrain**
Cognition	**ABSTRACT**	**CONCRETE**	**'EMOTIONAL'**
Mental State	**CALM**	**AROUSAL**	**FEAR**

CORTISOL



FREEZE

Perry: Responses to threat

Adaptative Response	**REST (Adult Male)**	**VIGILANCE**	**FREEZE**	**FLIGHT**
Hyperarousal Continuum	**REST (Male Child)**	**VIGILANCE (Crying)**	**RESISTANCE Freeze**	**DEFIANCE 'Posturing'**
Dissociative Continuum	**REST (Female Child)**	**AVOIDANCE (Crying)**	**COMPLIANCE Freeze**	**DISSOCIATION 'Numbing'**
PRIMARY secondary Brain Areas	**NEOCORTEX Subcortex**	**SUBCORTEX Limbic**	**LIMBIC Midbrain**	**MIDBRAIN Brainstem**
Cognition	**ABSTRACT**	**CONCRETE**	**'EMOTIONAL'**	**REACTIVE**
Mental State	**CALM**	**AROUSAL**	**FEAR**	**TERROR**

DISSOCIATION

Perry: Responses to threat

Adaptative Response	**REST (Adult Male)**	**VIGILANCE**	**FREEZE**	**FLIGHT**	**FIGHT**
Hyperarousal Continuum	**REST (Male Child)**	**VIGILANCE (Crying)**	**RESISTANCE Freeze**	**DEFIANCE 'Posturing'**	**AGGRESSION**
Dissociative Continuum	**REST (Female Child)**	**AVOIDANCE (Crying)**	**COMPLIANCE Freeze**	**DISSOCIATION 'Numbing'**	**FAINTING 'Mini-psychosis'**
PRIMARY secondary Brain Areas	**NEOCORTEX Subcortex**	**SUBCORTEX Limbic**	**LIMBIC Midbrain**	**MIDBRAIN Brainstem**	**BRAINSTEM Autonomic**
Cognition	**ABSTRACT**	**CONCRETE**	**'EMOTIONAL'**	**REACTIVE**	**REFLEXIVE**
Mental State	**CALM**	**AROUSAL**	**FEAR**	**TERROR**	

REFLEXIVE

Cerebral Cortex January 2008;18:145-150
doi:10.1093/cercor/bhm040
Advance Access publication May 8, 2007

Rising Sound Intensity: An Intrinsic Warning Cue Activating the Amygdala

Dominik R. Bach[1], Hartmut Schächinger[2], John G. Neuhoff[3], Fabrizio Esposito[4], Francesco Di Salle[5], Christoph Lehmann[1], Marcus Herdener[1], Klaus Scheffler[6] and Erich Seifritz[1,7]

Rising intensity sounds produced neural activity in the amygdala, which was accompanied by activity in intraparietal sulcus, superior temporal sulcus, and temporal plane. Our results indicate that rising sound intensity is an elementary warning cue eliciting adaptive responses by recruiting attentional and physiological resources.

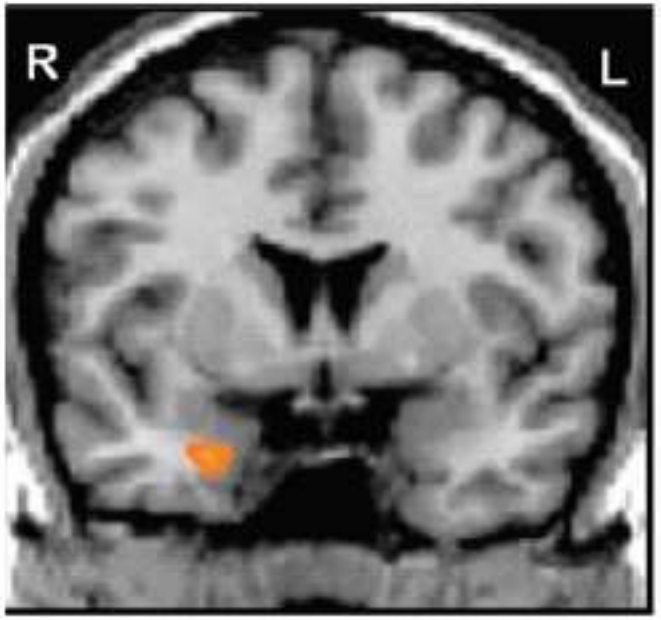


Figure 3. Activation of the right amygdala (left), the left temporal compared to falling sound intensity.

SSHHH!!

amygdala and left temporal areas. This provides direct evidence for the warning properties of rising sound intensity. STS and

Moro reflex –
often called a
STARTLE REFLEX

because it occurs when a baby is startled by a loud sound or movement


minion
AEG

Moro reflex
STARTLE

Thumb flex
finger claw

FREEZE

Perry: Responses to threat

Adaptative Response	**REST (Adult Male)**	**VIGILANCE**	**FREEZE**	**FLIGHT**
Hyperarousal Continuum	**REST (Male C**	**VIGILANCE (Crying)**	**RESISTANCE Freeze**	**DE NCE 'Postur**
Dissociative Continuum	**REST (Female Child)**	**AVOIDANCE (Crying)**	**COMPLIANCE Freeze**	**DISSOCIATION 'Numbing'**
PRIMARY secondary Brain Areas	**NEOCORTEX Subcortex**	**SUBCO Limbic**	**LIMBIC**	**MIDBRAI**
Cognition	**ABSTRACT**	**CONCRETE**	**'EMOTIONAL'**	**REACTIVE**
Mental State	**CALM**	**AROUSAL**	**FEAR**	**TERROR**

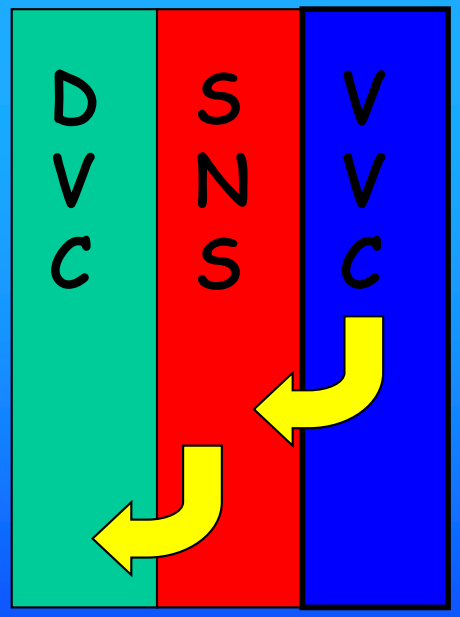
DISSOCIATION

Jacksonian Dissolution

CORTISOL

The more threatened the individual, the more 'primitive' (or regressed) becomes the style of thinking and behaving.

Perry 1995



Toxic Stress

CORTISOL

- Strong and prolonged activation of the body's stress management systems in the absence of the buffering protection of adult support.
- Disrupts brain architecture and leads to stress management systems that respond at relatively lower thresholds, thereby increasing the risk of stress-related physical and mental illness.

Slide by: Jack P. Shonkoff, M.D.

Primate separation studies

Primate separation studies

Development/Plasticity/Repair

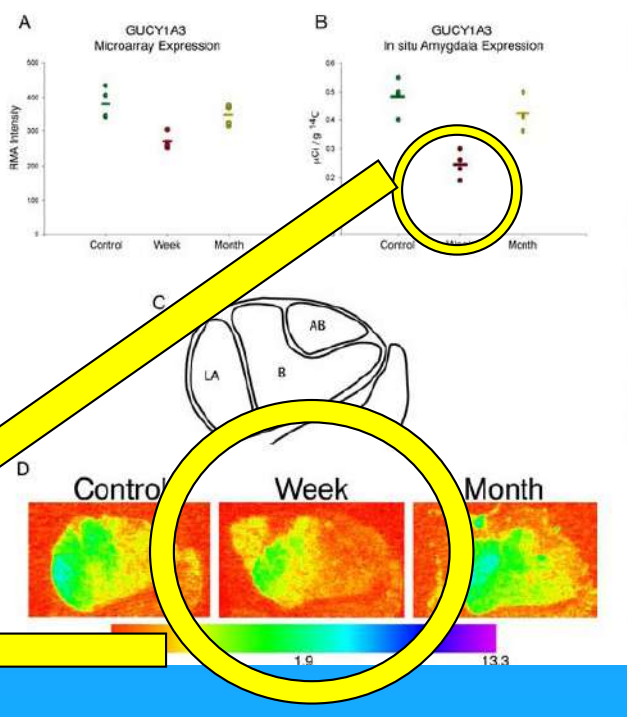
Amygdala Gene Expression Correlates of Social Behavior in Monkeys Experiencing Maternal Separation

Children exposed to early parental loss from death or separation carry a greater risk for developing future psychiatric illnesses, such as major depression and anxiety. Monkeys experiencing maternal separation at 1 week of age show fewer social behaviors and an increase in self-comforting behaviors (e.g., thumb sucking) over development, whereas in contrast, monkeys experiencing maternal separation at 1 month of age show increased seeking of social comfort later in life. We sought to identify neural systems that may underlie these

Maternal Separation Paradigm

	0w	1w	2w	3w	4w	5w	6w → → 12w
n 4	Mat	MNS → group reared no mother					
n 4	Mat →	→	→	MNS → group as above			
n 4	Mat →	→	→	→	→	→	(control)

Gene specific for the AMYGDALA (GUYC1A3)

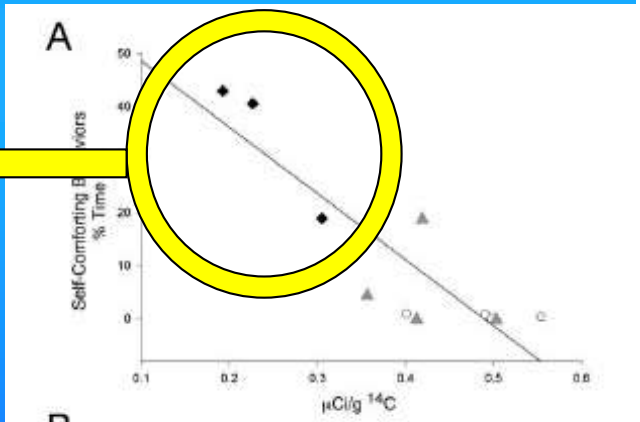


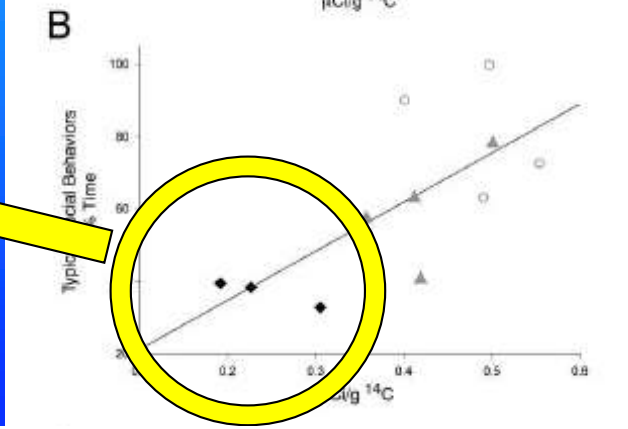
Separated at 1 week:

LOW gene expression

Increased self soothing → Anxiety

Decreased sociality → Depression



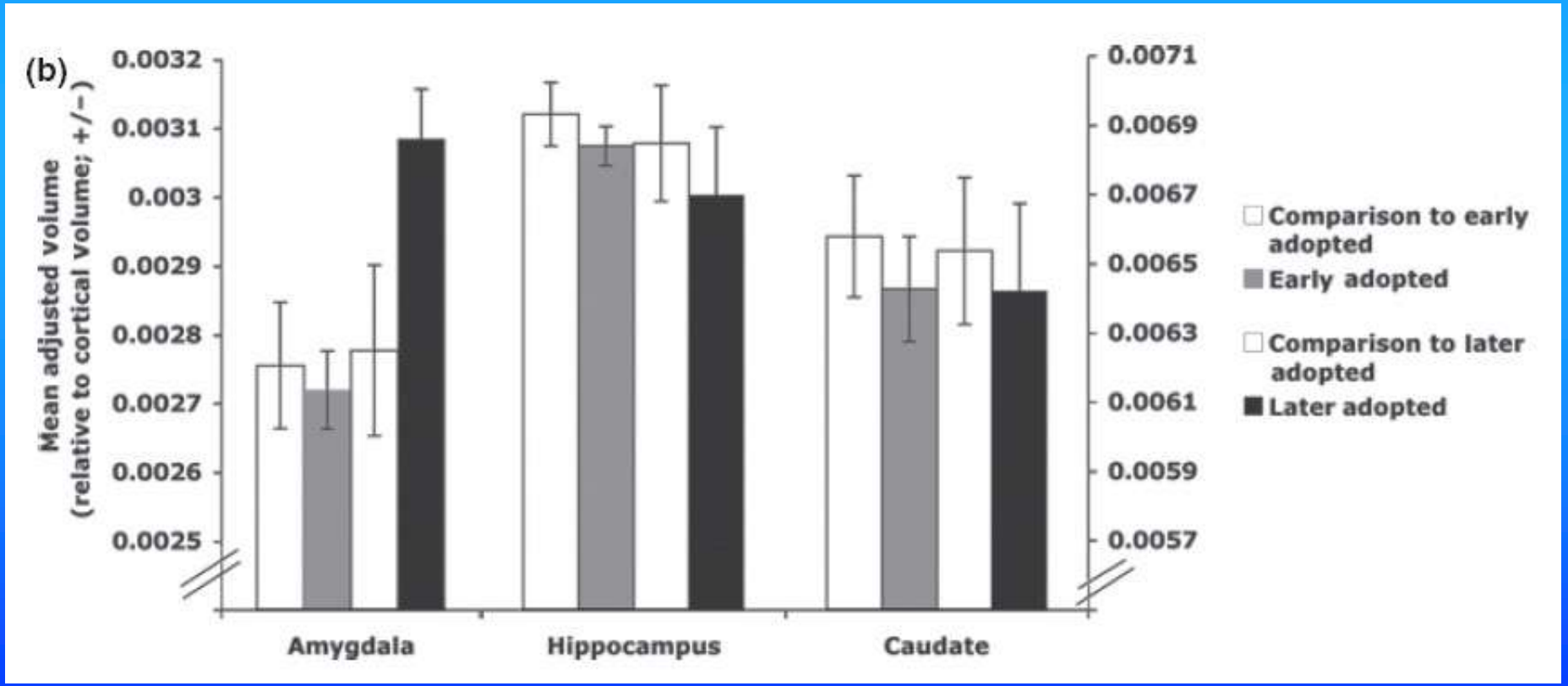


Developmental Science

Developmental Science 13:1 (2010), pp 46–61 DOI: 10.1111/j.1467-7687.2009

PAPER

Prolonged institutional rearing is associated with atypically large amygdala volume and difficulties in emotion regulation



Primate separation studies

Primate Early Life Stress Leads to Long-Term Mild Hippocampal Decreases in Corticosteroid Receptor Expression

Dimitrula Arabadzisz, Rochellys Diaz-Heijtz, Irene Knuesel, Elisabeth Weber, Sonia Pilloud, Andrea C. Dettling, Joram Feldon, Amanda J. Law, Paul J. Harrison, and Christopher R. Pryce

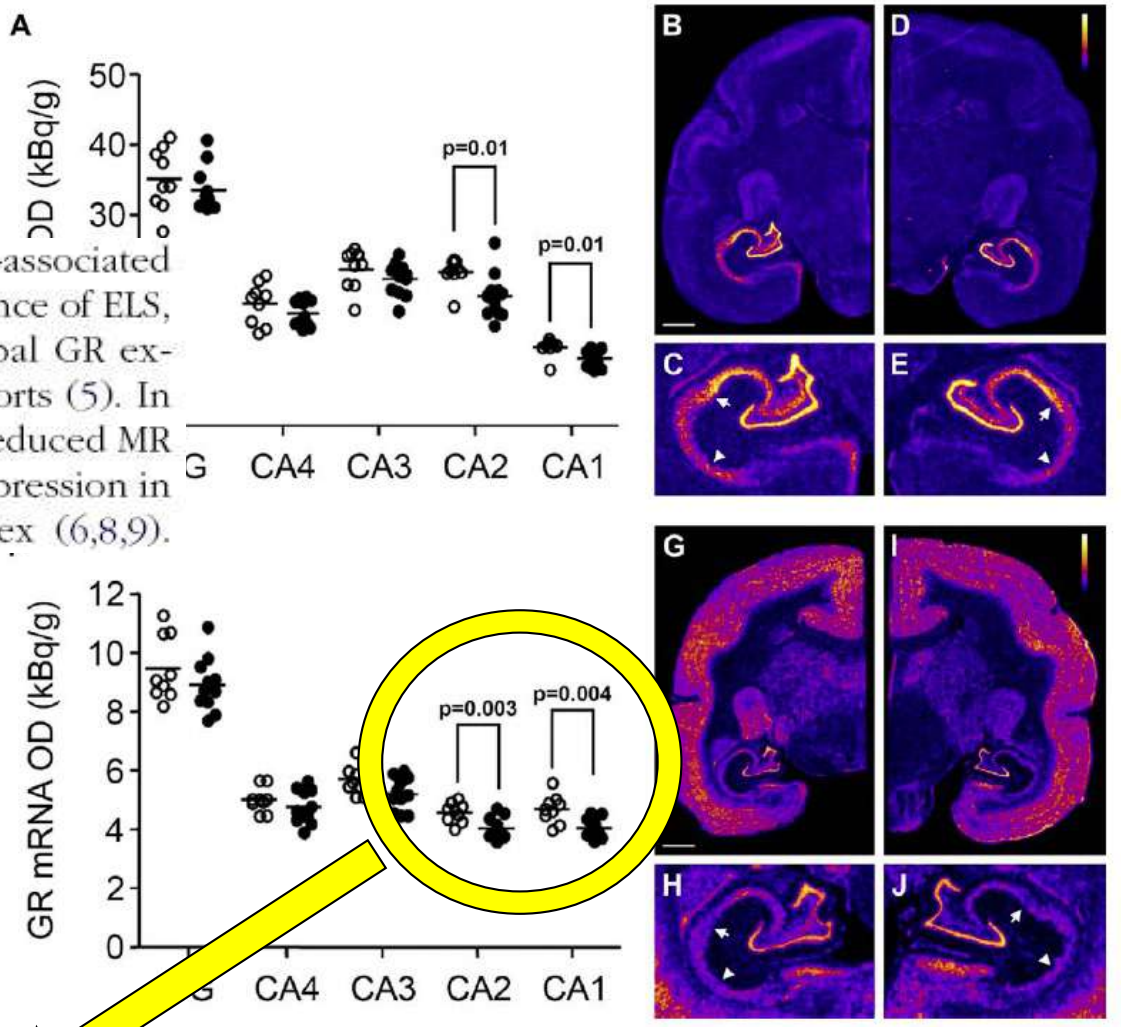
Depression is predicted by prior early life stress (ELS), such as parent–infant/child neglect or abuse (1,2), but mediating mechanisms and processes are not well-

Maternal Separation Paradigm

Early Deprivation (ED) vs control (CON)

	0d	2d	→	→28d	→	→	48w
ED n 11	Mat	30 -120 min daily			→		
CON n 4	Mat	→	→	→	→	→	48w

adult human probands who committed depression-associated suicide were separated according to presence or absence of ELS, the ELS/suicide cohort exhibited reduced hippocampal GR expression relative to non-ELS/suicide and control cohorts (5). In depression with unknown early life history, there is reduced MR expression in hippocampus (6,7) and reduced GR expression in hippocampus, prefrontal cortex, and temporal cortex (6,8,9).



Repeated short separations:

LOW gene expression

Correlate to human adult depression

Maternal support in early childhood predicts larger hippocampal volumes at school age

Joan L. Luby[a,1], Deanna M. Barch[a,b,c], Andy Belden[a], Michael S. Gaffrey[a], Rebecca Tillman[a], Casey Babb[a], Tomoyuki Nishino[a], Hideo Suzuki[a], and Kelly N. Botteron[a,c]

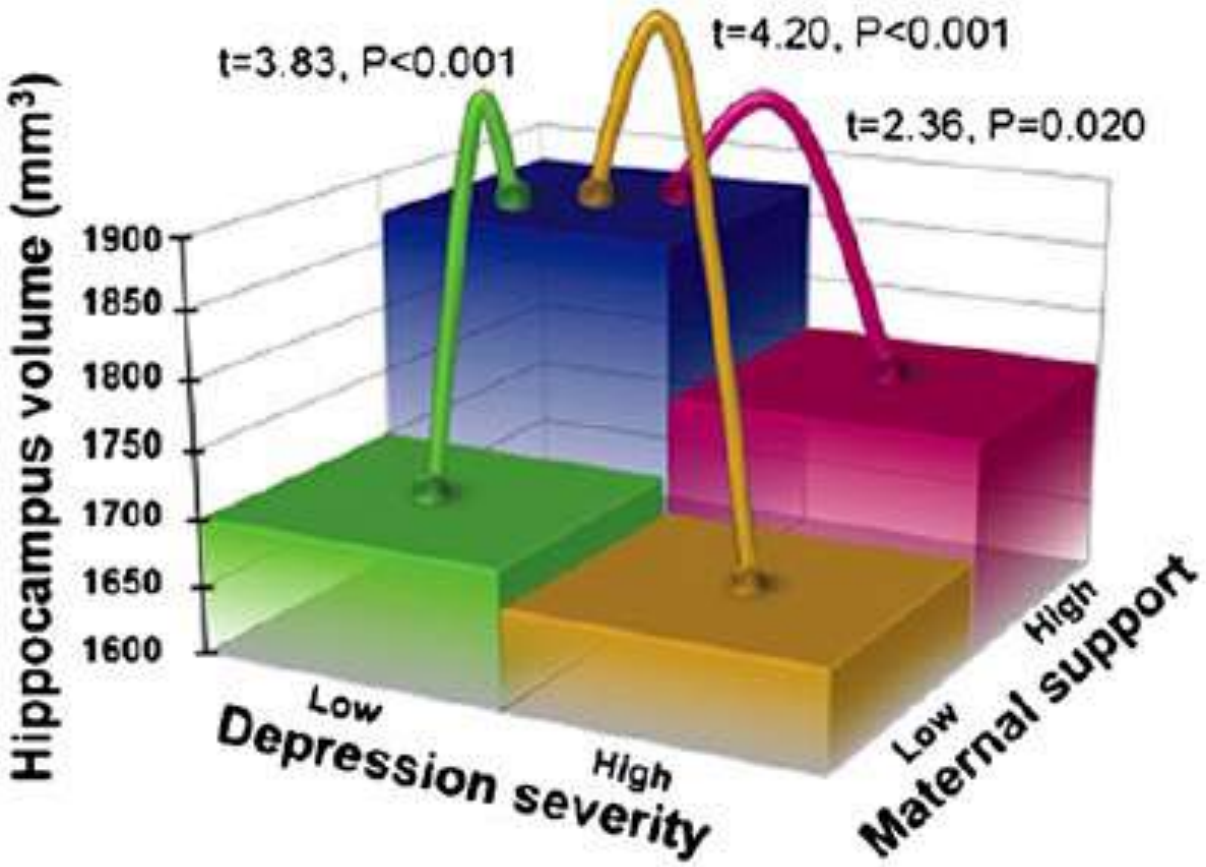


Fig. 2. Hippocampus volume by preschool depression severity and maternal support.

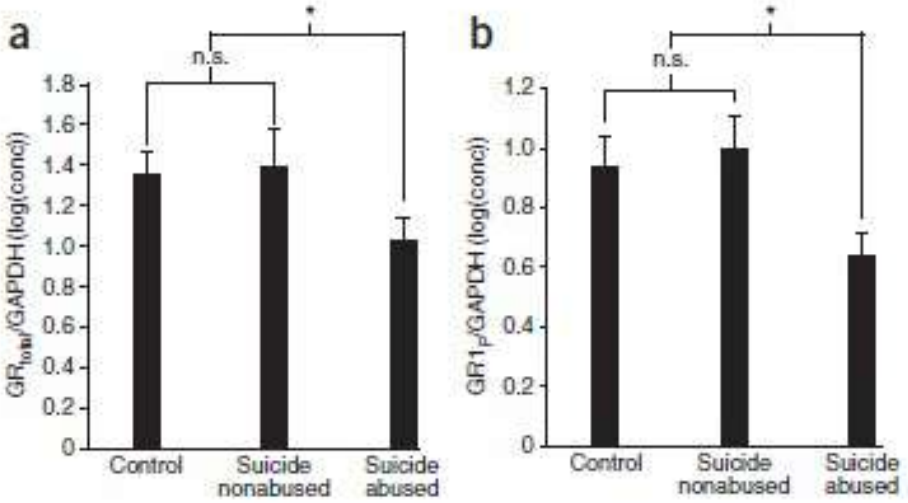
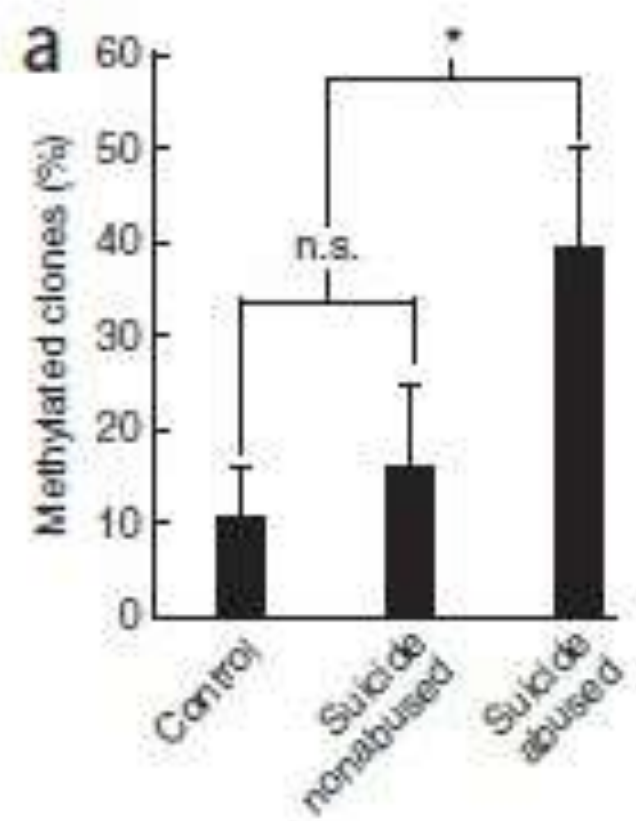


Figure 1 Hippocampal glucocorticoid receptor expression. (**a**,**b**) Mean ± s.e.m. expression levels of total glucocorticoid receptor (GR) mRNA (**a**) and glucocorticoid receptor 1_F (GR1_F) in 12 suicide victims with a history of childhood abuse, 12 nonabused suicide victims and 12 control subjects (**b**). Outliers excluded from analysis included $n = 2$ control subjects, $n = 1$ suicide victims with a history of childhood abuse for glucocorticoid receptor 1_F and an additional $n = 1$ suicide victim with a history of childhood abuse, and $n = 3$ nonabused suicide victims for overall levels of glucocorticoid receptor. * indicates $P < 0.05$; n.s. indicates not statistically significant.



Adults with depression, suicides:

LOW gene expression

smalller hippocampal volume

reduced expression frontal lobe

Epigenetic regulation of the glucocorticoid receptor in human brain associates with childhood abuse

Patrick O McGowan[1,2], Aya Sasaki[1,2], Ana C D'Alessio[3], Sergiy Dymov[3], Benoit Labonté[1,4], Moshe Szyf[2,3], Gustavo Turecki[1,4] & Michael J Meaney[1,2,5]

These findings translate previous results from rats / monkeys to humans

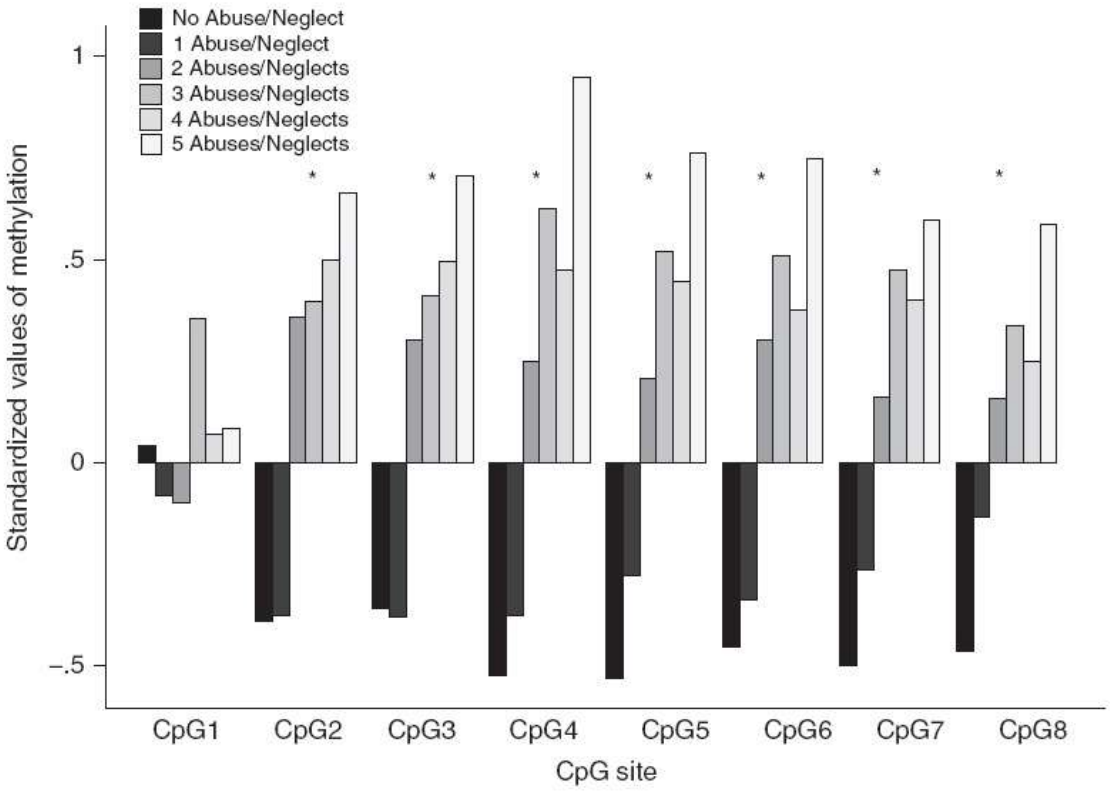
Adults with depression, suicides:
LOW gene expression
smalller hippocampal volume
reduced expression frontal lobe

promoter constructs that mimicked the methylation state in samples from abused suicide victims showed decreased NGFI-A transcription factor binding and NGFI-A–inducible gene transcription. These findings translate previous results from rat to humans and suggest a common effect of parental care on the epigenetic regulation of hippocampal glucocorticoid receptor expression.

Citation: Transl Psychiatry (2011) 1, e59, doi:10.103

www.nature.com/tp

Increased methylation of glucocorticoid receptor gene (*NR3C1*) in adults with a history of childhood maltreatment: a link with the severity and type of trauma



2ND KNOCK

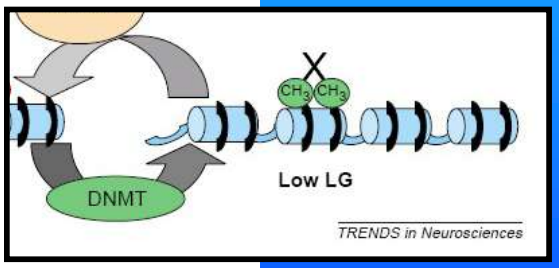


Figure 4 Methylation of the exon 1_F *NR3C1* promoter region, showing the standardized value of methylation observed at each CpG site according to the number of types of childhood abuse and neglect in the whole sample. ($^*P < 1 \times 10^{-6}$).

Child Health, Developmental Plasticity, and Epigenetic Programming

Z. Hochberg, R. Feil, M. Constancia, M. Fraga, C. Junien, J.-C. Carel, P. Boileau,

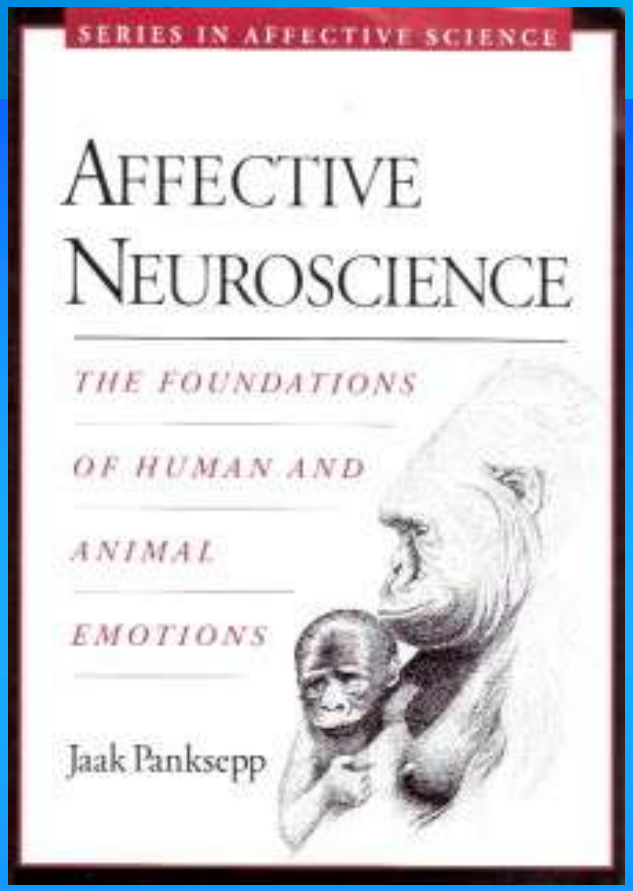
DOHAD

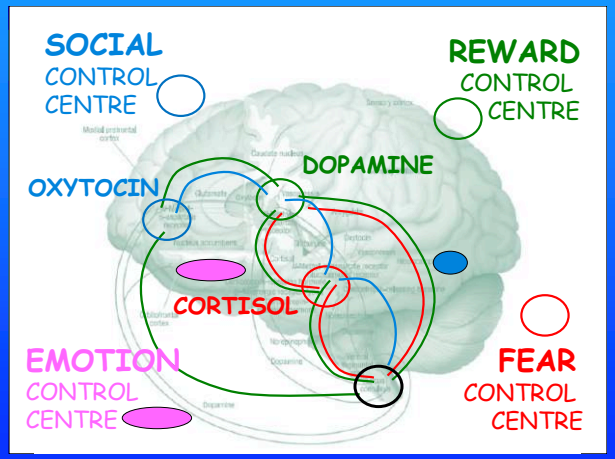
Developmental Origins of Health and Adult Disease

Early stress alters gene expression, with health impact across lifespan.

. . . very early, once off, and forever.

NELSON, E. E., PANKSEPP, J. *Brain substrates of infant–mother attachment: contributions of opioids, oxytocin, and norepinephrine.* NEUROSCI BIOBEHAV REV **22**(3) 437–452, 1998.—The aim of this paper is to review recent work concerning the psychobiological





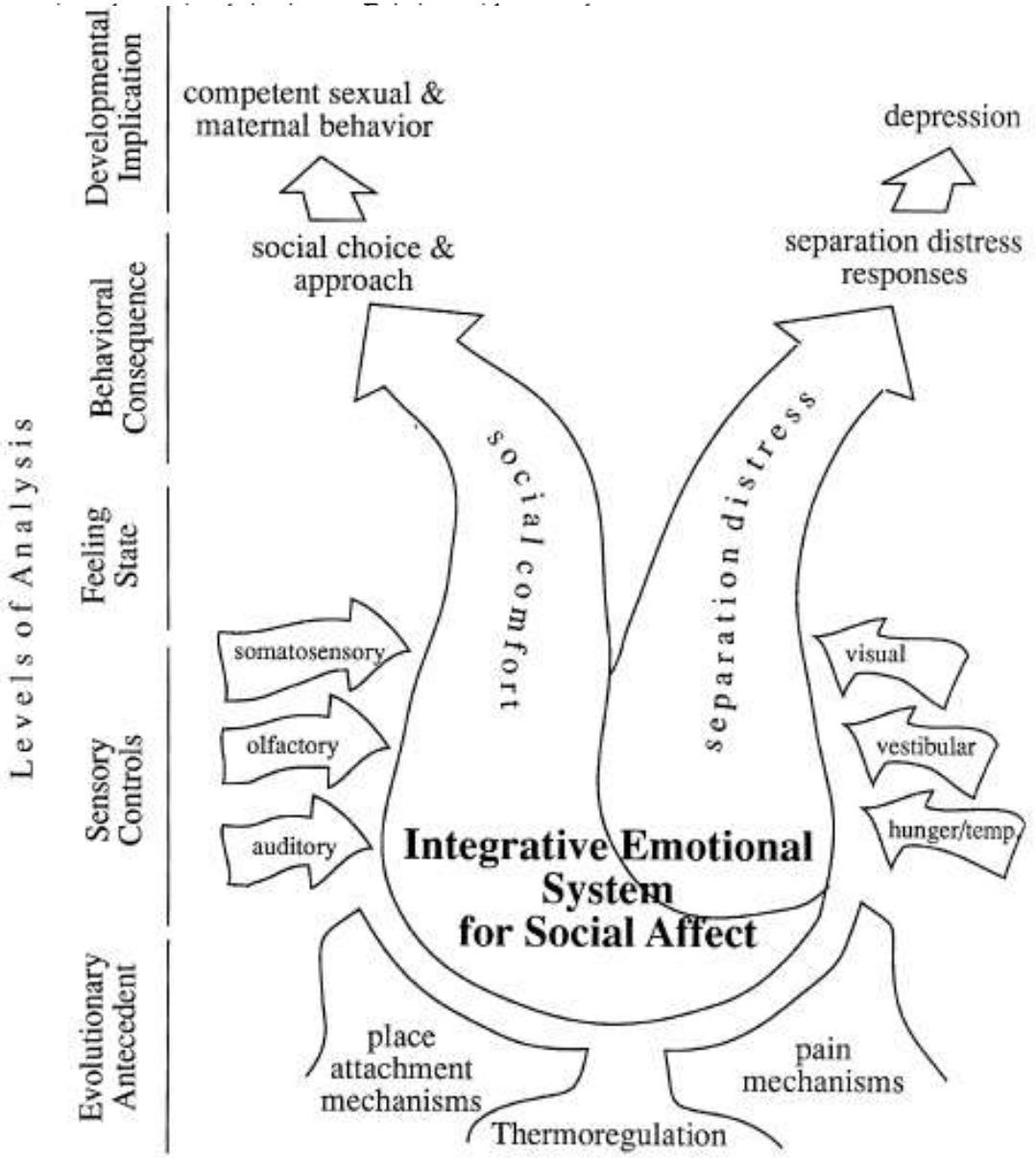
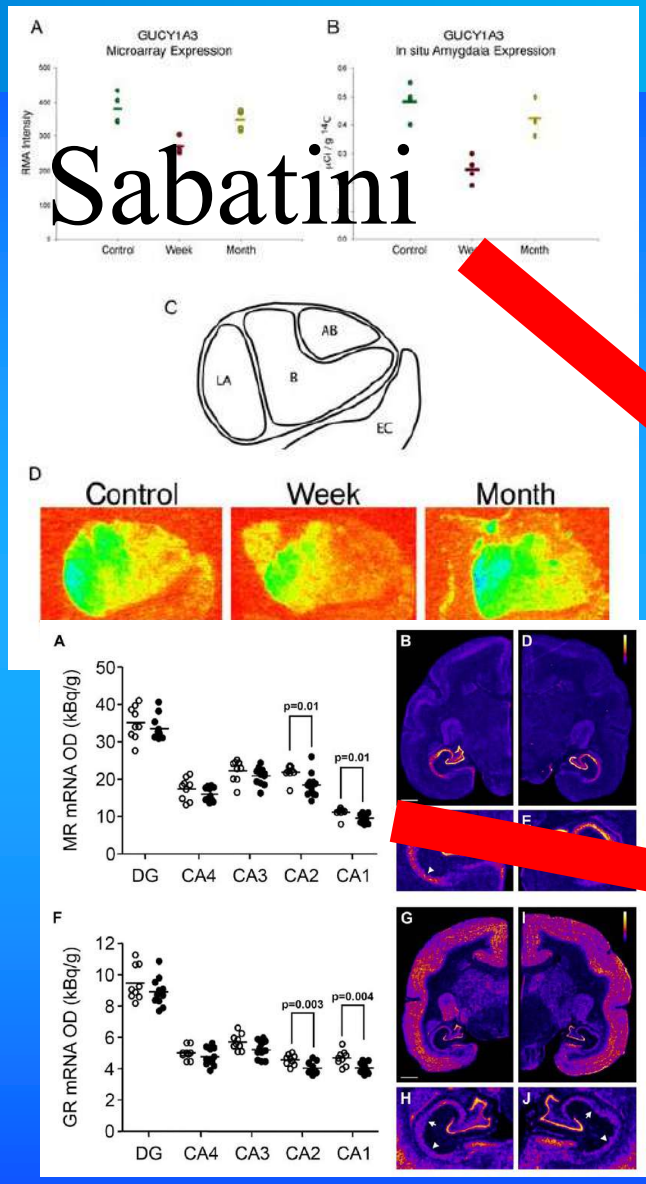


FIG. 1. Schematic depiction of the neurobiological foundations, inputs, and consequences of attachment and affiliative behavior in mammals. Figure reprinted with permission of the New York Academy of Sciences.

NELSON, E. E., PANKSEPP, J. *Brain substrates of infant–mother attachment: contributions of opioids, oxytocin, and norep*
NEUROSCI BIOBEHAV REV **22**(3) 437–452, 1998.—The aim of this paper is to review recent work concerning the psyc

Sabatini



Arabadzisz

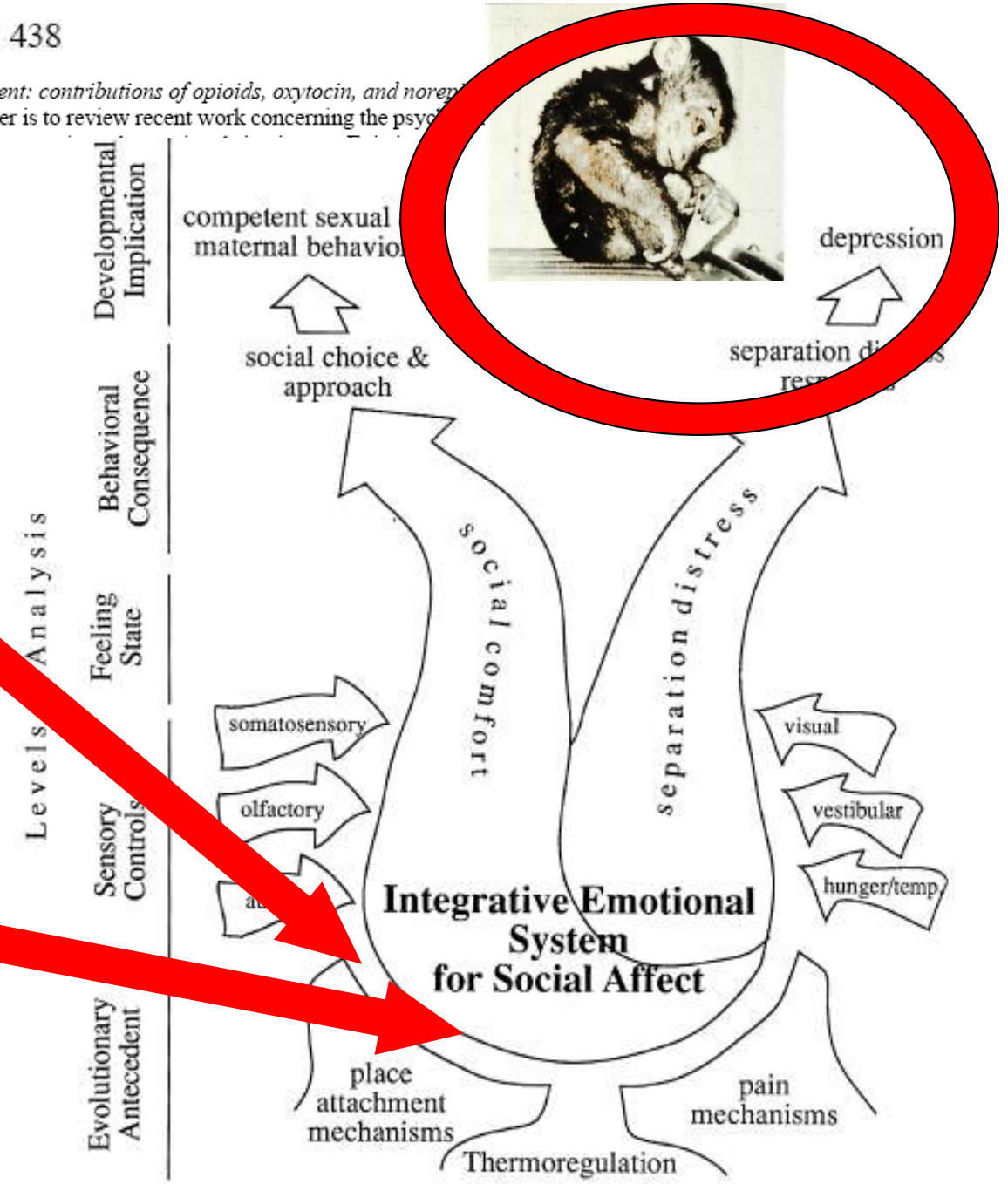
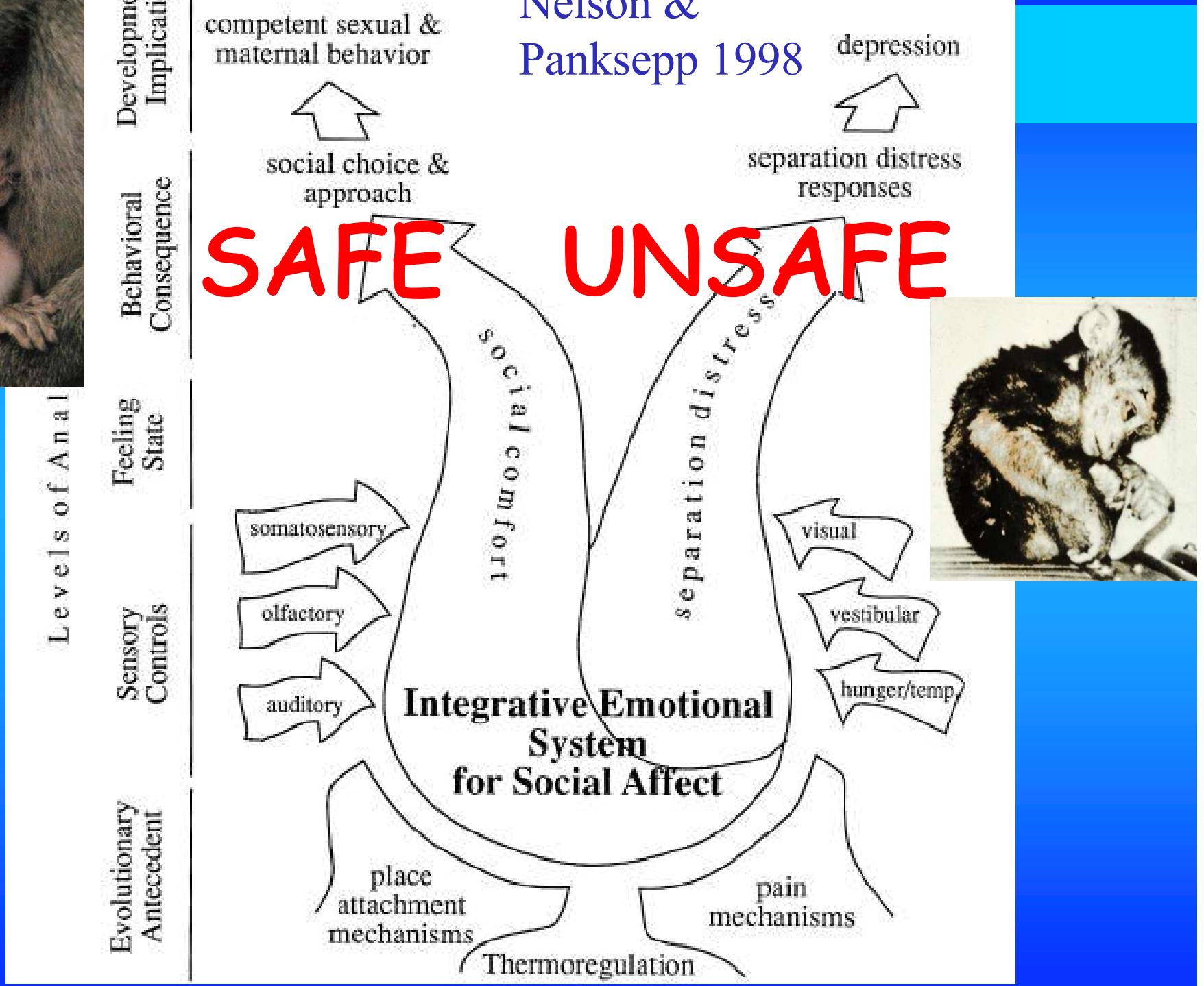
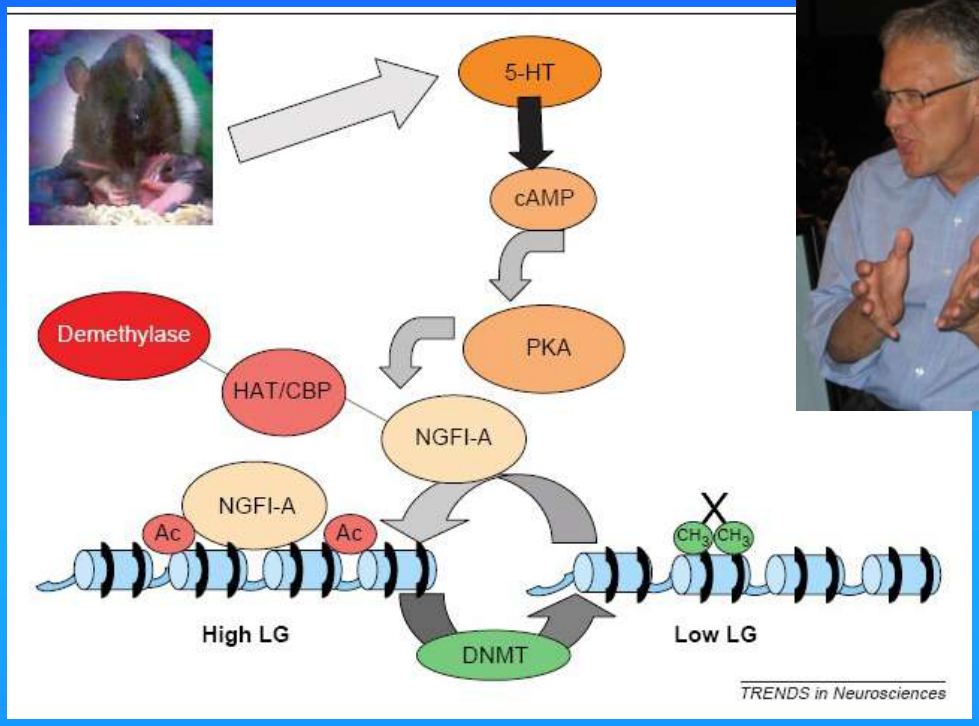


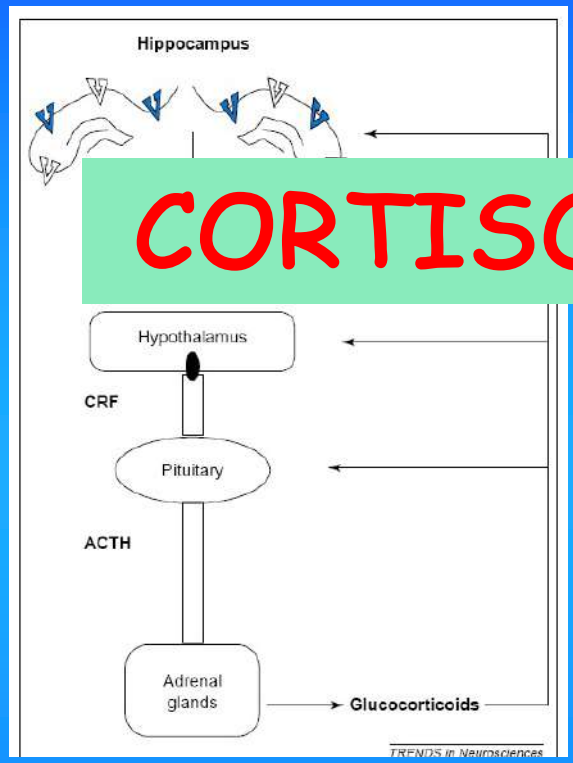
FIG. 1. Schematic depiction of the neurobiological foundations, inputs, and consequences of attachment and affiliative behavior in mammals. Figure reprinted with permission of the New York Academy of Sciences.

Nelson &
Panksepp 1998



MICHAEL MEANEY epigenetics





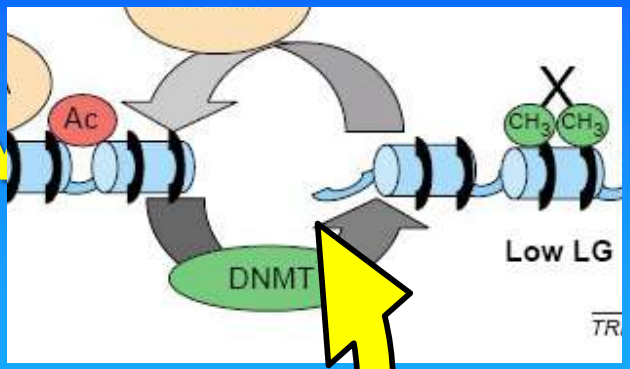
CORTISOL

Unsafe environment activates HPA axis (autonomic nervous system, ANS).

MOTHER
HG - High Grooming

MOTHER
Low Grooming LG

HG BABY



LG BABY

Healthy adult

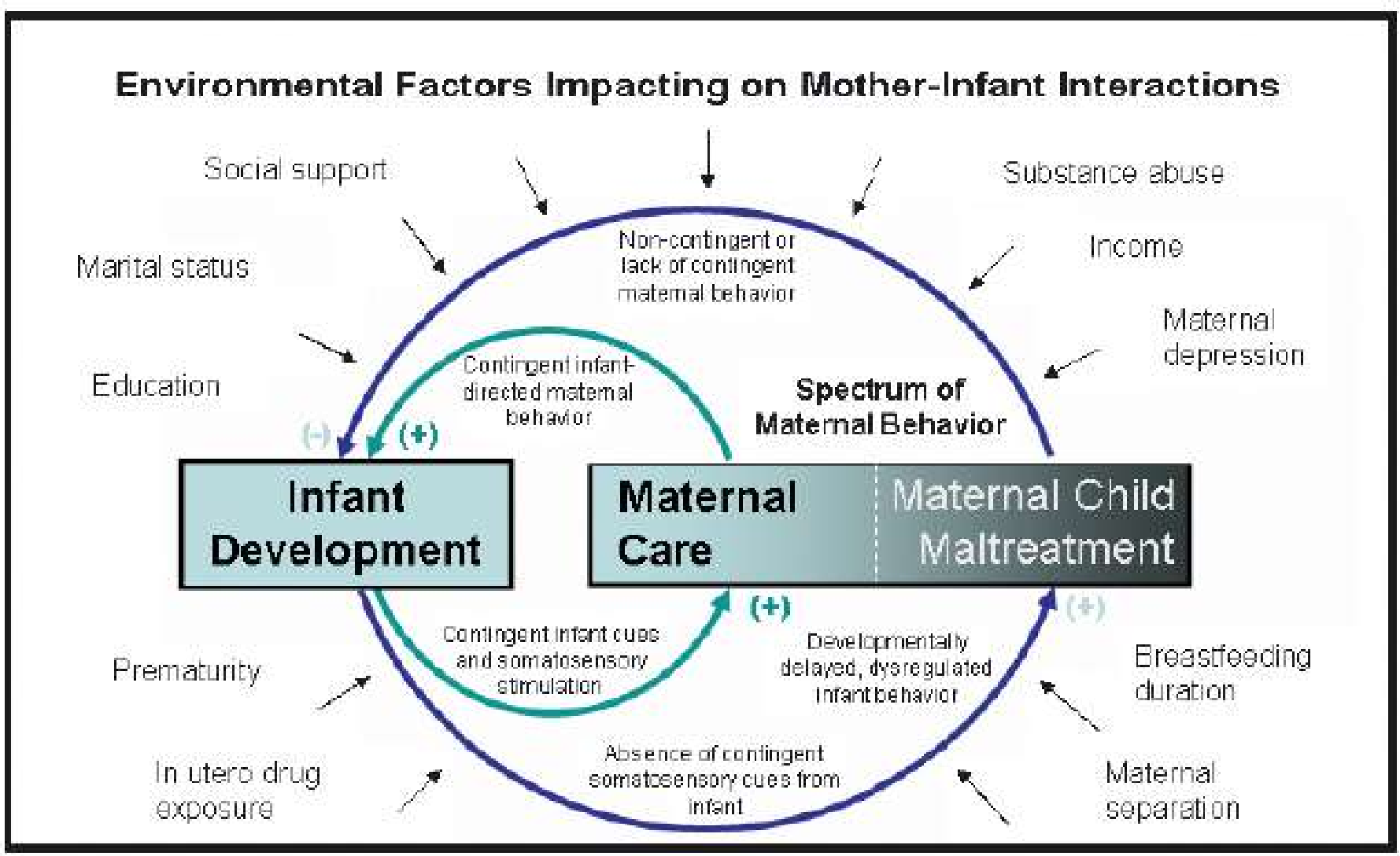
UNHEAL adult

Makes MOTHER
HG – High Grooming

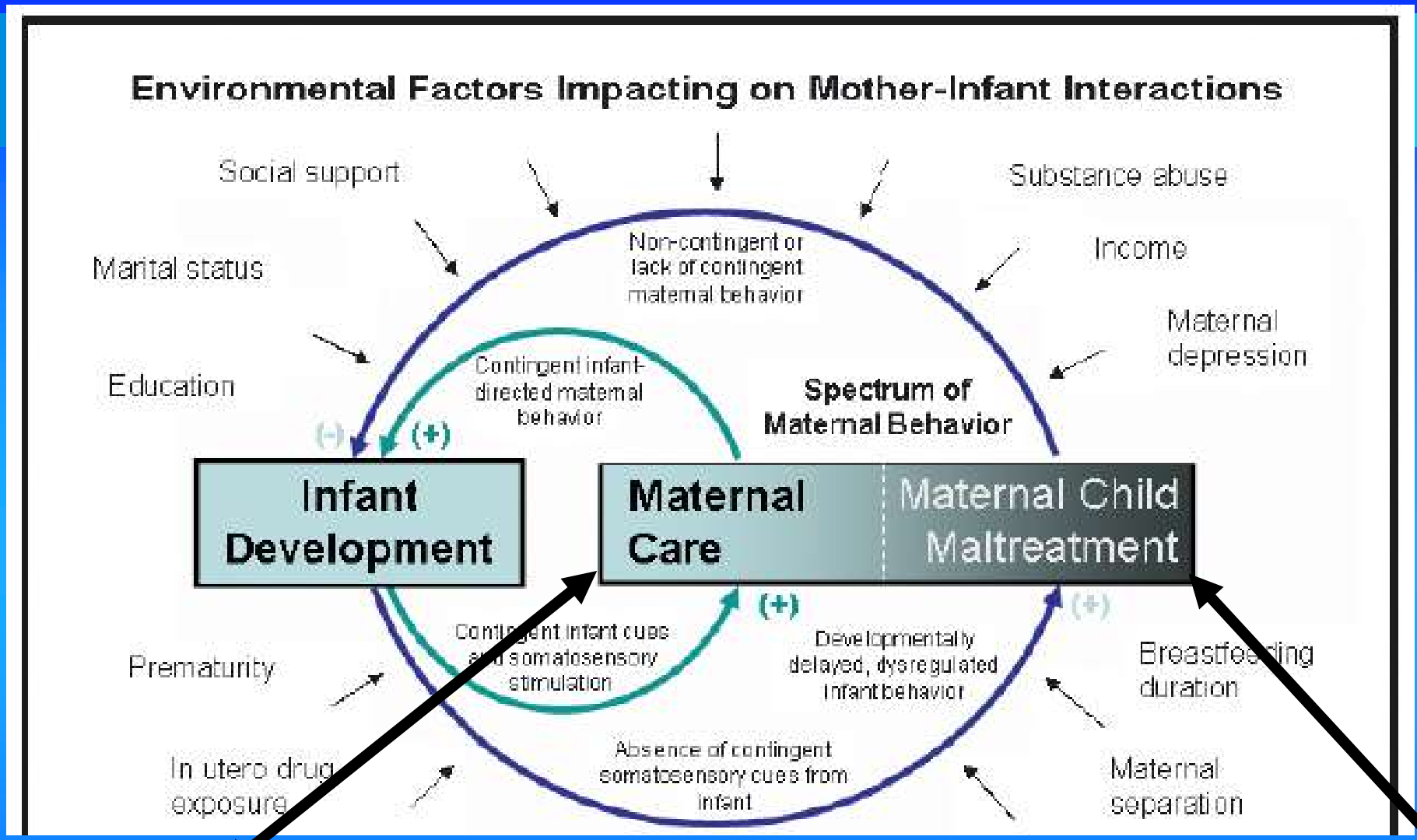
Makes MOTHER
Low Grooming - LG

SAME CORTISOL RECEPTOR SWITCHED OFF BY STRESS

Early stress alters gene expression, with health impact across lifespan.



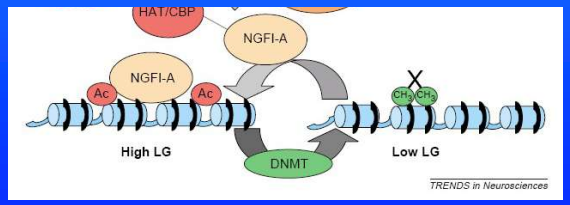
Early stress alters gene expression, with health impact across lifespan.



HEALTH

DISEASE

OXYTOCIN



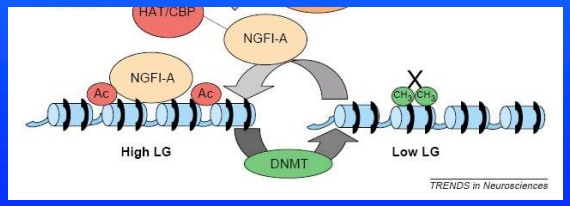
CORTISOL

RESILIENCE
(= STRESS RESISTANCE)

"capacity to maintain healthy emotional functioning in the after-math of stressful experiences"

HEALTH — DISEASE

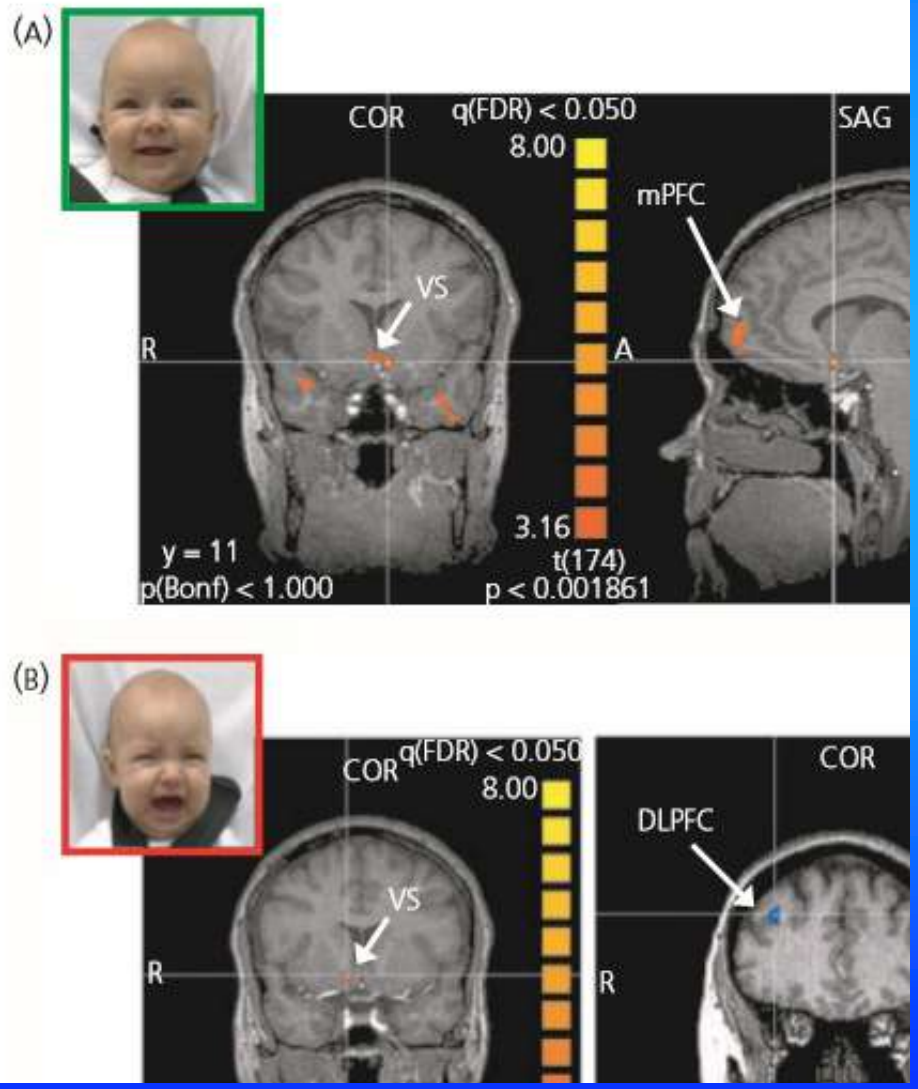
OXYTOCIN



CORTISOL

How oxytocin and dopamine connect

From animal studies, we learn that oxytocinergic circuits are directly linked with the mesocorticolimbic dopamine pathway, with oxytocinergic neurones projecting from the hypothalamic PVN and MPOA to both the VTA and the VS (Fig. 3). The strength of these connections is associated with levels of maternal caregiving behav-



AT BIRTH ...

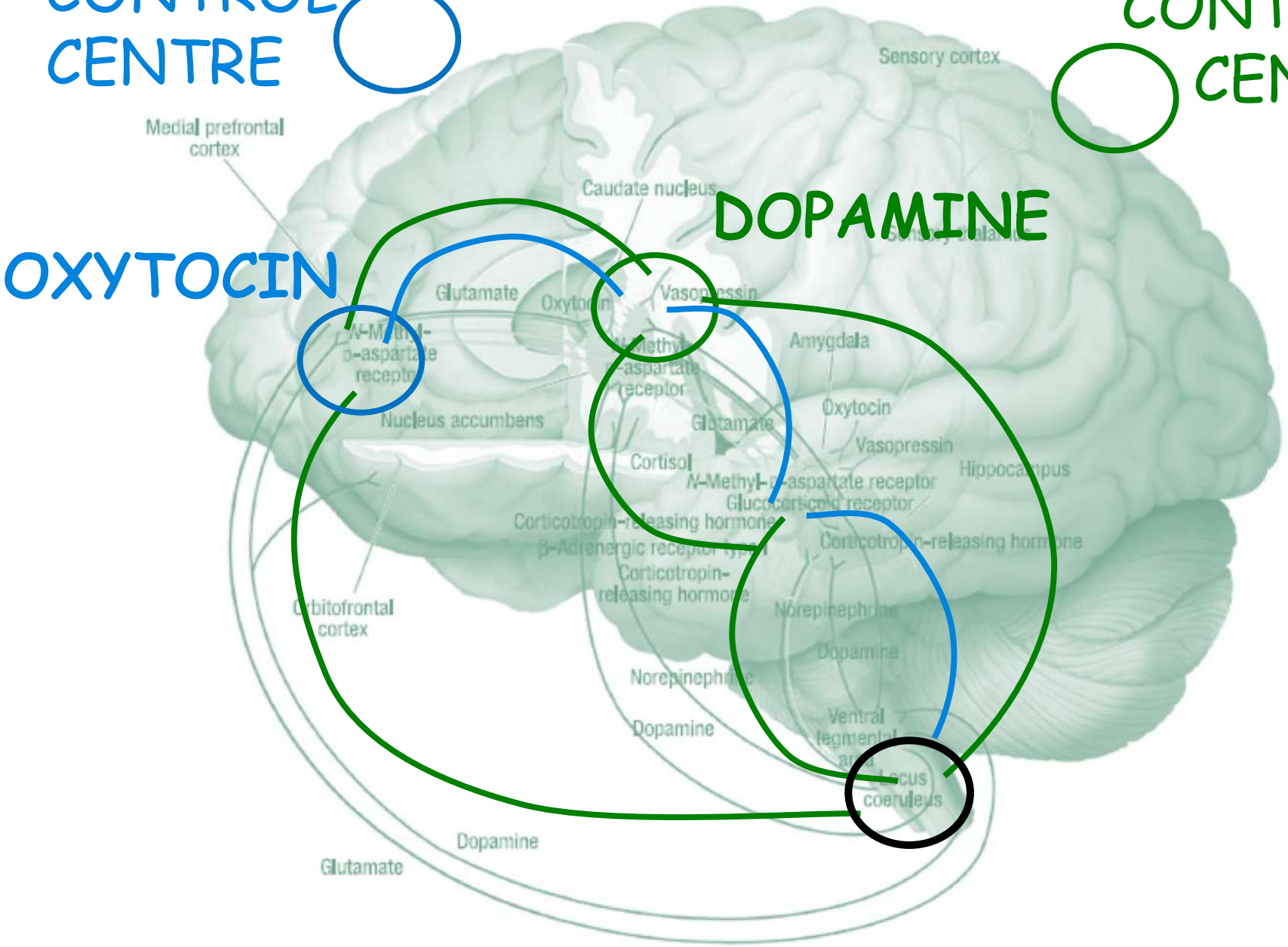
... infant cues - suckling, vocalisation and tactile stimulation - stimulate **OXYTOCIN** release in the hypothalamus, which may result in the activation of the **DOPAMINE** reward pathway leading to behavioural reinforcement

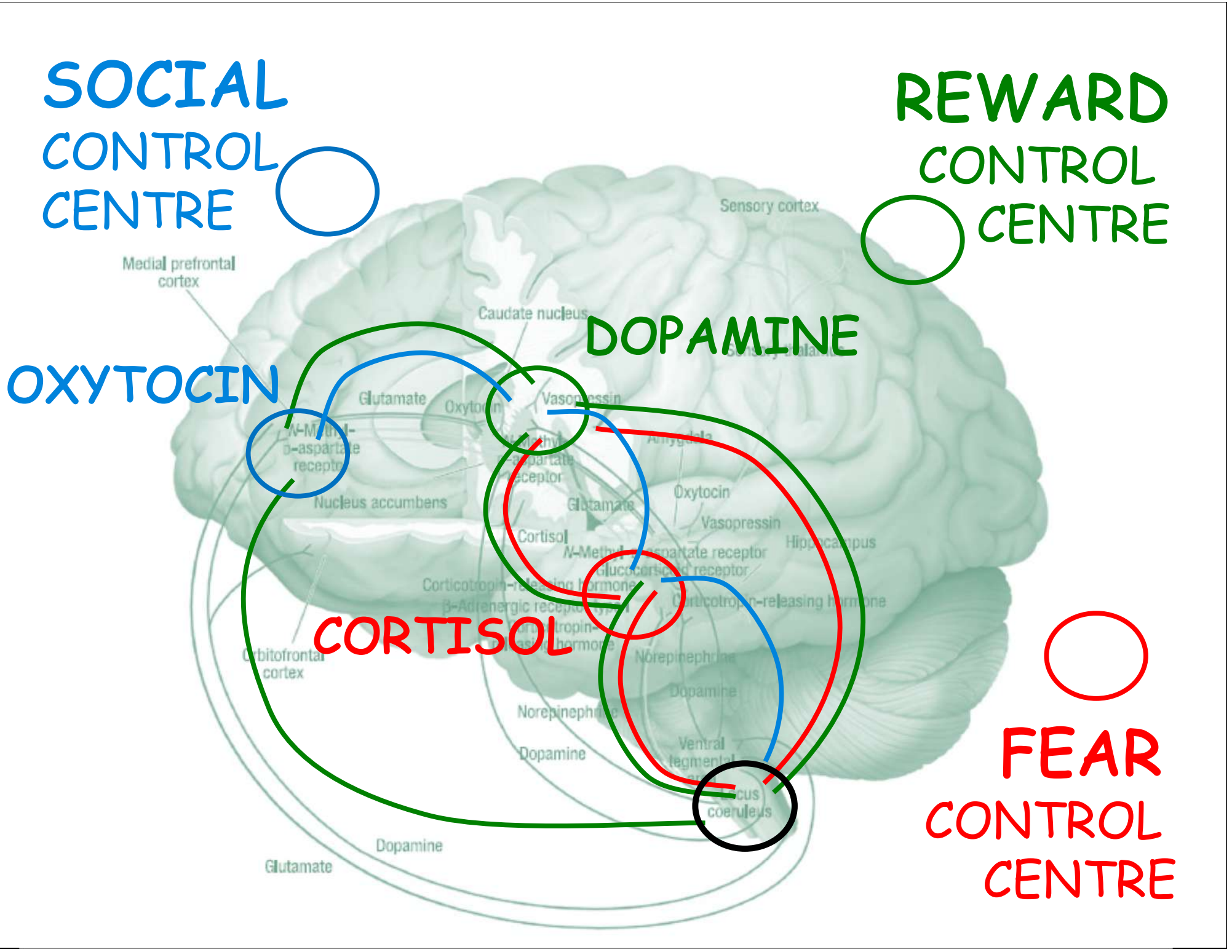
SOCIAL CONTROL CENTRE

REWARD CONTROL CENTRE

OXYTOCIN

DOPAMINE




SOCIAL
CONTROL
CENTRE
REWARD
CONTROL
CENTRE
OXYTOCIN
DOPAMINE
CORTISOL
FEAR
CONTROL
CENTRE
Medial prefrontal cortex
Caudate nucleus
Sensory cortex
Glutamate
Nucleus accumbens
Oxytocin
Vasopressin
Cortisol
Hippocampus
Norepinephrine
Dopamine
Ventral tegmental
Orbitofrontal cortex
Dopamine
Glutamate

SOCIAL CONTROL CENTRE

REWARD CONTROL CENTRE

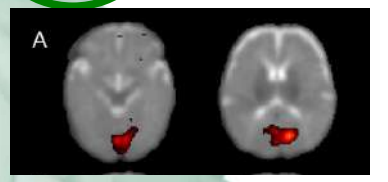
DOPAMINE

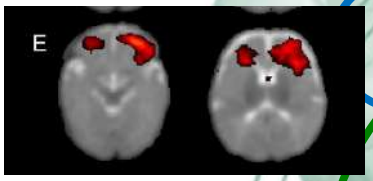
OXYTOCIN

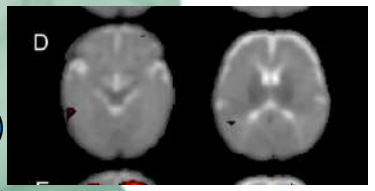
CORTISOL

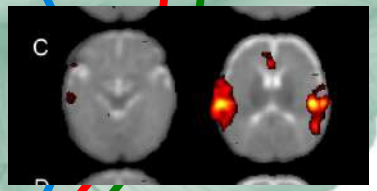
EMOTION CONTROL CENTRE

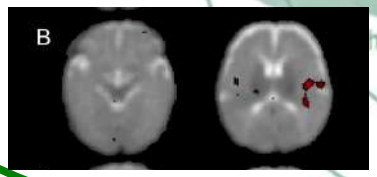
FEAR CONTROL CENTRE

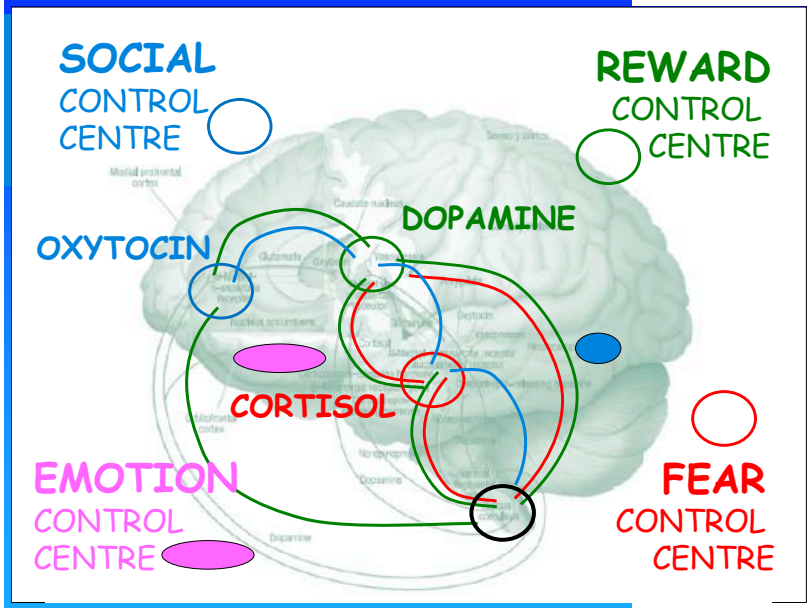












Dennis S. Charney, M.D.

Psychobiological Mechanisms of Resilience and Vulnerability:

Implications for Successful Adaptation to Extreme Stress

… there is considerable overlap in the brain structures associated with these neural mechanisms … functional interactions among the circuits.

HEALTH — DISEASE

RESILIENCE — **VULNERABILITY**

WELL-BEING → SUSCEPTIBILITY → MORBIDITY → MORTALITY

Artificial Weaning of Old World Monkeys: Benefits and Costs

Viktor Reinhardt
Animal Welfare Institute
Washington, D.C.

FIGURE 1 Artificially weaned, single-caged rhesus macaque infant showing typical signs of depression.

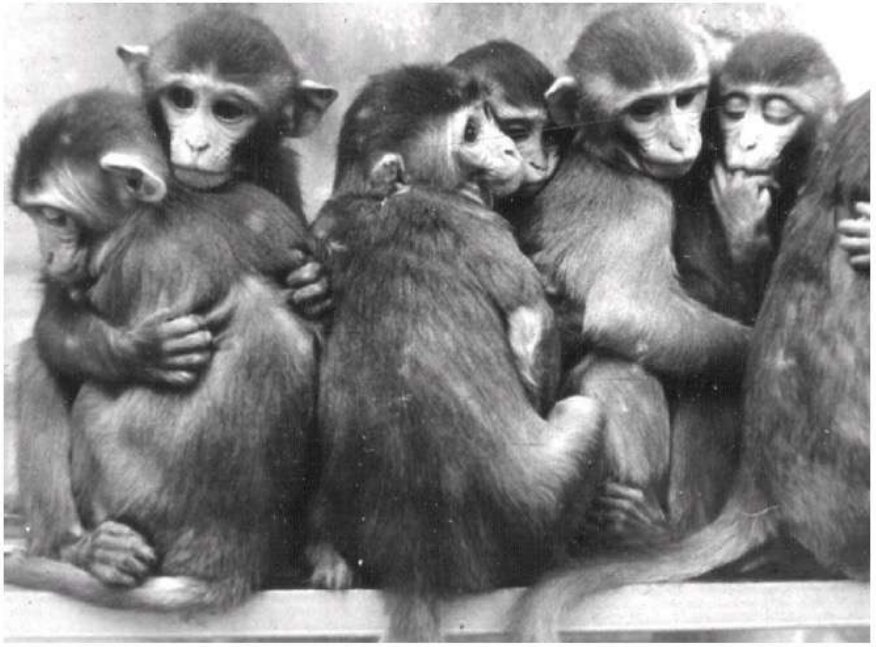


FIGURE 2 Artificially weaned, group-housed rhesus macaque infants showing the biologically atypical clinging-together behavior, which reflects their frustrated need to obtain the biological normal contact–comfort from their mothers.

CONCLUSIONS

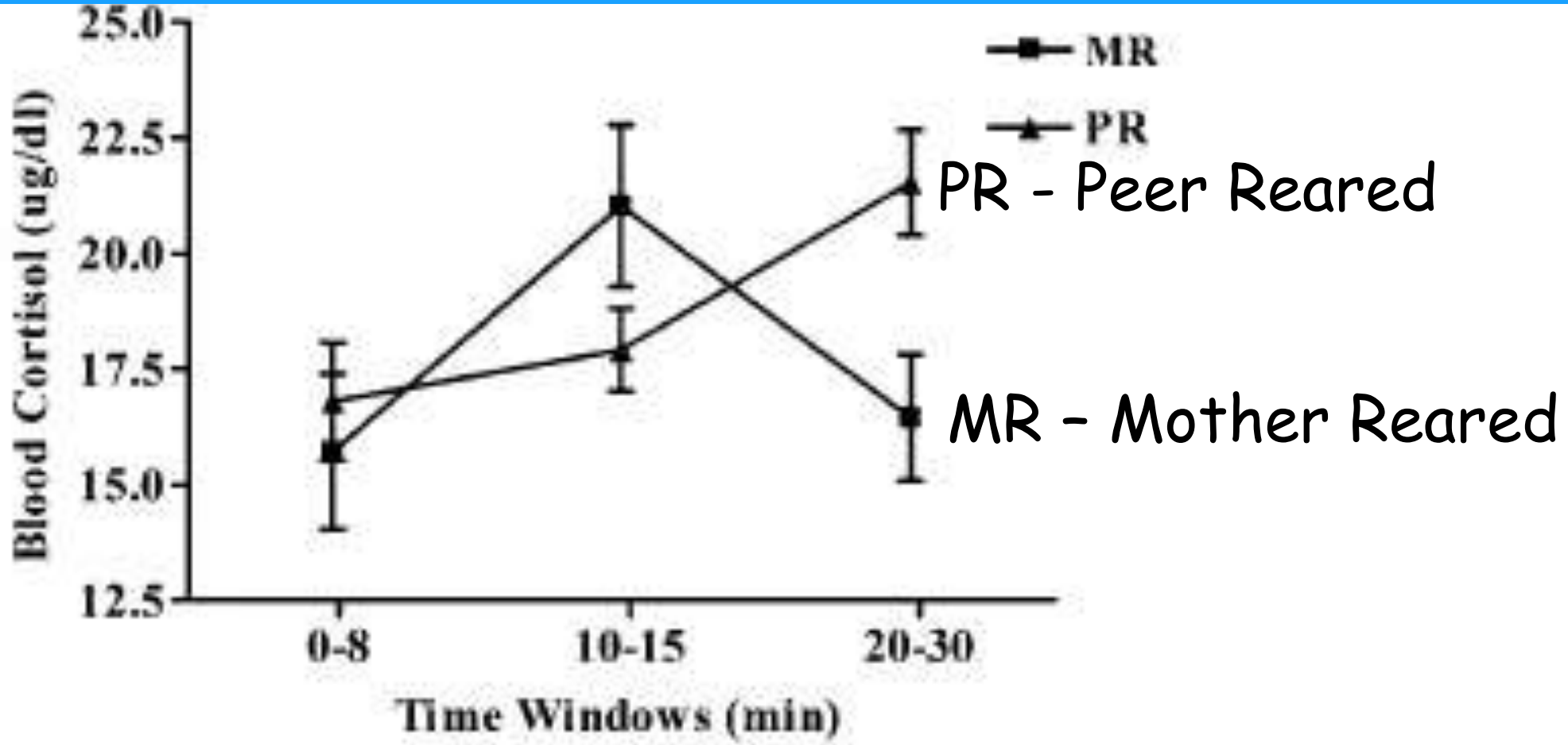
Scientific findings do not support the perceived benefits of permanent, preweaning mother-infant separation.

Maternal separation produces lasting changes in cortisol and behavior in rhesus monkeys

Xiaoli Feng[a,b,c,1], Lina Wang[a,b,c,1], Shangchuan Yang[a,b], Dongdong Qin[a,b,c], Jianhong Wang[a,b], Chunlu Li[a,b,c], Longbao Lv[b,d], Yuanye Ma[a,b,e,2], and Xintian Hu[a,b,e,2]

www.pnas.org/cgi/doi/10.1073/pnas.1010943108

Plasma CORTISOL response to STRESS (2y)



PR - Peer Reared

MR – Mother Reared

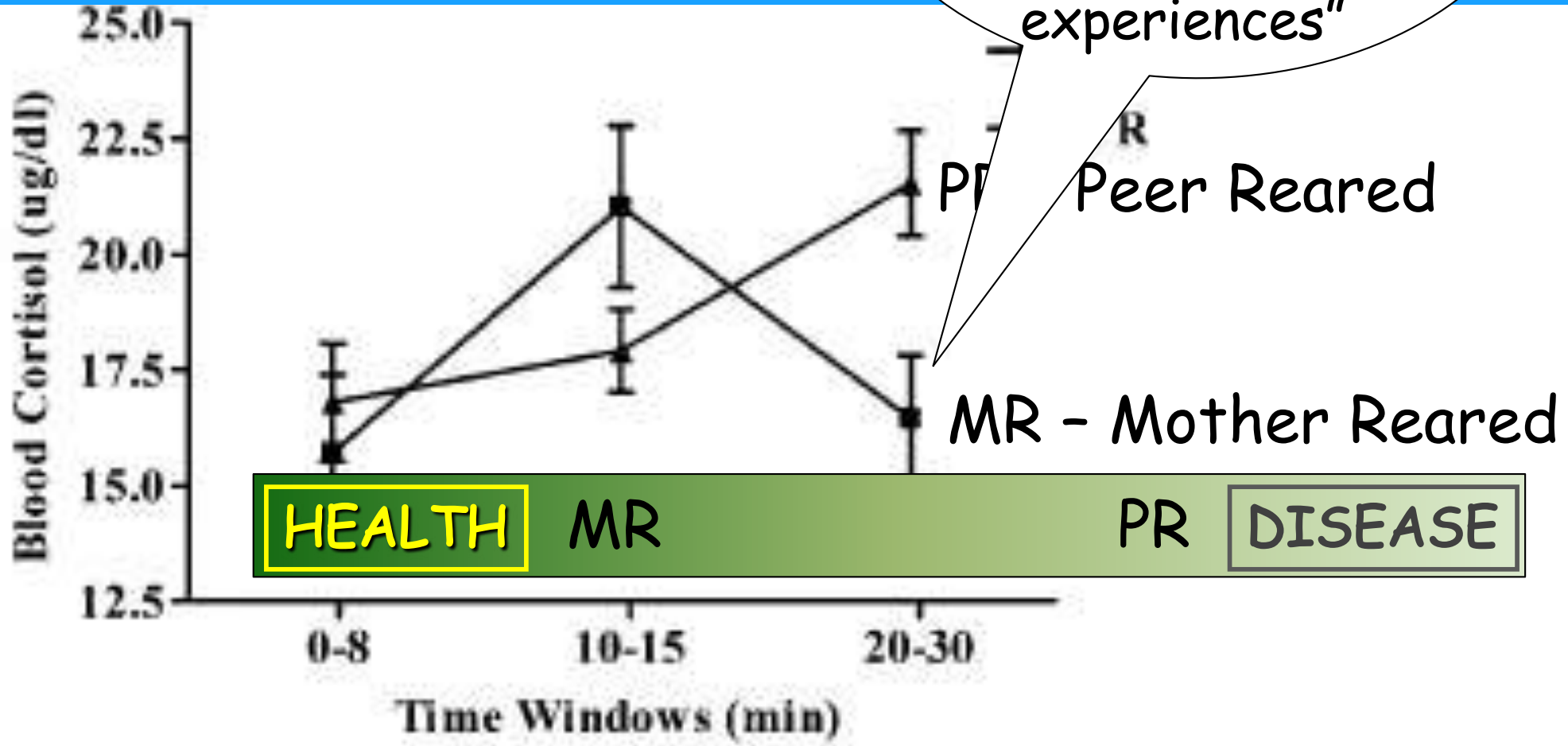
Maternal separation produces lasting changes in cortisol and behavior in rhesus

Xiaoli Feng[a,b,c,1], Lina Wang[a,b,c,1], Shangchuan Yang[a,b], Do
Longbao Lv[b,d], Yuanye Ma[a,b,e,2], and Xintian Hu[a,b,e,2]

108

Plasma CORTISOL respor

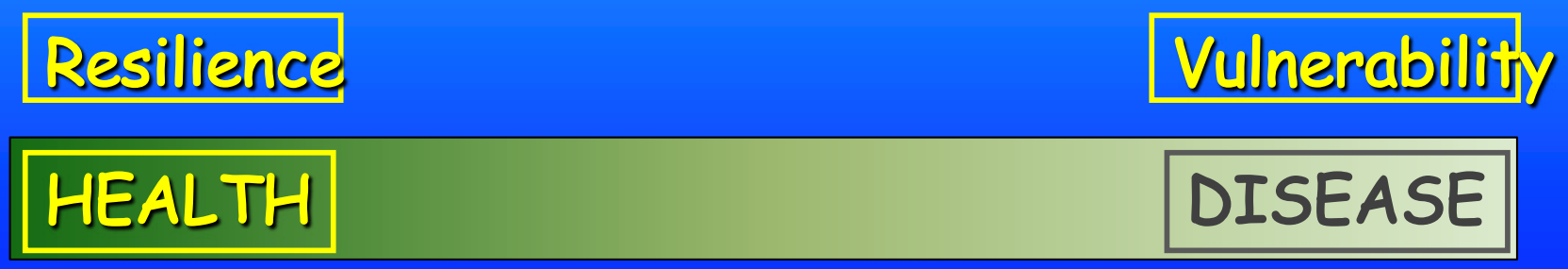
RESILIENCE:
"capacity to maintain healthy emotional functioning in the after-math of stressful experiences"



RESILIENCE

(= STRESS RESISTANCE)

"capacity to maintain healthy emotional functioning in the after-math of stressful experiences"



Annual Review of Psychology

Developmental Adaptation to Stress: An Evolutionary Perspective

ENVIRONMENT → **ADAPTATION** → **EXPERIENCE** → **REPRODUCTIVE FITNESS**

Life History Theory

as a Framework for Adaptive Plasticity

In evolutionary biology, a major framework for explaining coordinated patterns of developmental plasticity is life history theory. Life history theory addresses how organisms allocate their limited stocks of time and energy to the various activities (including growth, maintenance of bodily tissues, mating, and parenting) that compose their life cycle.

Bruce J. Ellis[1] and Marco Del Giudice[2]

Annual Review of Psychology

Developmental Adaptation to Stress: An Evolutionary Perspective

ENVIRONMENT → ADAPTATION → EXPERIENCE → REPRODUCTIVE FITNESS

SEPARATION

Toxic stress

Life History Theory

as a Framework for Adaptive Plasticity

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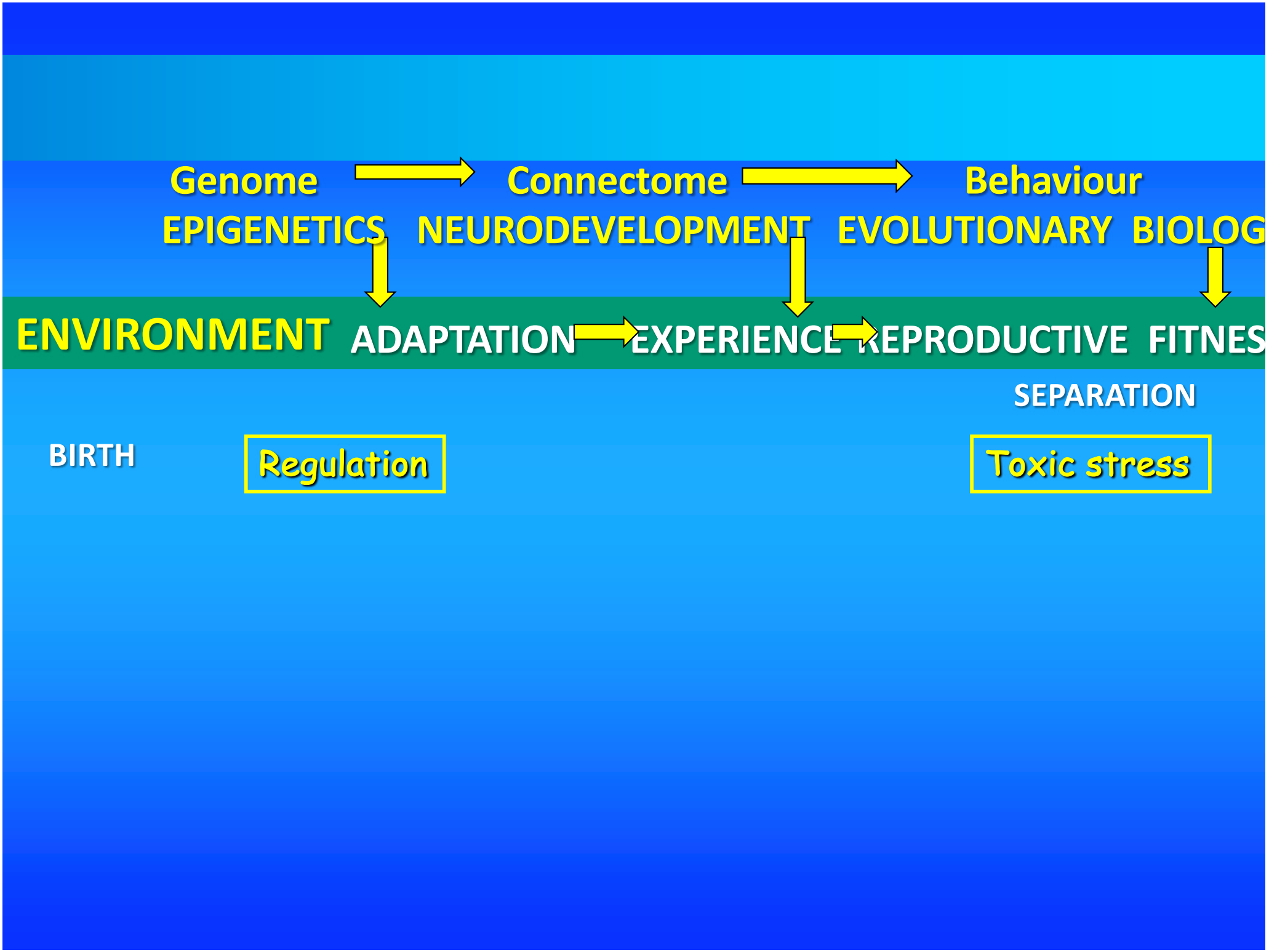
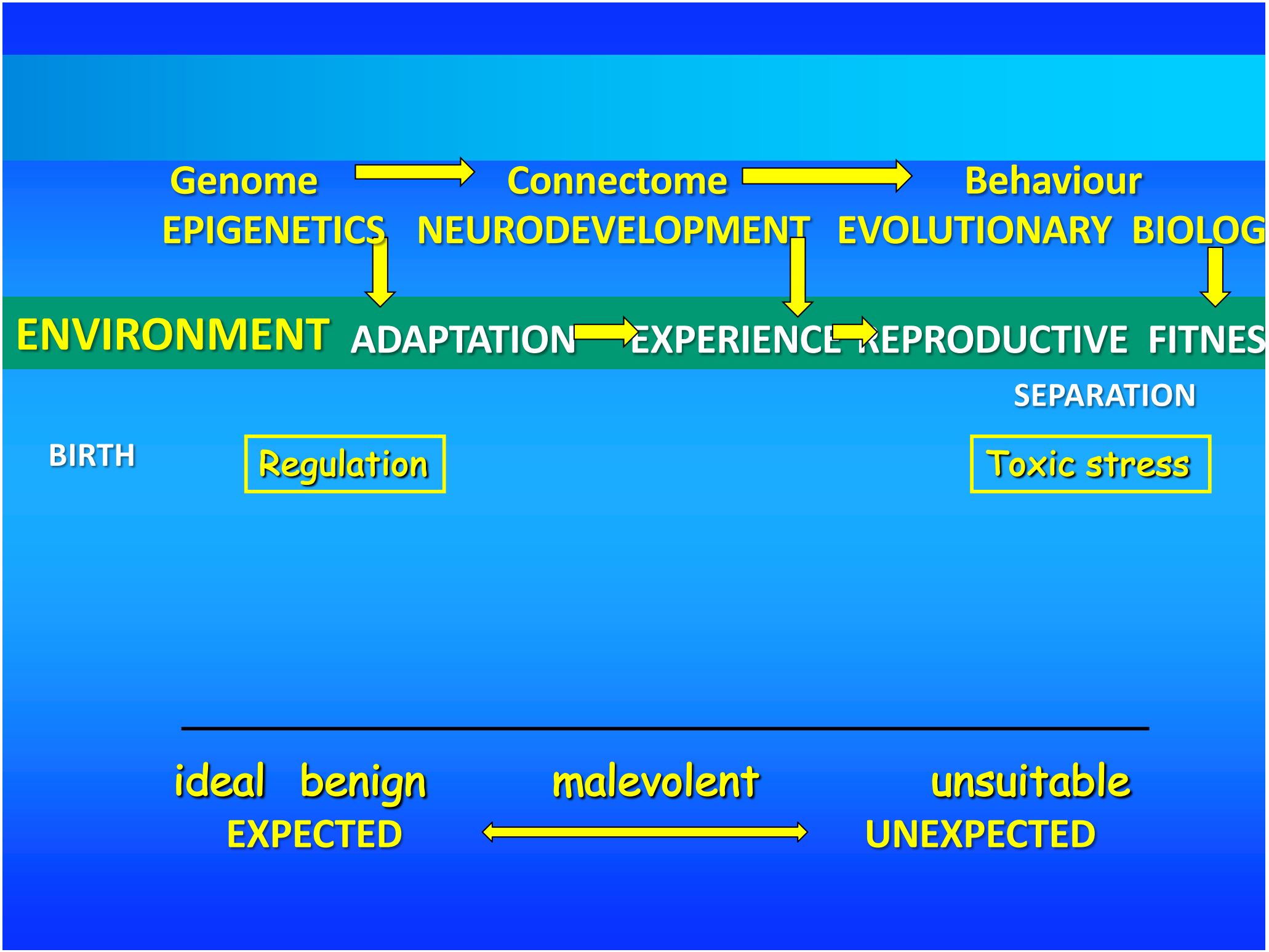
Bruce J. Ellis[1] and Marco Del Giudice[2]


Genome
Connectome
Behaviour
EPIGENETICS
NEURODEVELOPMENT
EVOLUTIONARY
BIOLOG
ENVIRONMENT
ADAPTATION
EXPERIENCE
REPRODUCTIVE
FITNES
SEPARATION
BIRTH
Regulation
Toxic stress


Genome
Connectome
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EPIGENETICS
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EVOLUTIONARY
BIOLOG
ENVIRONMENT
ADAPTATION
EXPERIENCE
REPRODUCTIVE
FITNES
SEPARATION
BIRTH
Regulation
Toxic stress
ideal
benign
malevolent
unsuitable
EXPECTED
UNEXPECTED

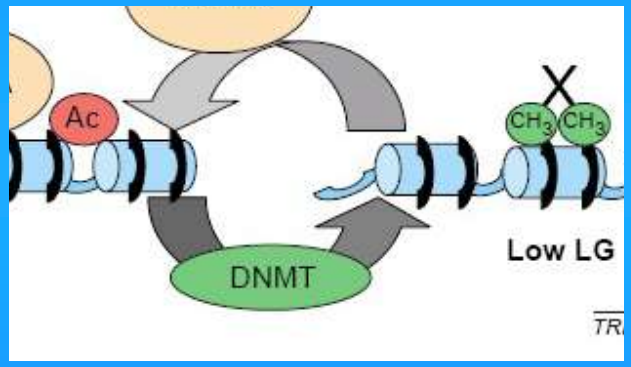
Genome → Connectome → Behaviour

EPIGENETICS NEURODEVELOPMENT EVOLUTIONARY BIOLOG

ENVIRONMENT ADAPTATION → EXPERIENCE → REPRODUCTIVE FITNES

BIRTH

Regulation



SEPARATION

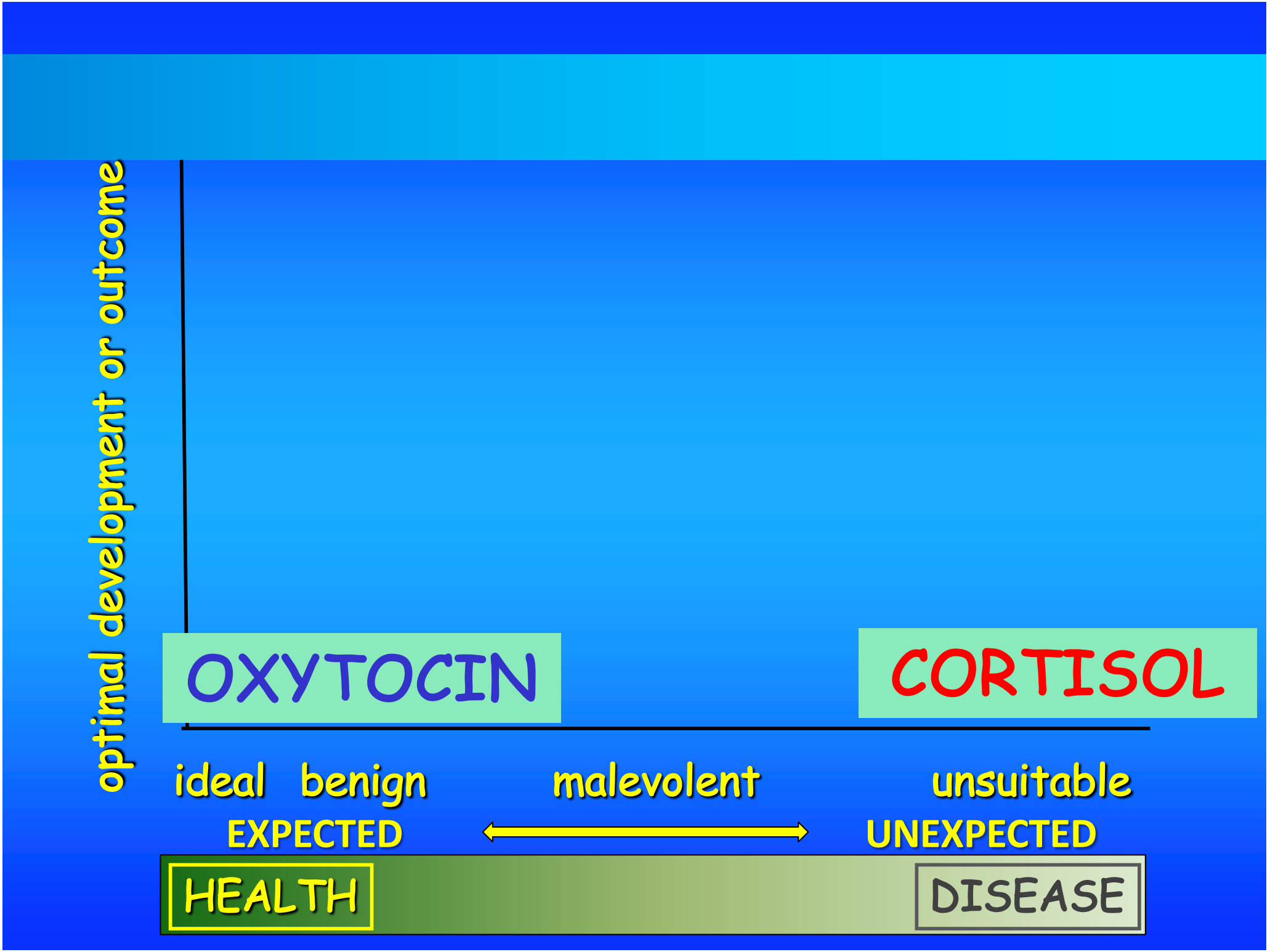
Toxic stress

OXYTOCIN

CORTISOL

ideal benign malevolent unsuitable

EXPECTED ⟷ UNEXPECTED


optimal development or outcome
OXYTOCIN
CORTISOL
ideal
benign
malevolent
unsuitable
EXPECTED
UNEXPECTED
HEALTH
DISEASE

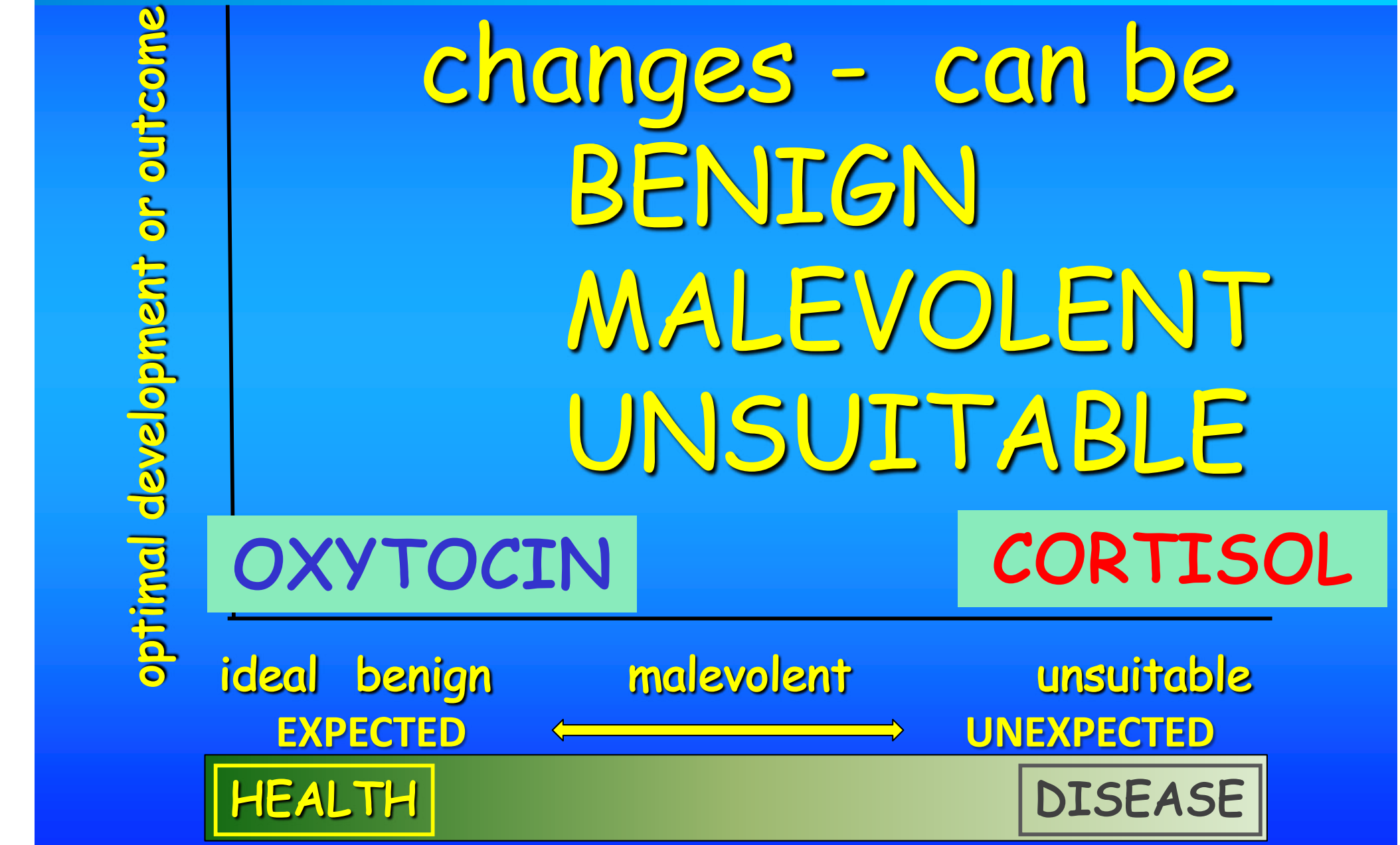
"Environment"

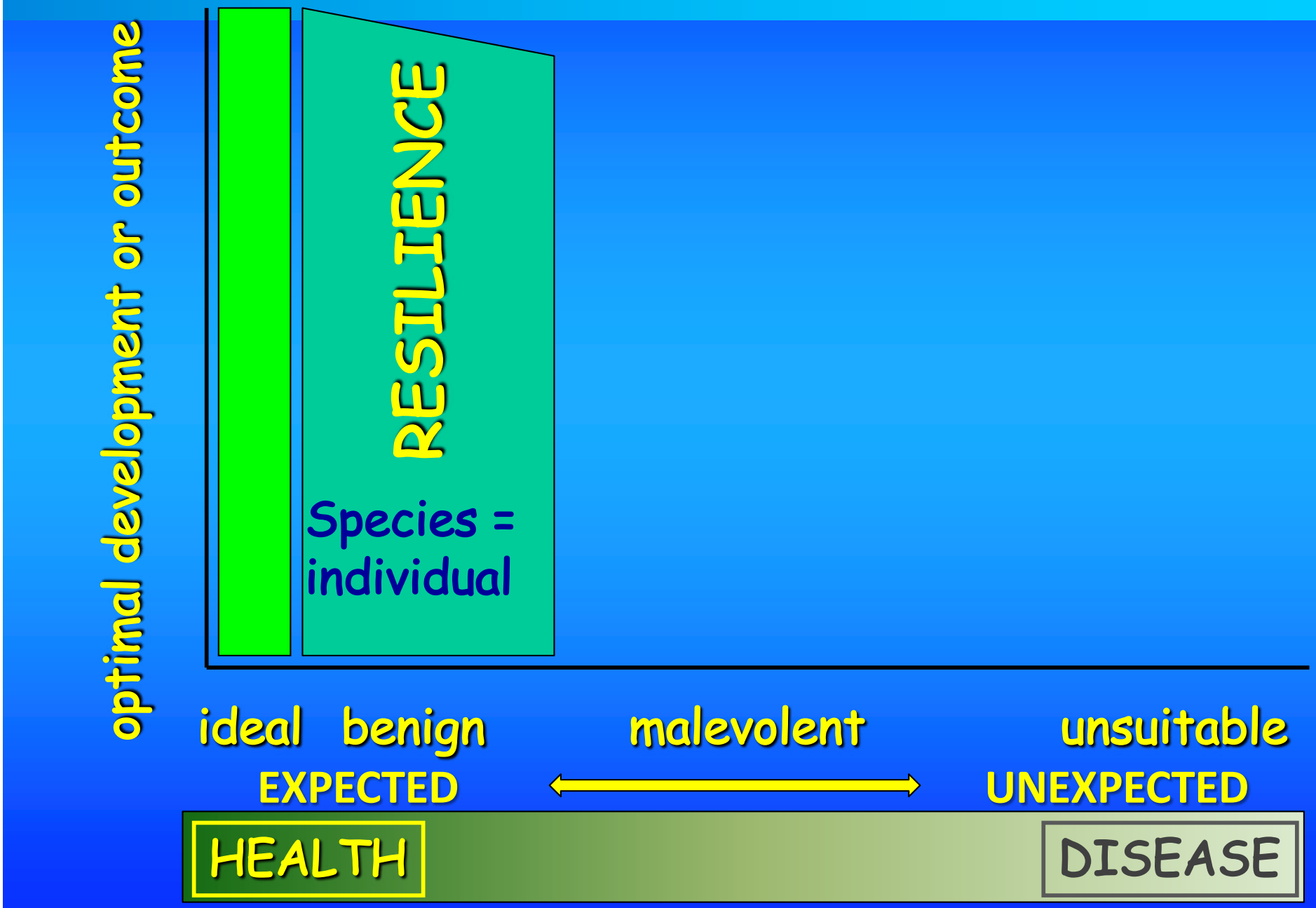
changes - can be

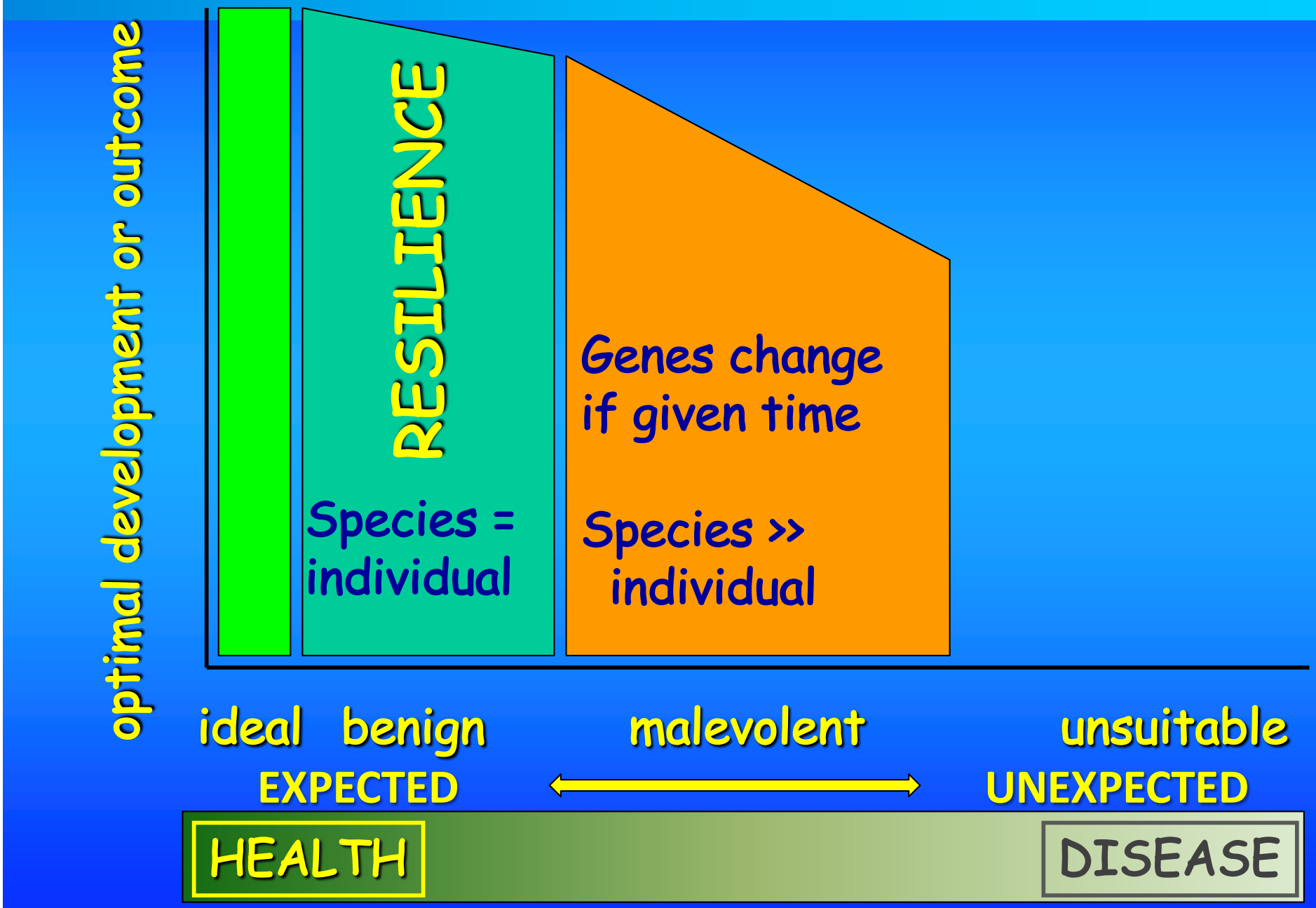
BENIGN

MALEVOLENT

UNSUITABLE




optimal development or outcome
RESILIENCE
Species = individual
ideal
benign
malevolent
unsuitable
EXPECTED
UNEXPECTED
HEALTH
DISEASE


optimal development or outcome
RESILIENCE
Species = individual
Genes change if given time
Species >> individual
ideal
benign
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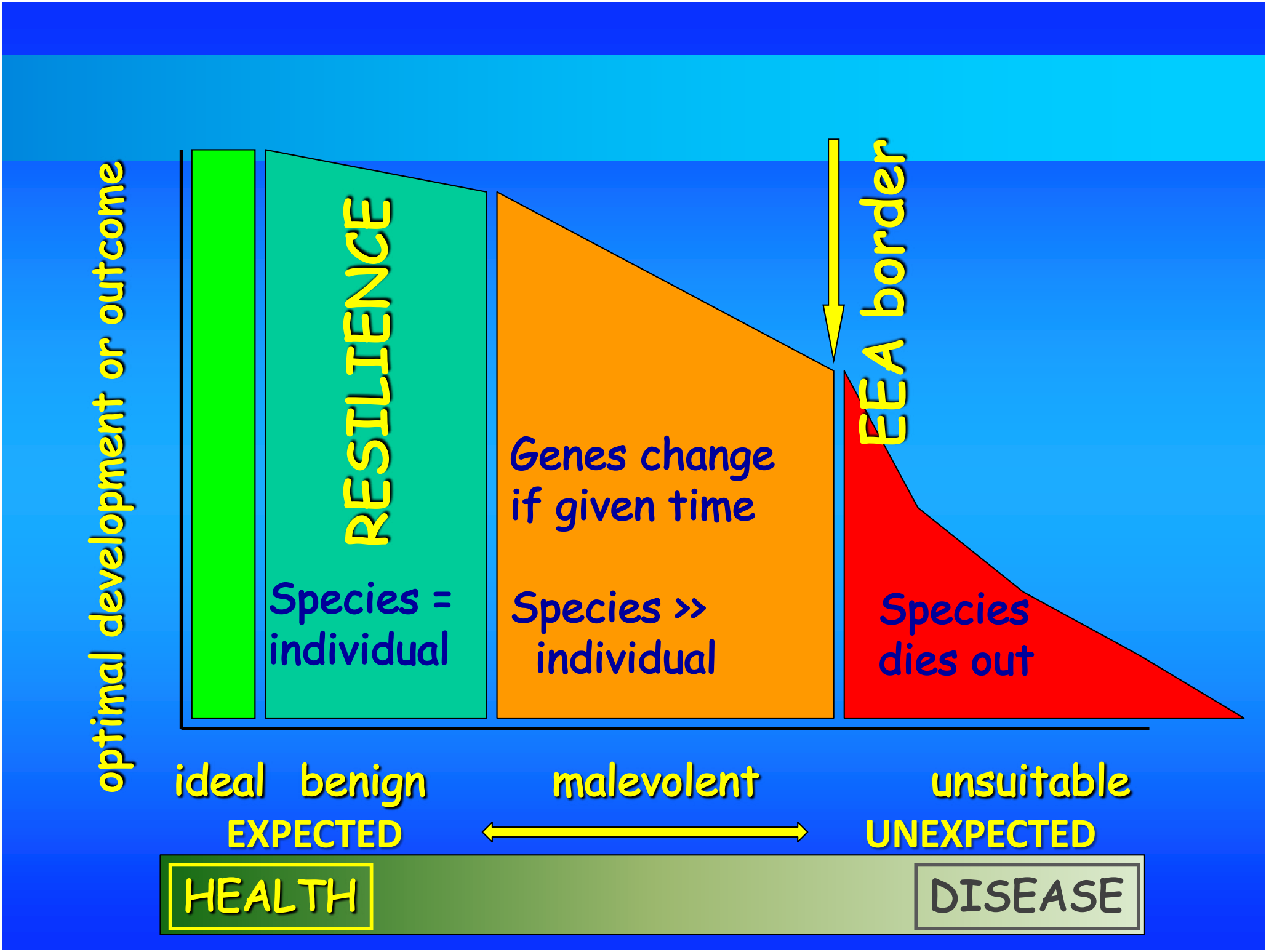
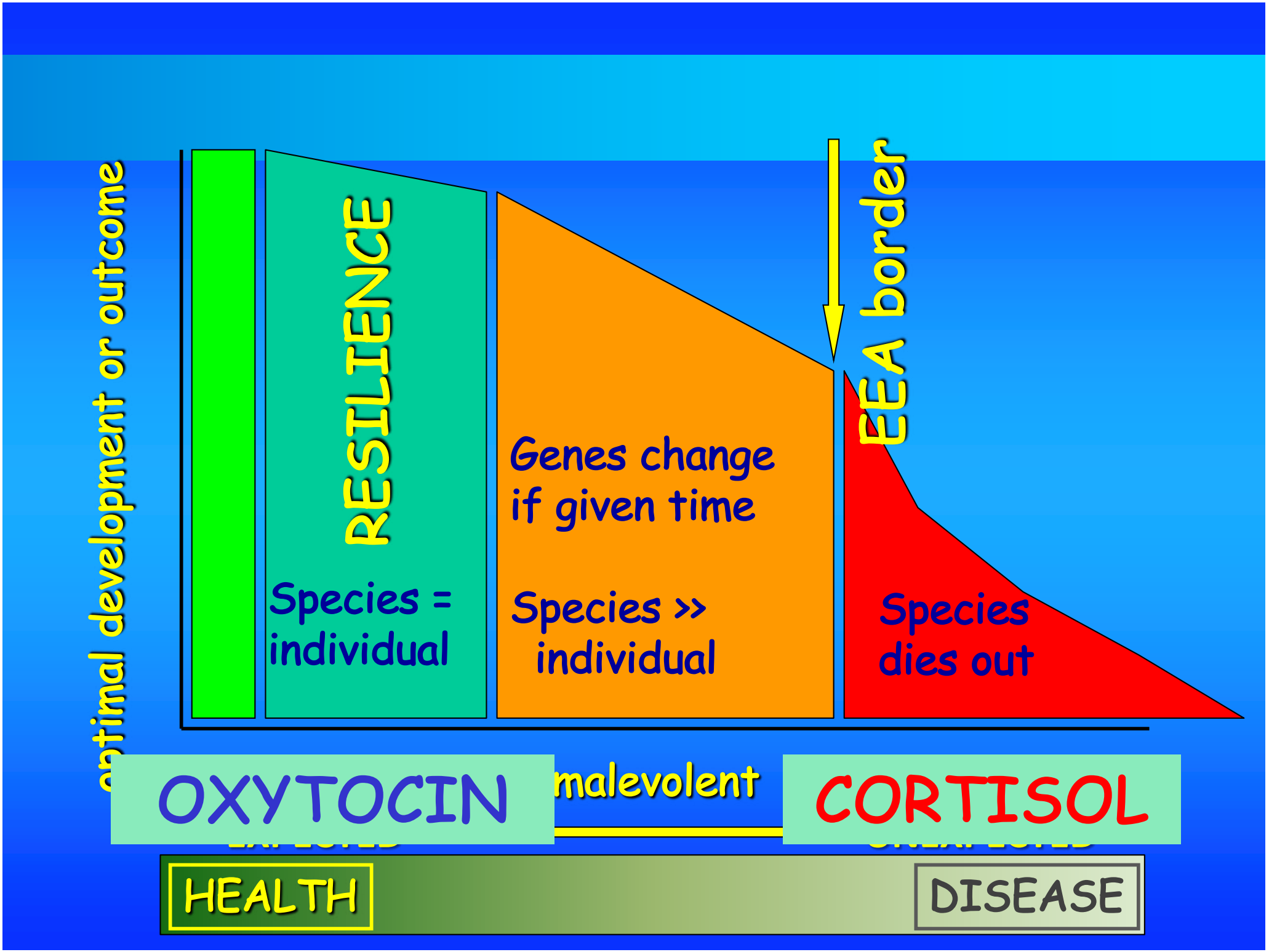
EXPECTED
UNEXPECTED
HEALTH
DISEASE


optimal development or outcome
RESILIENCE
Species = individual
Genes change if given time
Species >> individual
EEA border
Species dies out
ideal
benign
malevolent
unsuitable
EXPECTED
UNEXPECTED
HEALTH
DISEASE


optimal development or outcome
RESILIENCE
Species = individual
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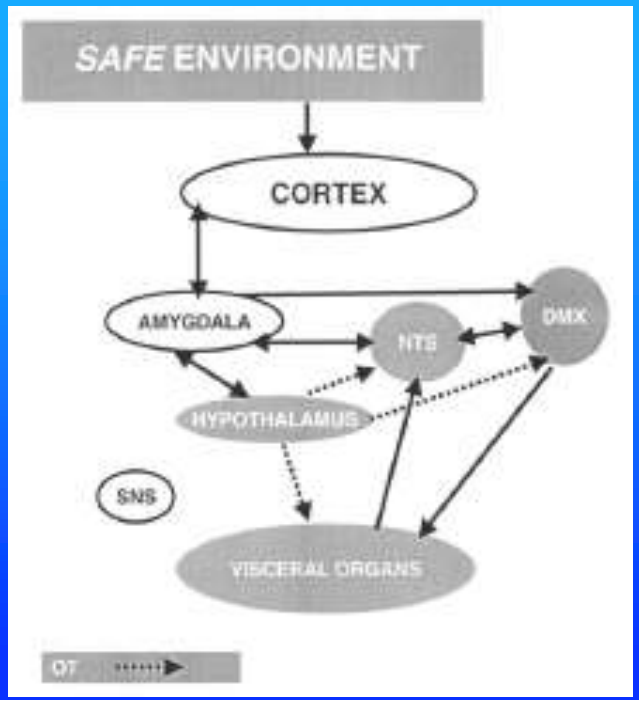
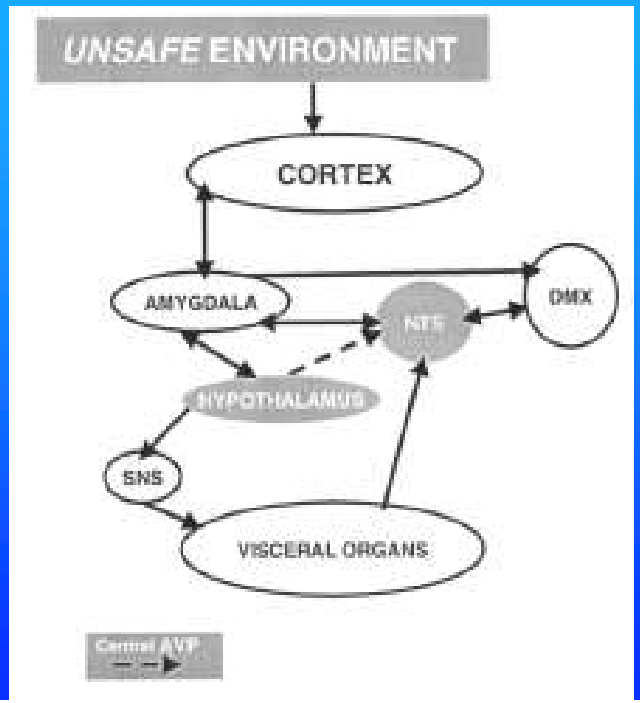
Species >> individual
EEA border
Species dies out
OXYTOCIN
malevolent
CORTISOL
HEALTH
DISEASE

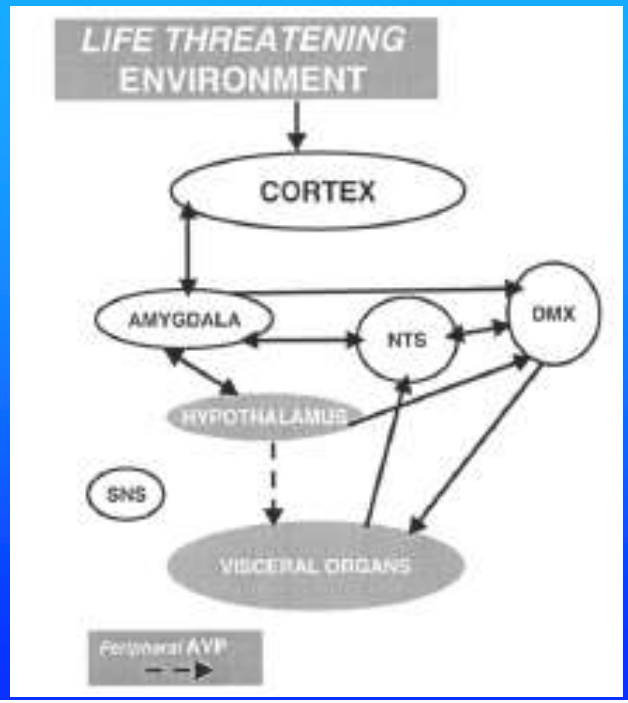
CANALISATION

Porges →
same neural circuitry,
adapted to circumstance

OXYTOCIN VASOPRESSIN CORTISOL







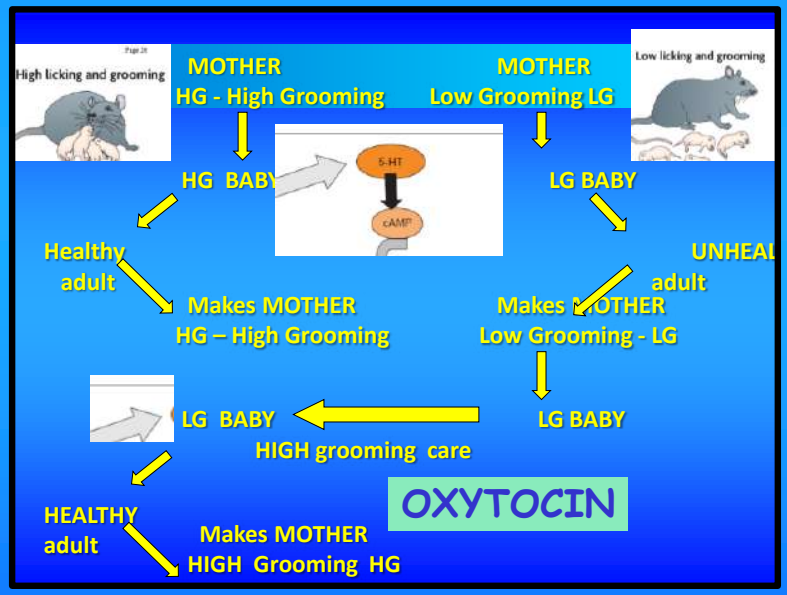
CANALISATION
LIFE HISTORY STRATEGY

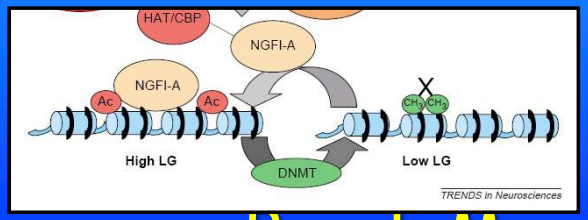
Beneficial,
abundant, LOW stress

TOP-DOWN regulation

Neo-cortex
reflect - big picture
Long term - Future gain

SLOW LIFE HISTORY
STRATEGY





Barak Morgan 2013

CANALISATION
LIFE HISTORY STRATEGY

Beneficial,
abundant, LOW stress

TOP-DOWN regulation

Neo-cortex
reflect - big picture
Long term - Future gain

SLOW LIFE HISTORY STRATEGY

QUALITY

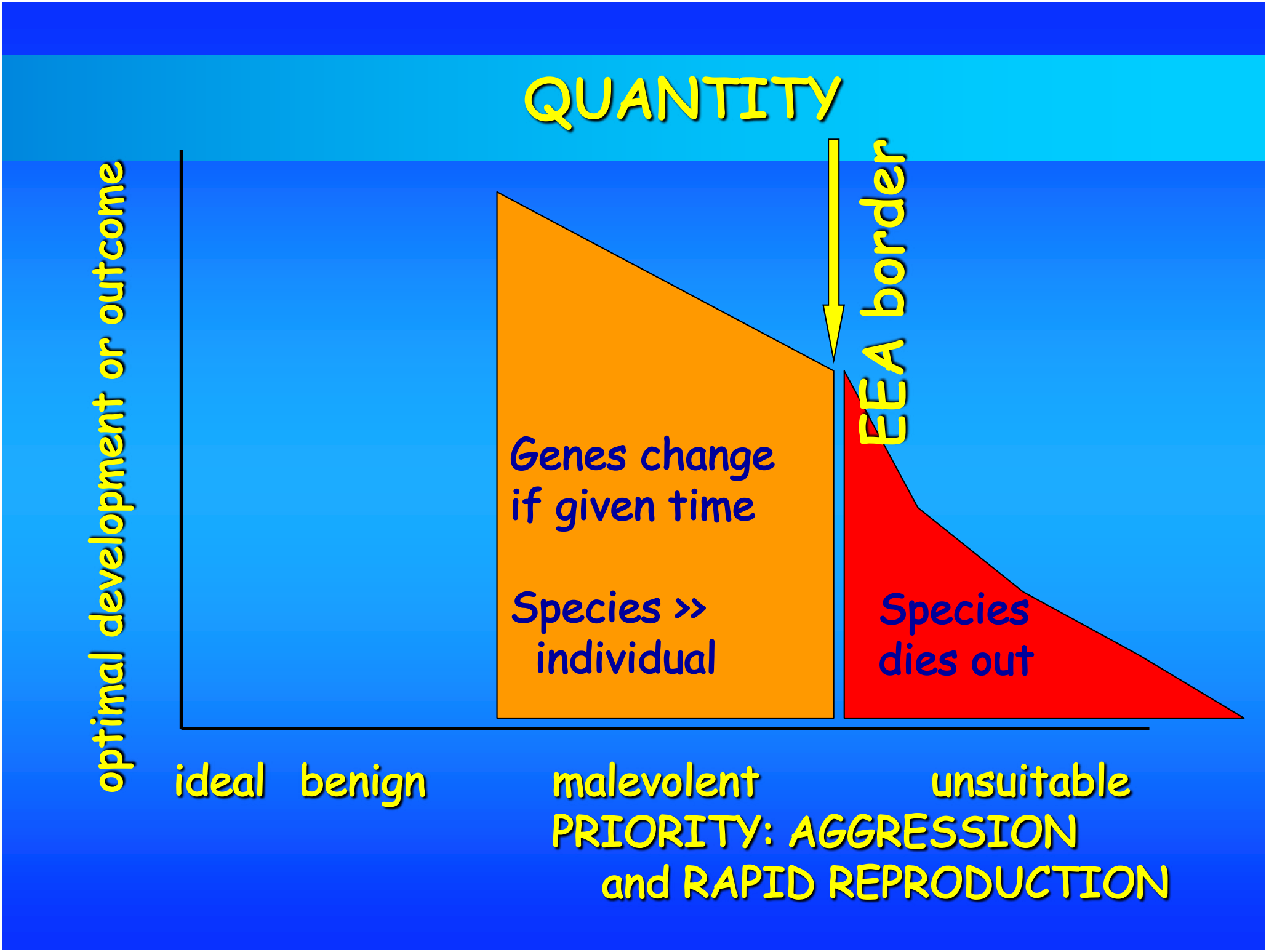
Adverse ,
impoverished, HIGH stress

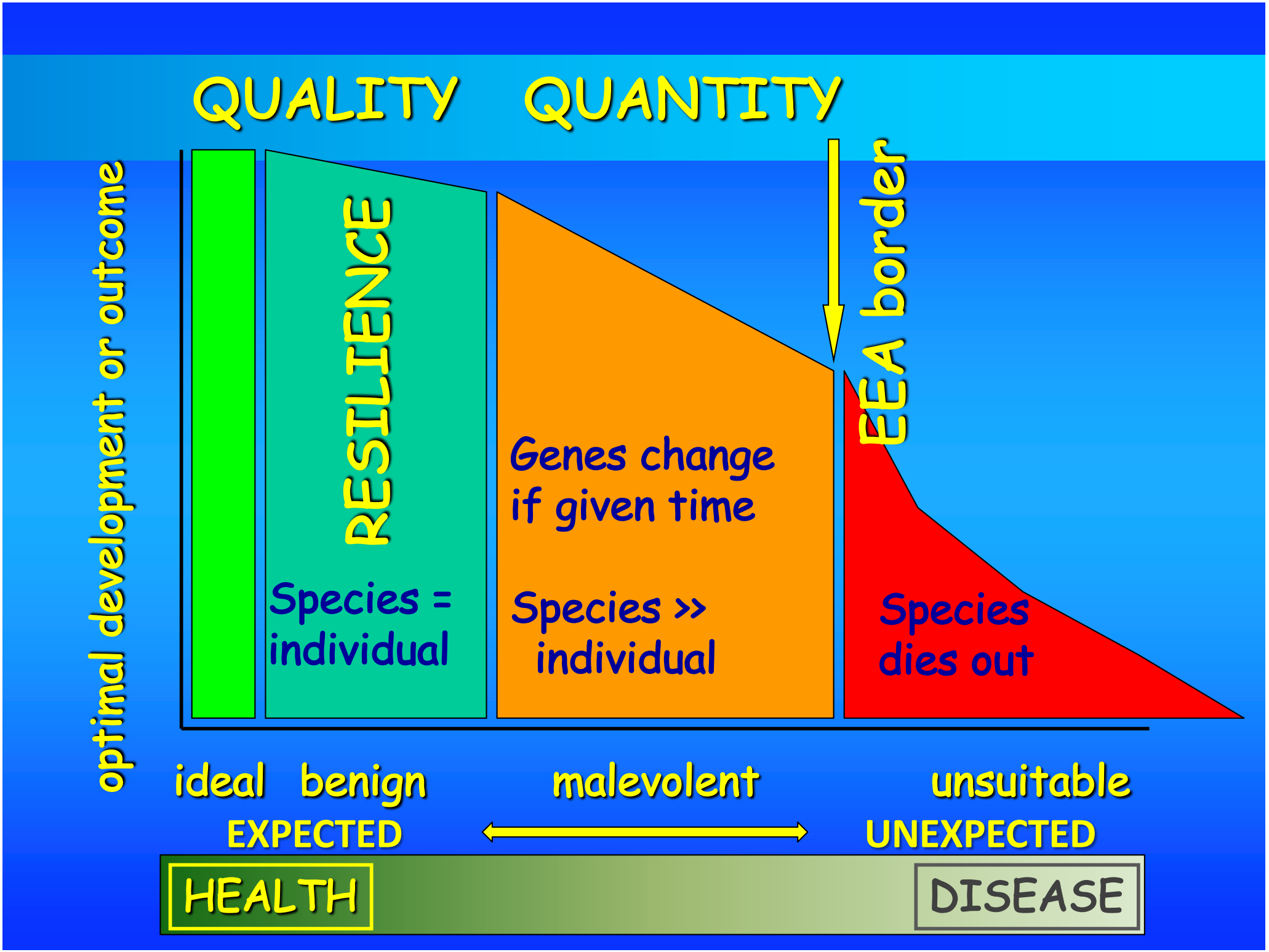
BOTTOM-UP regulation

Sub-cortex
reacts - small picture
Short term – Present gain

FAST LIFE HISTORY STRATEGY

QUANTITY


QUANTITY
optimal development or outcome
EEA border
Genes change if given time
Species » individual
Species dies out
ideal
benign
malevolent
unsuitable
PRIORITY: AGGRESSION and RAPID REPRODUCTION


QUALITY
QUANTITY
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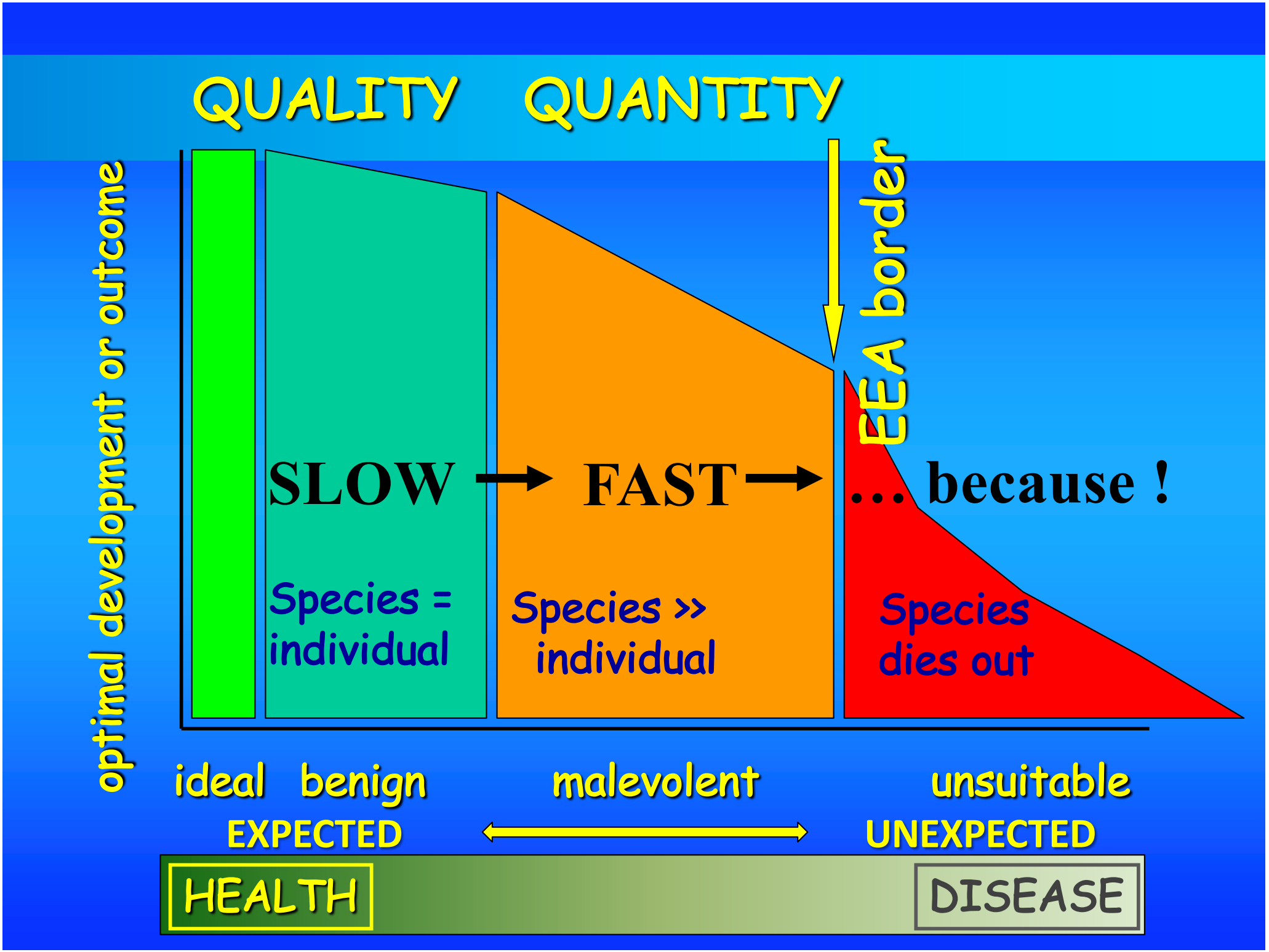
DISEASE


QUALITY
QUANTITY
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FAST
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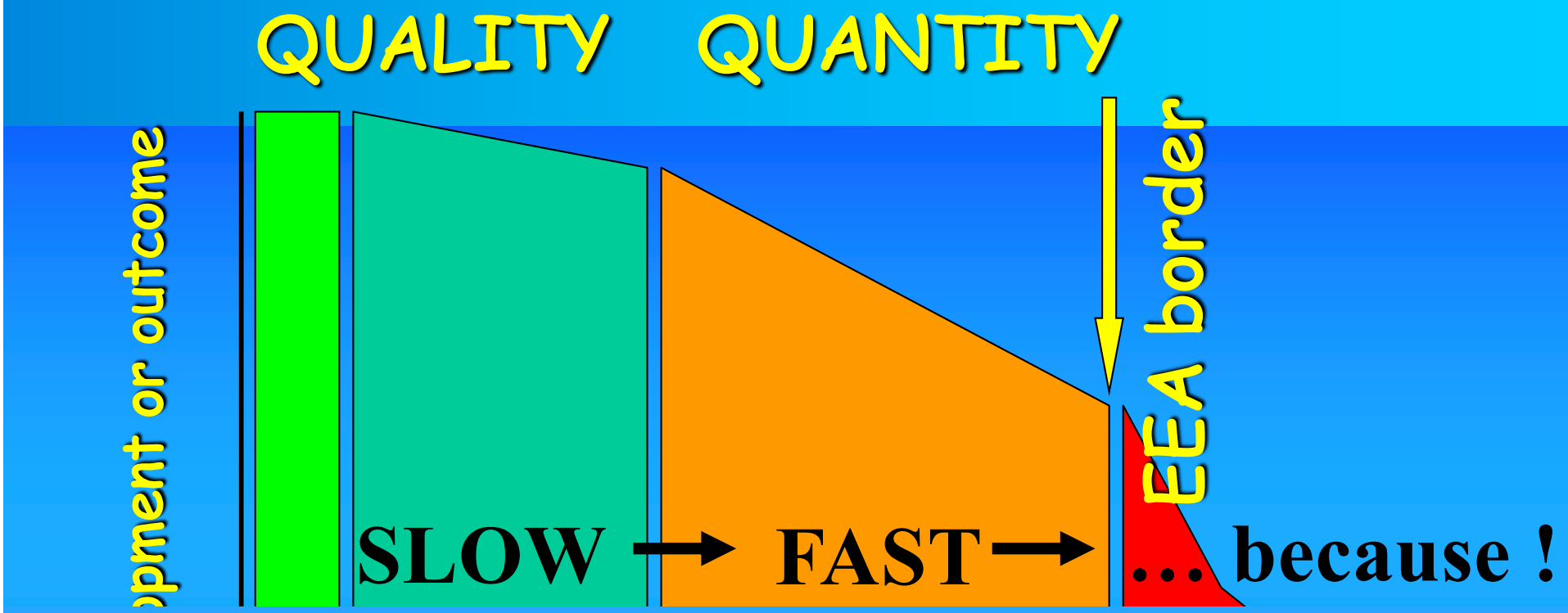
UNEXPECTED
HEALTH
DISEASE



- The developing brain copes adaptively to early stress.
- Prepared for harsh/malevolent environment

Teicher 2002, Ellis 2018

AN EVOLUTIONARY PERSPECTIVE

- Early stress produces alterations in brain function and disrupts normal brain development.

- The developing brain copes adaptively to early stress.
- Prepared for harsh/malevolent environment

Teicher 2002, Ellis 2018

Adaptive Changes to stress

BRAIN CHANGES	CONSEQUENCE
AMYGDALA changes limbic irritability	→fight-flight response →aggressive defence.
HIPPOCAMPUS	→dissociation defence.
Left HEMISPHERE diminished maturation less R - L integration	→augmented anger →more aggression.
Vermal development (CEREBELLUM)	→limbic irritability, →maintains hyperarousal →sympathetic activation

Adaptive Changes to stress

HORMONE CHANGES CONSEQUENCE

Early stress produces a life-long :

VASOPRESSIN increase

OXYTOCIN reduction

Adaptive Changes to stress

HORMONE CHANGES CONSEQUENCE

Early stress produces a life-long :

VASOPRESSIN increase

→ Enhanced sexual arousal

OXYTOCIN reduction

→ Diminished sexual fulfillment

Adaptive Changes to stress

HORMONE CHANGES CONSEQUENCE

Early stress produces a life-long :

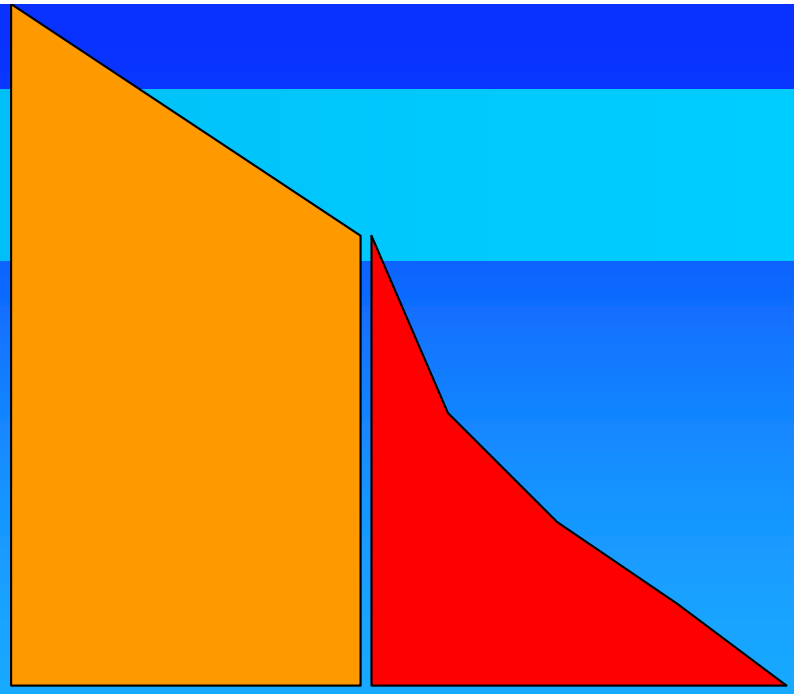
VASOPRESSIN increase

→ Enhanced sexual arousal

OXYTOCIN reduction

→ Diminished sexual fulfillment

→ Deficient commitment to a single partner



VASOPRESSIN increase

→ Enhanced sexual arousal

OXYTOCIN reduction

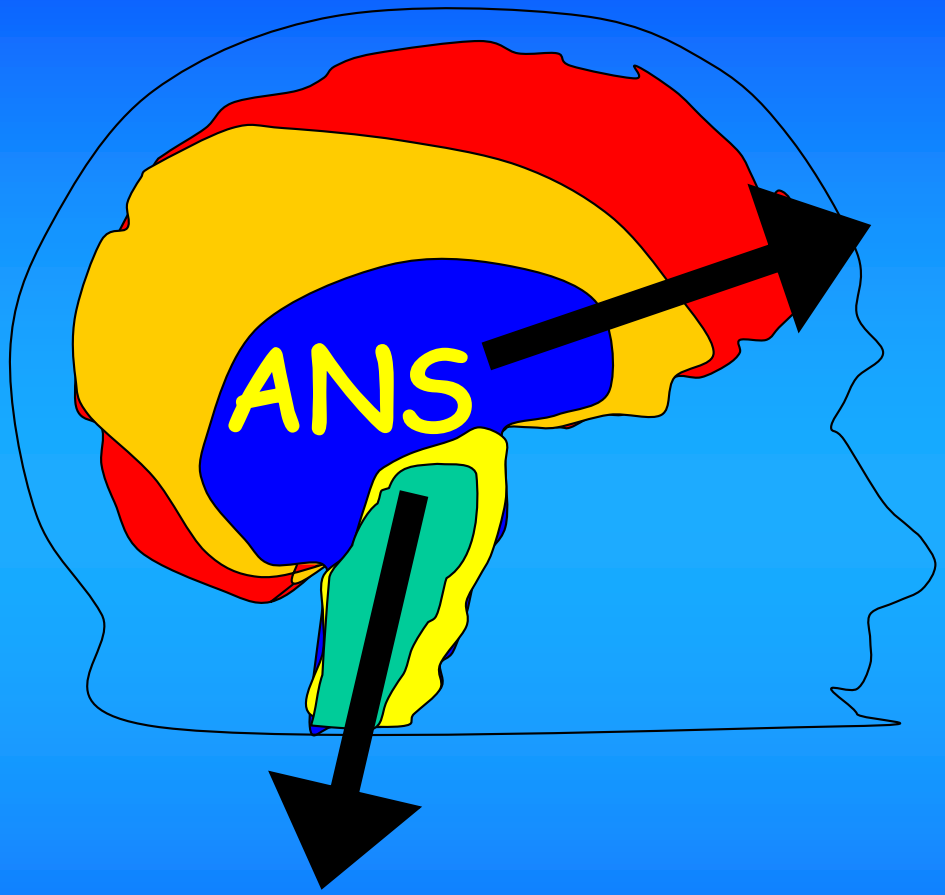
→ Diminished sexual fulfillment

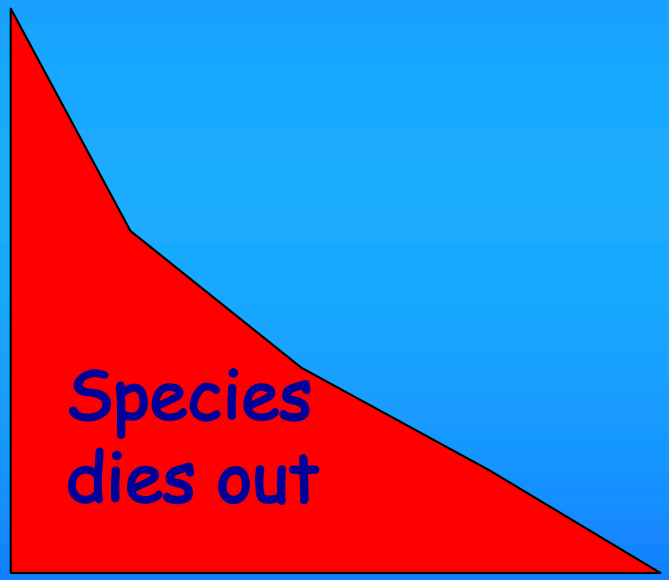
→ Deficient commitment to a single partner

→ Promiscuity :

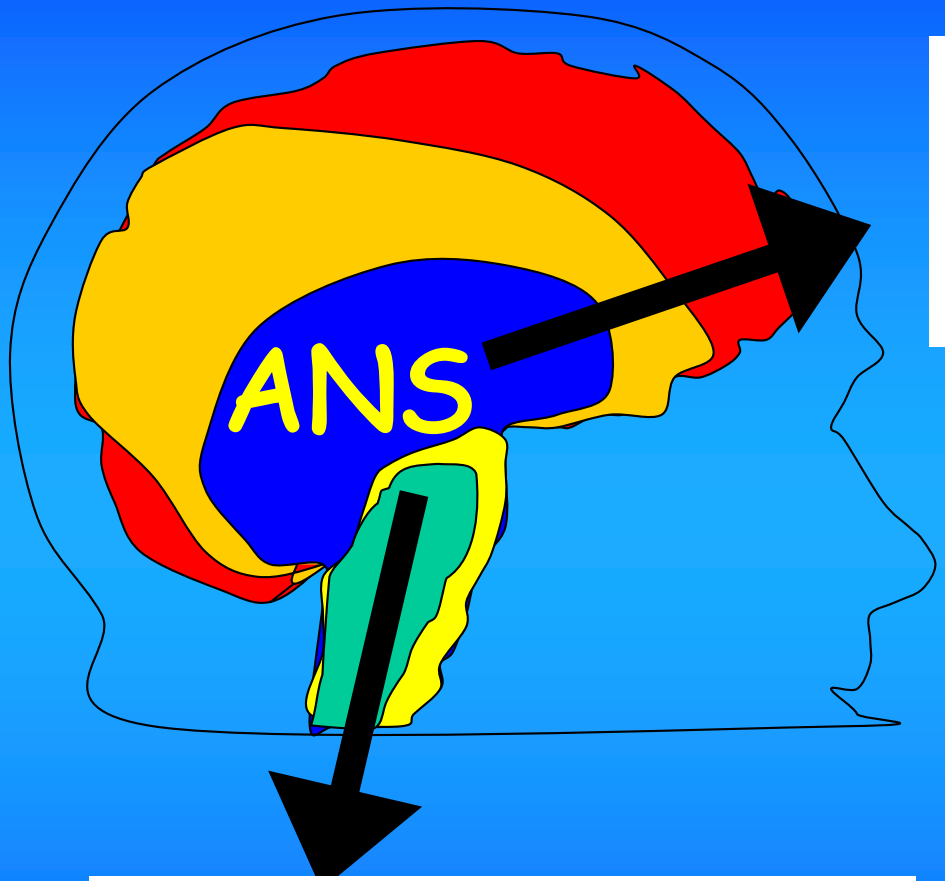
Reproductive success in times of danger

evolutionary survival machine

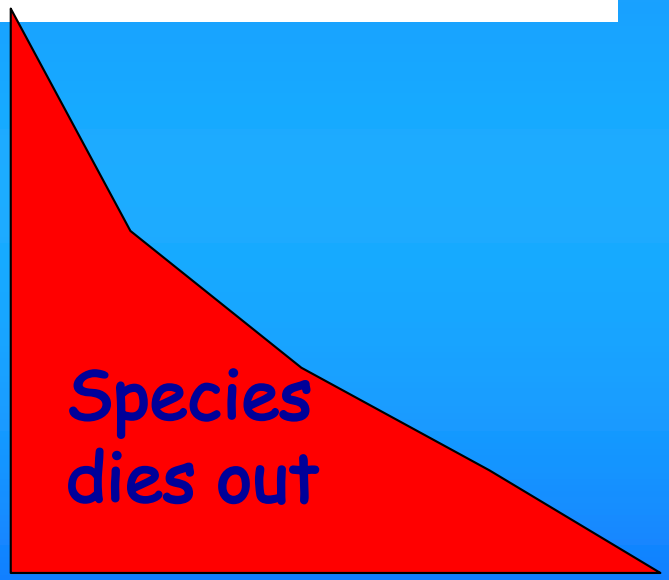




evolutionary survival machine



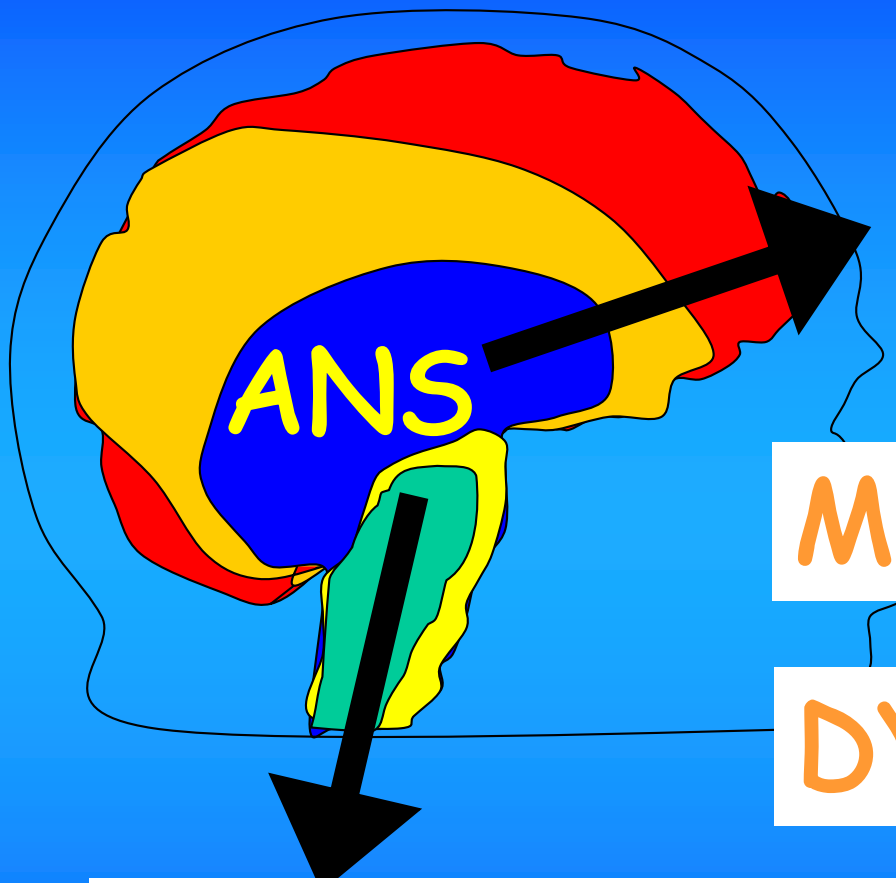
SECURE ATTACHMENT



REGULATION

OXYTOCIN

evolutionary survival machine



SECURE ATTACHMENT

MAL-ADAPTATION

DYS-REGULATION

REGULATION

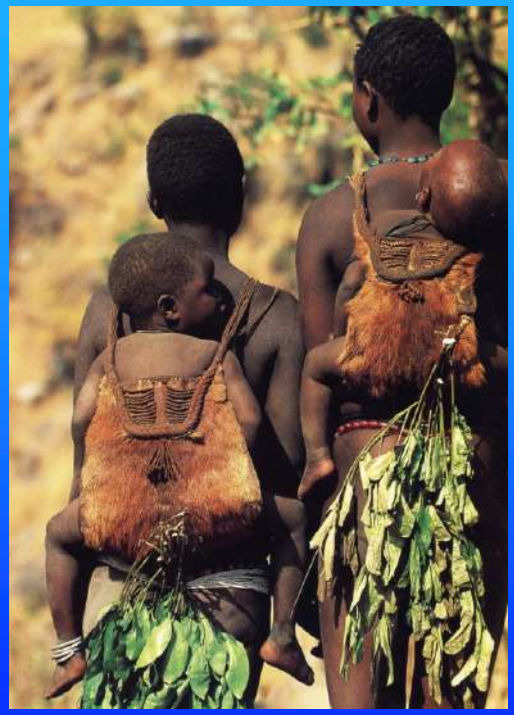
OXYTOCIN VASOPRESSIN CORTISOL

John Bowlby :

ENVIRONMENT ADAPTATION → EXPERIENCE → REPRODUCTIVE FITNESS

" … predisposition for attachment behaviour is inborn."

Environment of
Evolutionary
Adaptedness



BELSKY attachment and fitness

"Evolutionary"
the genes ensure
reproductive fitness
in malevolence ... an
alternative program

Belsky et al. Child Development 1991; Vol 62(4): 647-670
Childhood Experience, Interpersonal Development, and Reproductive Strategy: An evolutionary Theory of Socialization.

Mary Ainsworth (1913 – 1999)

… provide scientific evidence for Bowlby's theories.

Strange Situation Test:

- secure attachment
- insecure ambivalent (anxious)
- insecure avoidant

(- disorganized)

SECURE ATTACHMENT

1 world benign/benevolent
2 others can be trusted
3 relationships are
enduring & rewarding

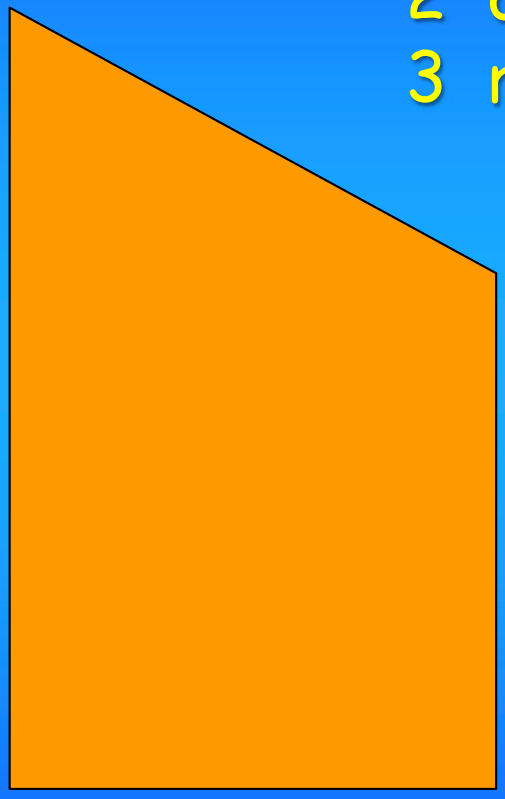
OXYTOCIN

STRONG PAIR BONDS
Parental care investment
SENSITIVE CARE
fewer offspring, better survival

Quality versus quantity

AVOIDANT attachment

1 world an uncaring place
2 others can NOT be trusted
3 relationships are NOT enduring & rewarding



"Programmed to be
self-serving
opportunistic
Multiple mating
MANY CHILDREN
INSENSITIVE CARE

ideal benign malevolent

MORE offspring, better survival

Quantity versus Quality

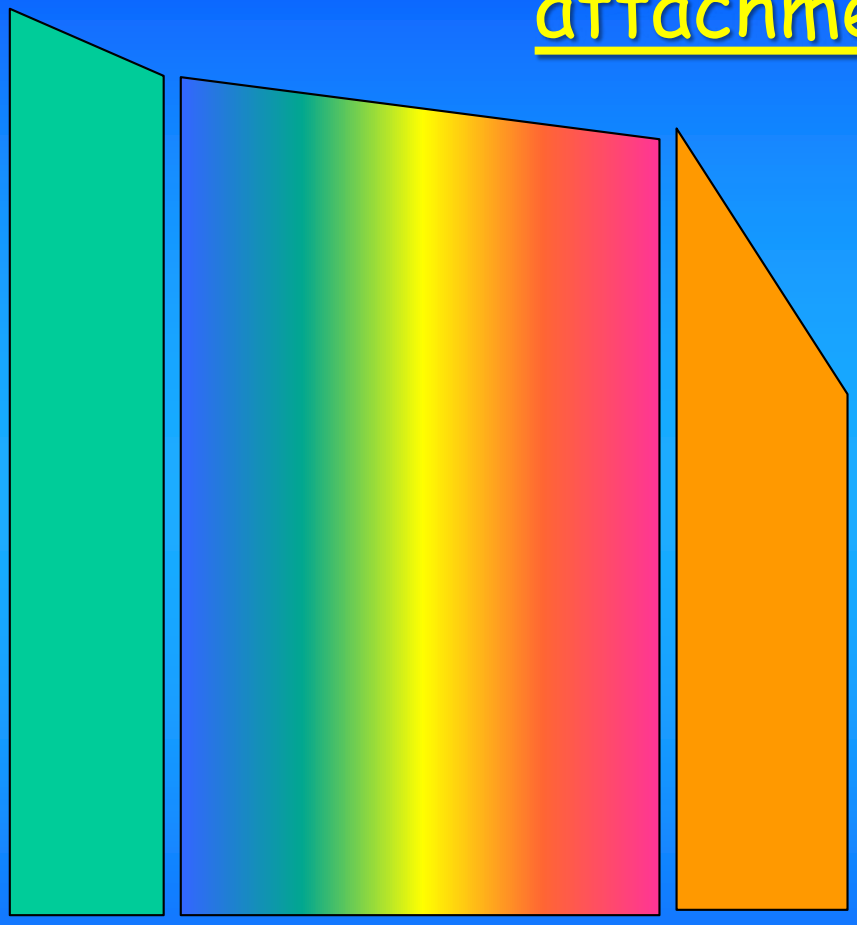
RESISTANT attachment

AVOIDANT attachment

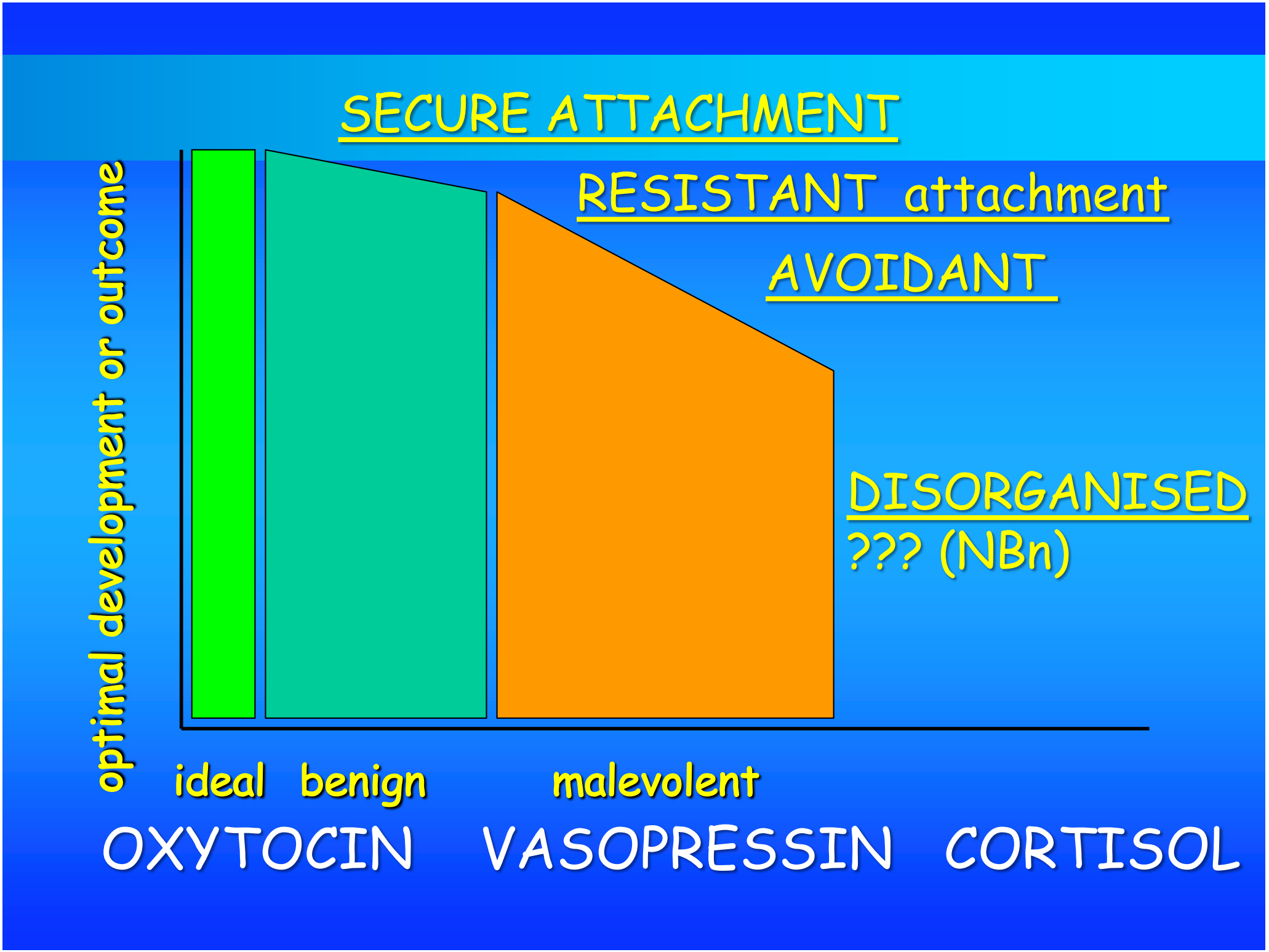
1 world unpredictable
2 dependency on others
3 relationships are enduring ~~& rewarding~~

ERRATIC CARE →
Exaggerated need for care
Depend on Parents →
"HELPER-AT-THE-NEST"

(NO PAIR BONDS)



Benign / malevolent

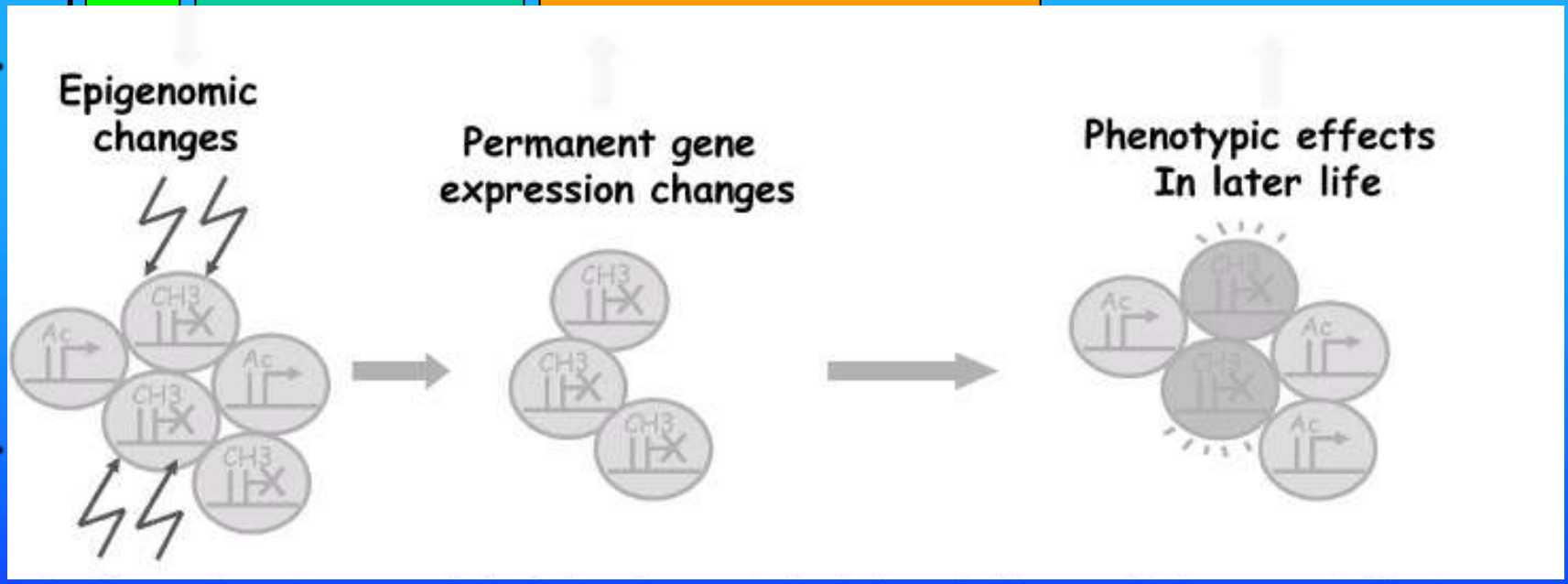

SECURE ATTACHMENT
RESISTANT attachment
AVOIDANT
DISORGANISED
??? (NBn)
optimal development or outcome
ideal
benign
malevolent
OXYTOCIN
VASOPRESSIN
CORTISOL

SECURE ATTACHMENT

RESISTANT attachment

AVOIDANT

optimal development or outcome



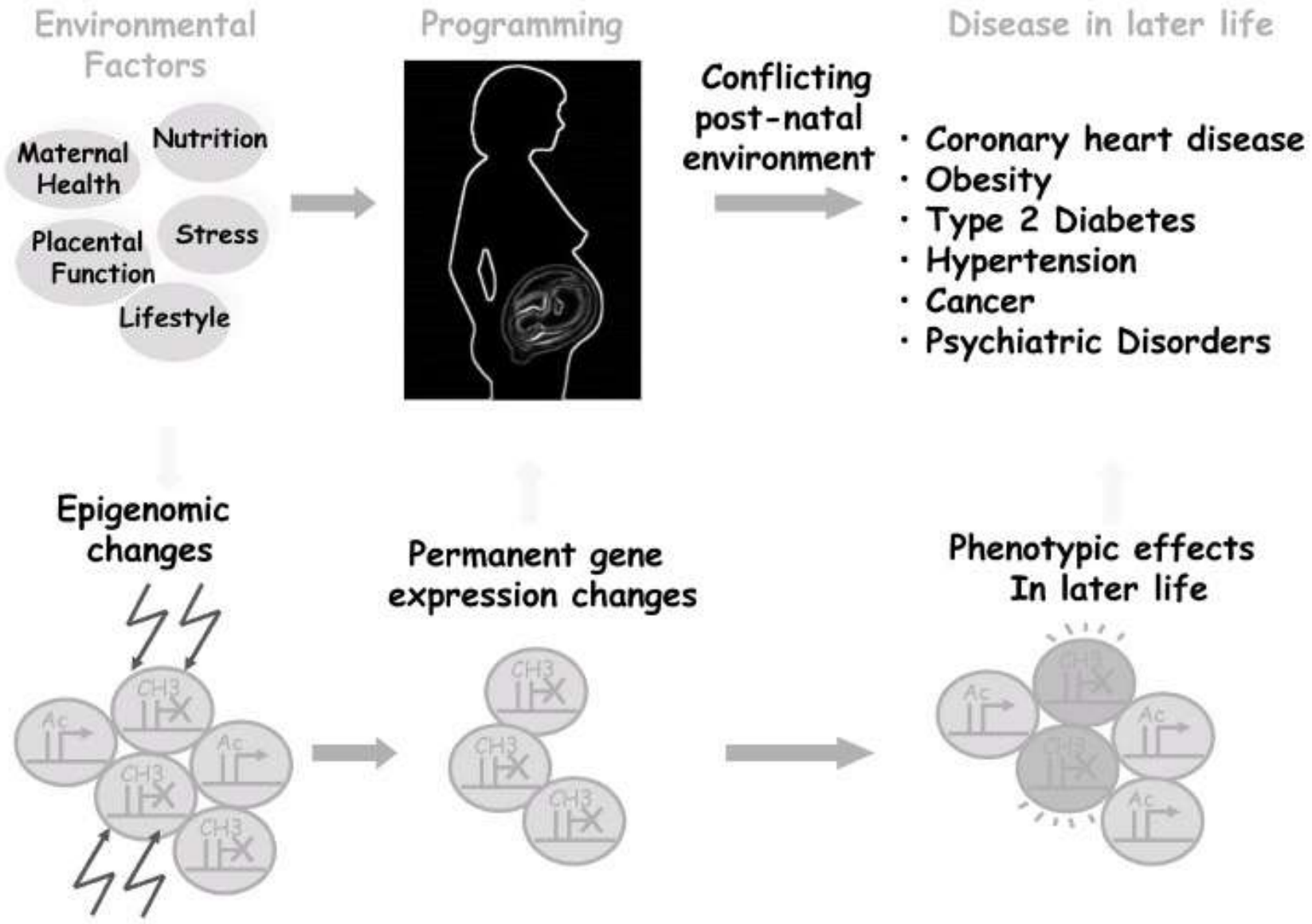


FIG. 6. The epigenotype model of developmental origins of disease. Environmental factors acting in early life have consequences that become manifest as an altered disease risk in later life. The period of life in which external factors can influence biology extends from

The Fetal Matrix:

Genome
EPIGENETICS

ENVIRONMENT

ADAPTATION

PREDICTIVE ADAPTIVE RESPONSES (PARs)

Gluckman &Hanson 2005

Match-mismatch paradigm →
early prediction vs mature environment

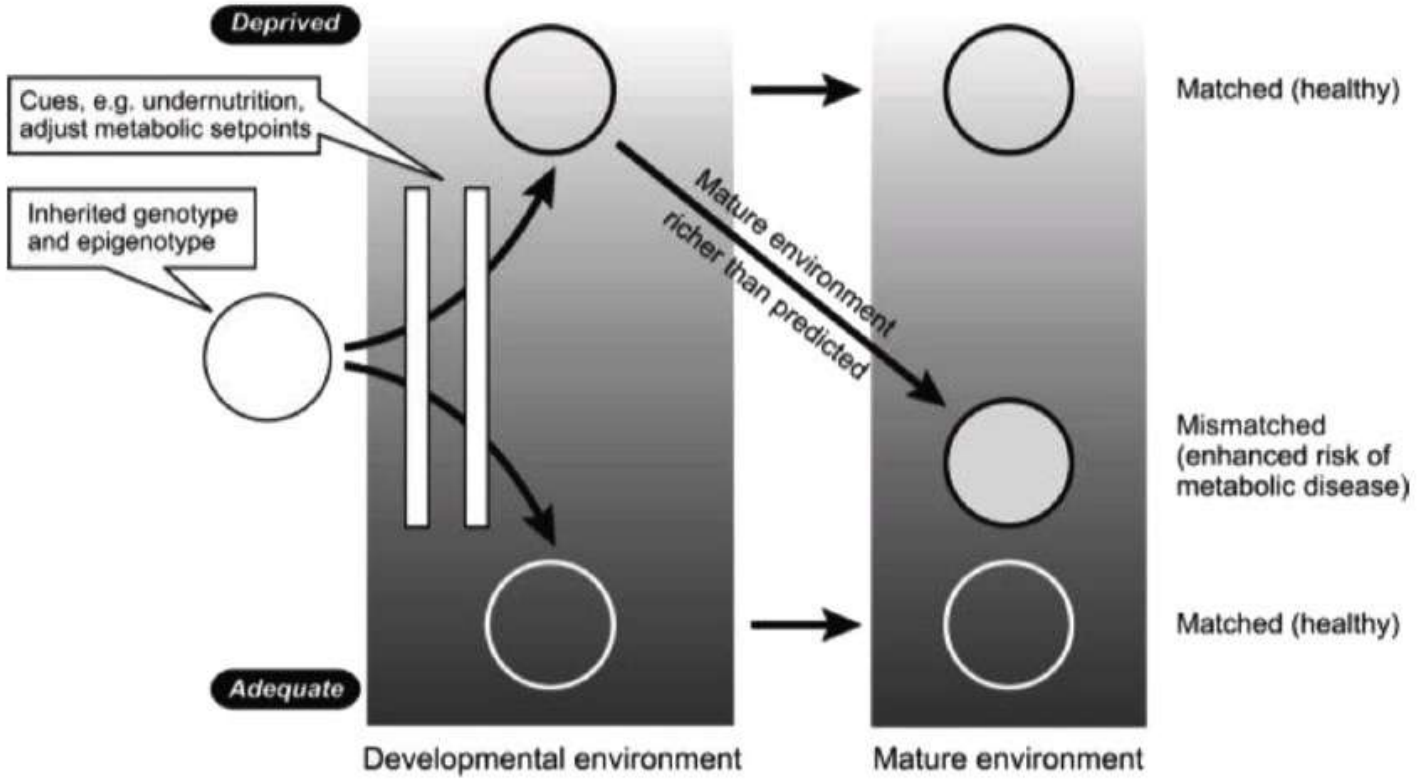


FIG. 2. The match-mismatch paradigm of metabolic disease. The developing organism senses maternally transmitted environmental cues, such as undernutrition, during prenatal and early postnatal life. Developmental plasticity in response to these cues modifies the default trajectory defined by the inherited fetal genor *k background*) or deprived (*light background*), resultin dequate or deprived, matches the prediction, then the risk nd actual mature environments, particularly if the mature er eproduced from P. D. Gluckman *et al.*: *Am J Hum Biol* 19:1–19, 2007 (23). © 2006 Wiley-Liss, Inc., reprinted with permission from John Wiley & Sons, Inc.]

MAL-ADAPTATION

Match-mismatch paradigm →
early prediction vs mature environment

Child Health, Developmental Plasticity, and Epigenetic Programming

Z. Hochberg, R. Feil, M. Constancia, M. Fraga, C. Junien, J.-C. Carel, P. Boileau,

Endocrine Reviews, April 2011, 32(2):159–224

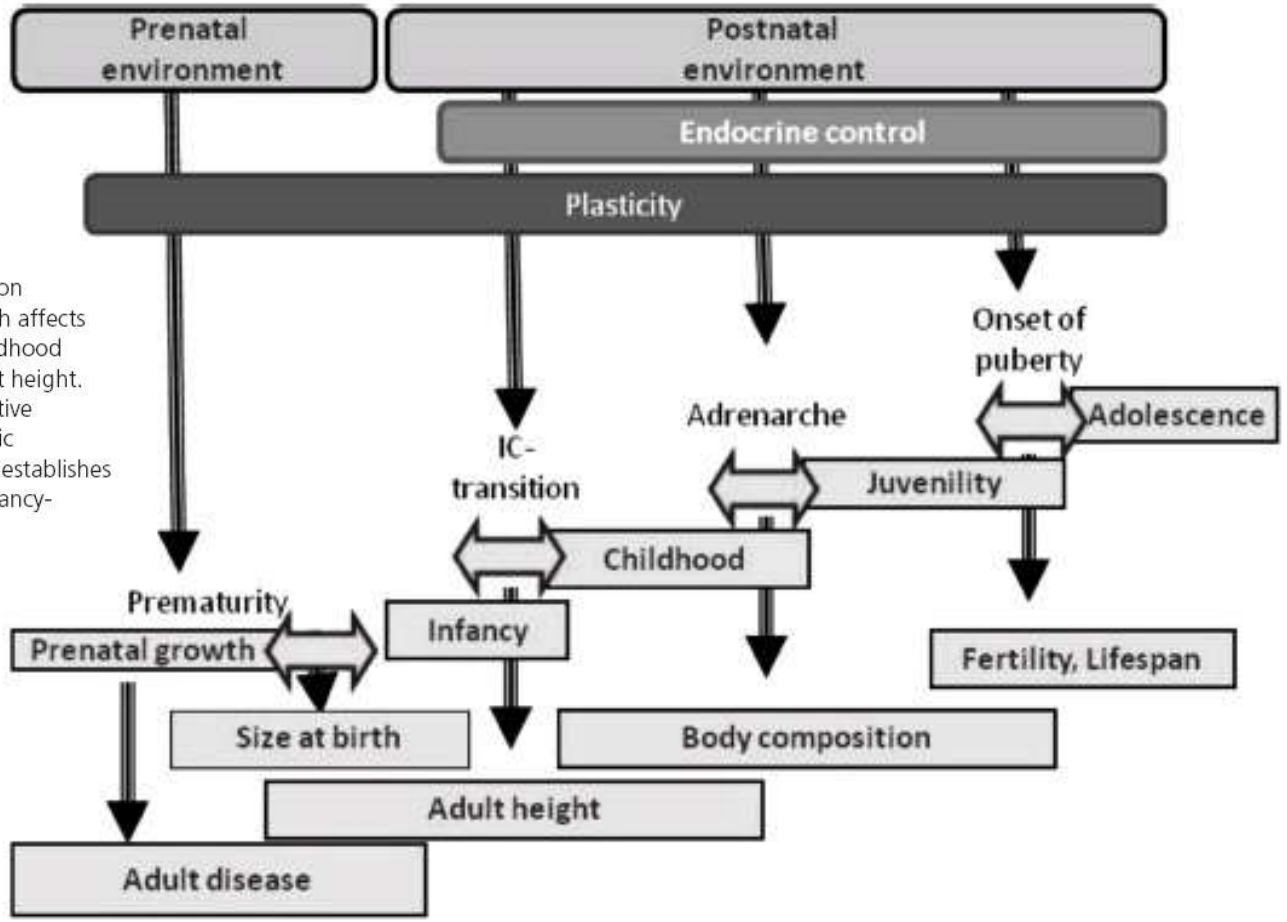


FIG. 1. Preadult periods of adaptive plasticity in the transition between life-history phases (*double arrows*). Prenatal growth affects adult health and disease. The transition from infancy to childhood confers a predictive adaptive response that determines adult height. The transition from childhood to juvenility bestows an adaptive response that resolves adult body composition and metabolic consequences. The transition from juvenility to adolescence establishes longevity and the age of reproduction and fecundity. IC, Infancy-childhood (transition).

Child Health, Developmental Plasticity, and Epigenetic Programming

Z. Hochberg, R. Feil, M. Constancia, M. Fraga, C. Junien, J.-C. Carel, P. Boileau,

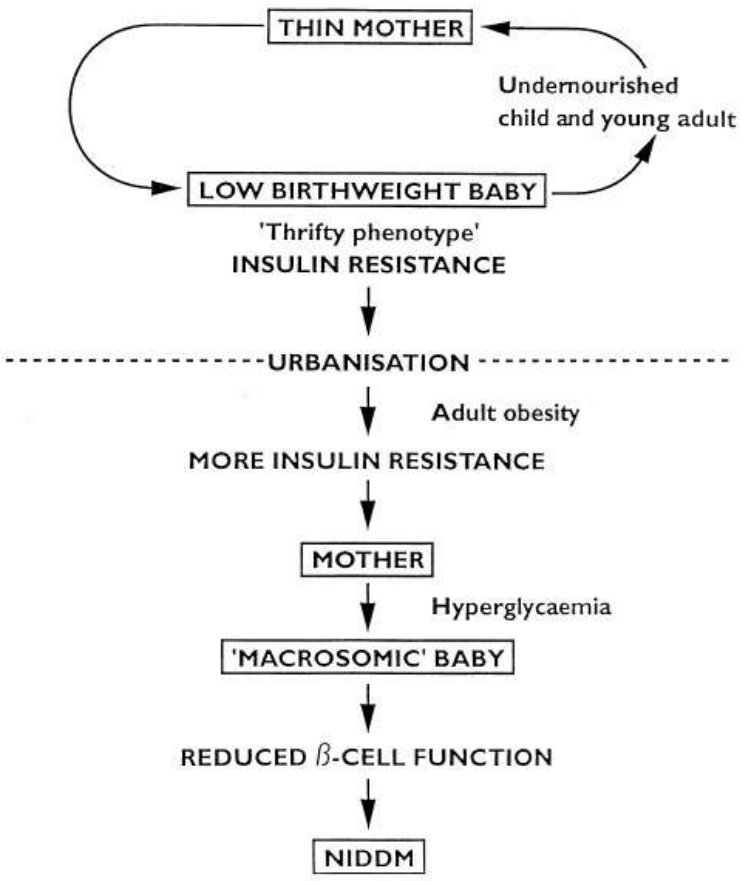
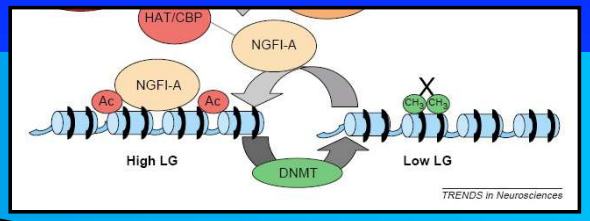


Figure 3 **A model to explain the epidemic of Type II diabetes in urban India**

NIDDM, non-insulin-dependent (Type II) diabetes mellitus.

DOHAD Developmental Origins of Health and Adult Disease

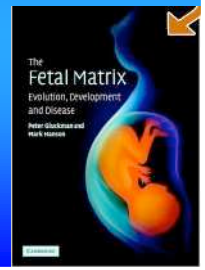


The Fetal Matrix: The DNA EPIGENETICS

ENVIRONMENT ADAPTATION

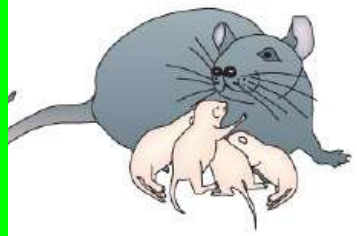
PREDICTIVE ADAPTIVE RESPONSES (PARs)

Gluckman &Hanson 2005

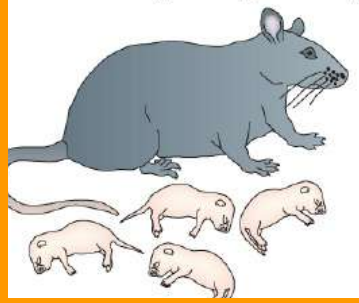


optimal development or outcome

High licking and grooming



Low licking and grooming



ideal benign malevolent

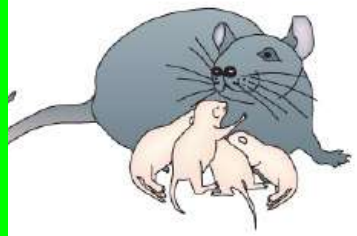
EXPECTED ⟷ UNEXPECTED

HEALTH DISEASE

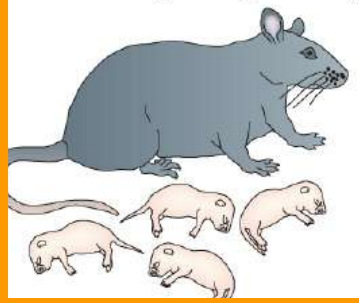
Good mum – Bad mum?

optimal development or outcome

High licking and grooming



Low licking and grooming



ideal benign malevolent

EXPECTED ⟷ UNEXPECTED

HEALTH DISEASE

Good mum – Bad mum? NO!

optimal development or outcome

Good world

Bad World → adapt!

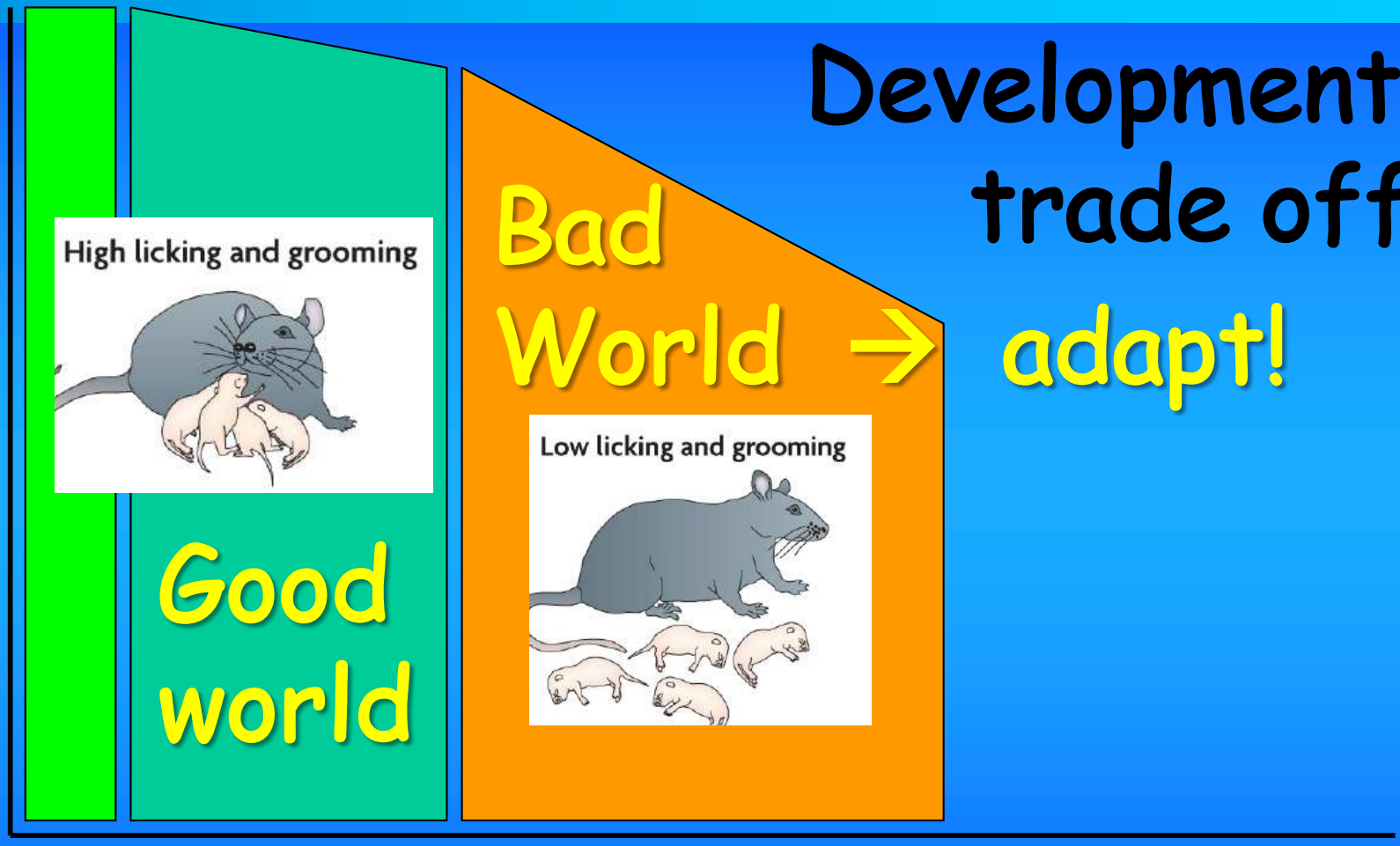
ideal benign malevolent

EXPECTED ⟷ UNEXPECTED

HEALTH DISEASE

Good mum – Bad mum?

optimal development or outcome



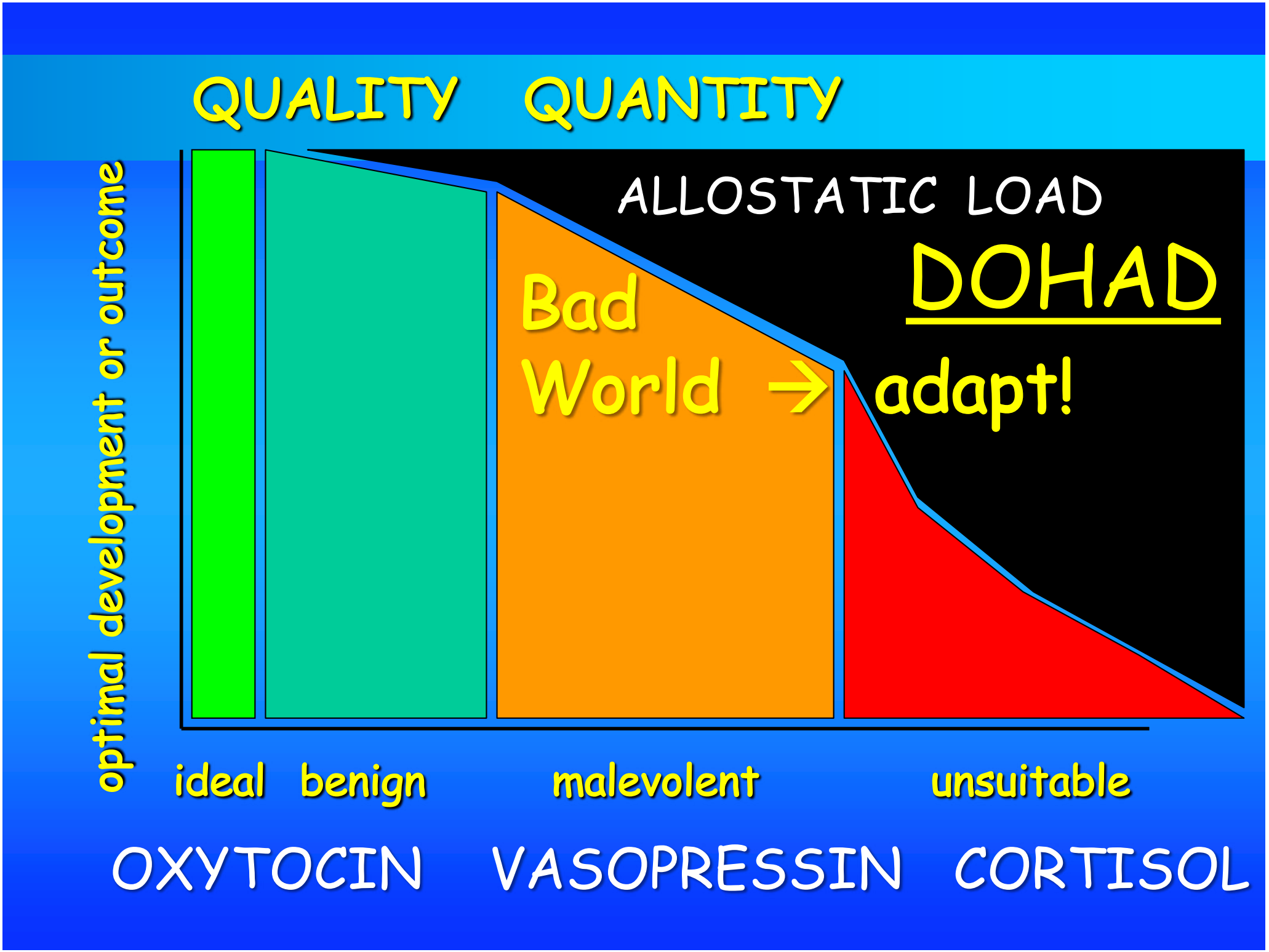
Developmental trade off

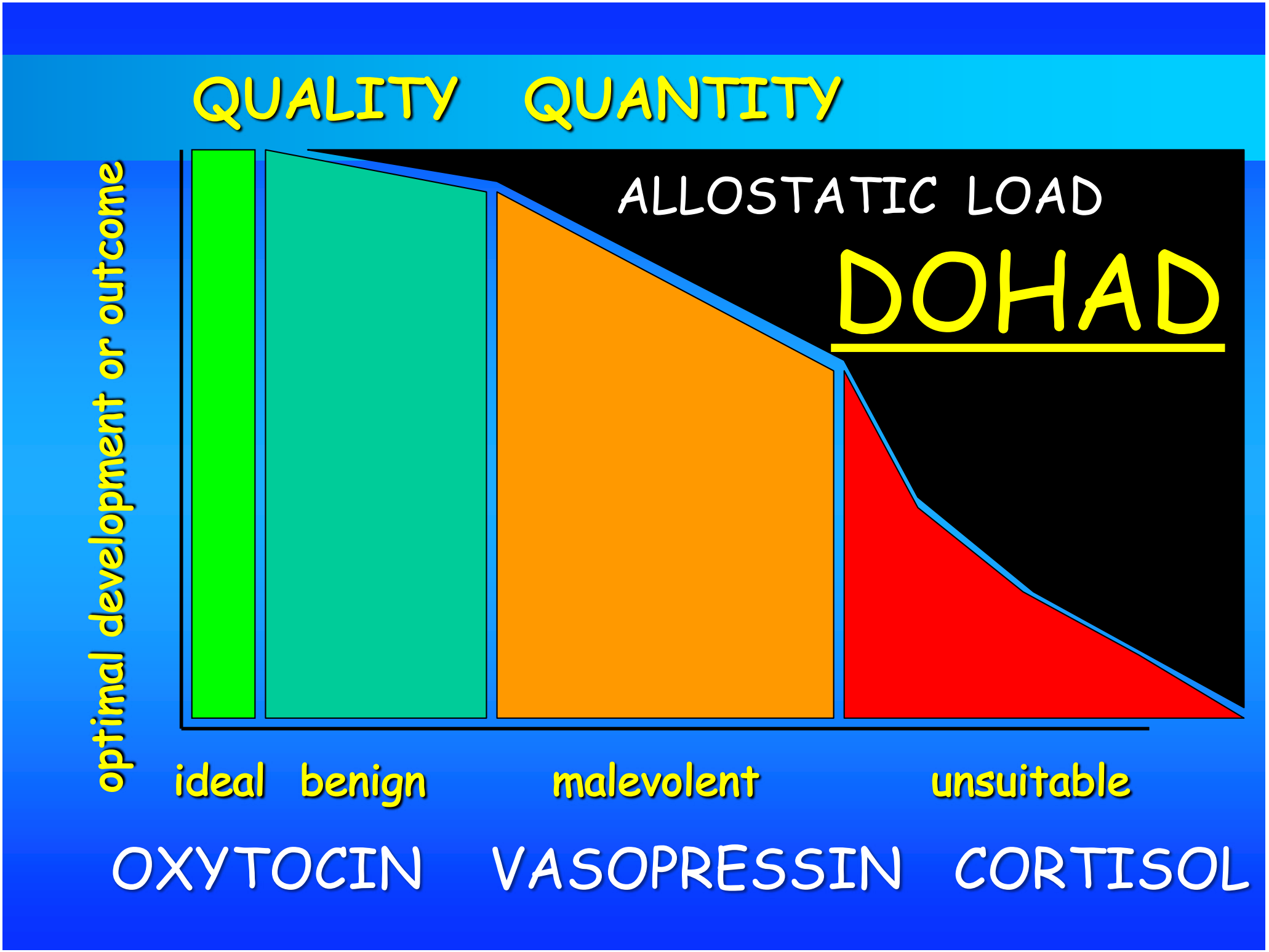
adapt!

ideal benign malevolent

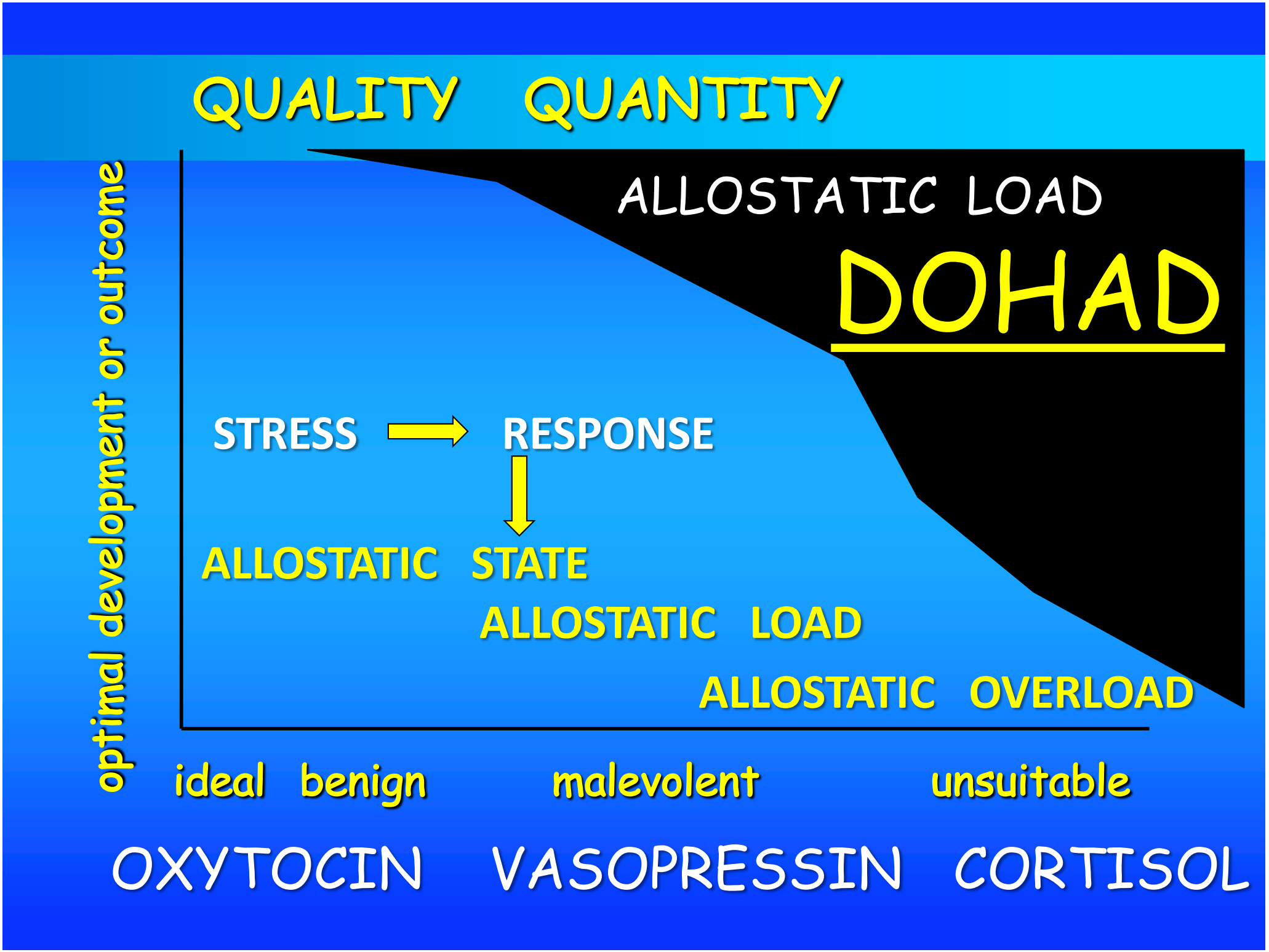
EXPECTED ⟷ UNEXPECTED

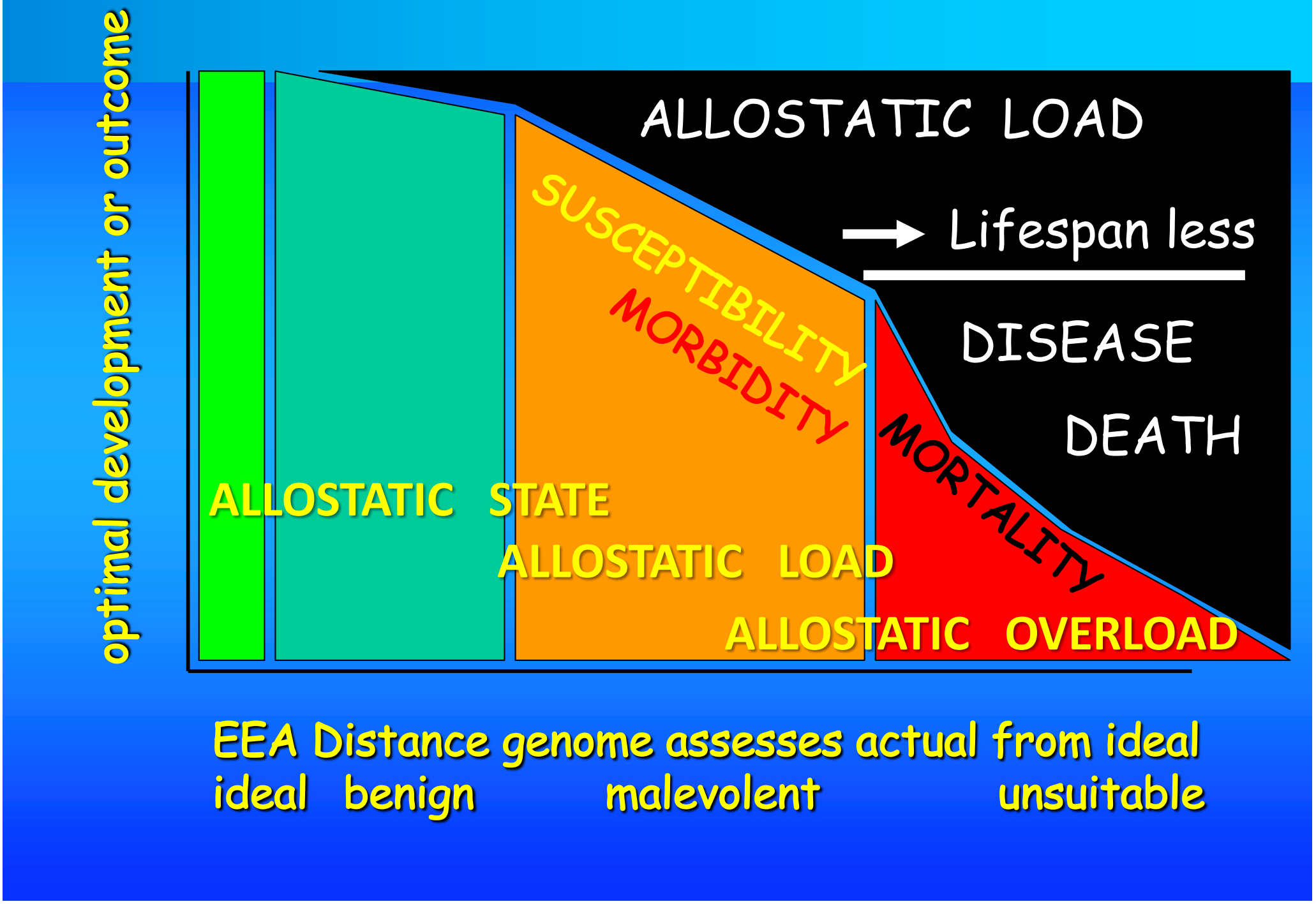
HEALTH DISEASE

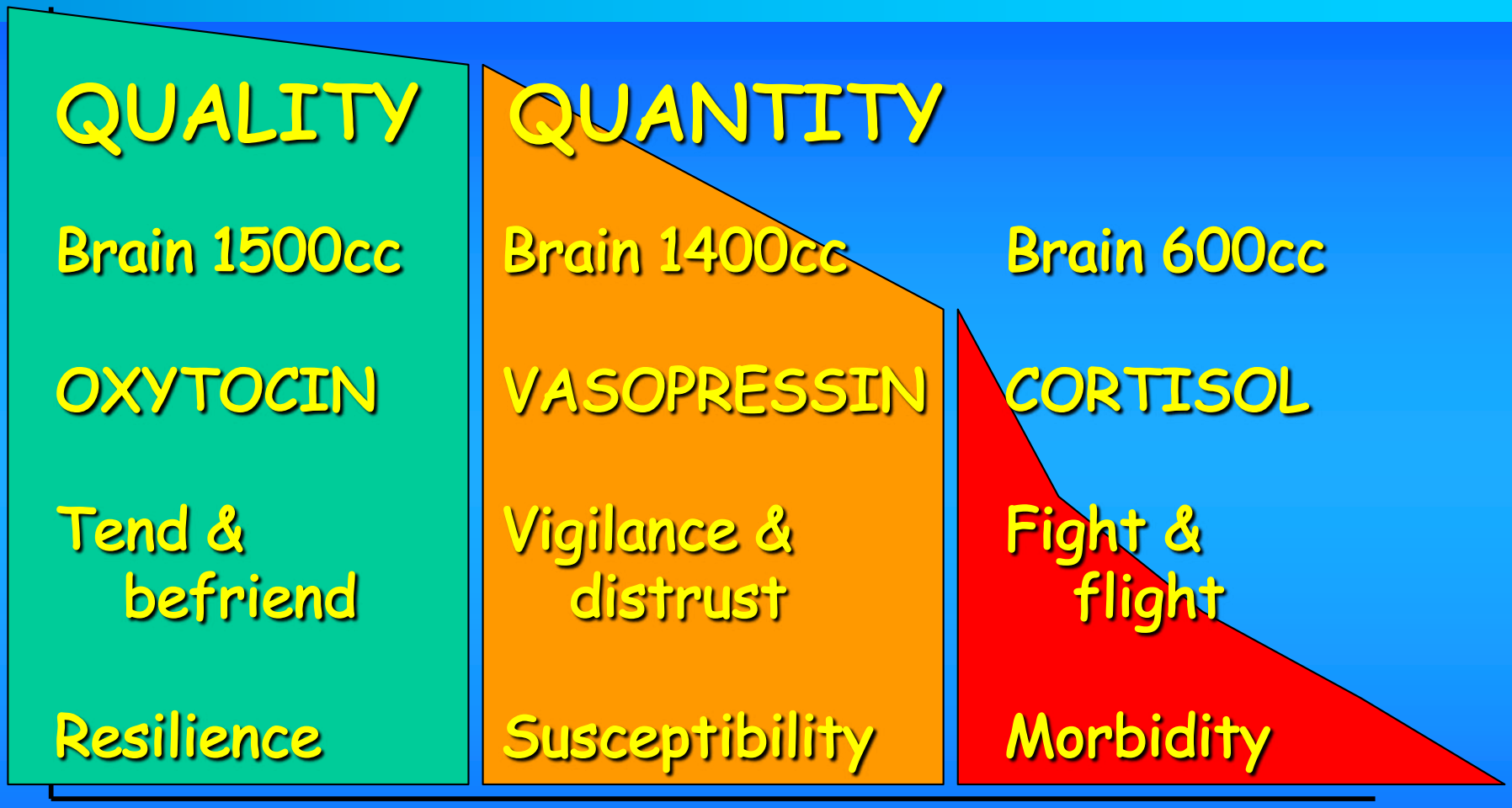

QUALITY
QUANTITY
ALLOSTATIC LOAD
DOHAD
Bad World →
adapt!
optimal development or outcome
ideal
benign
malevolent
unsuitable
OXYTOCIN
VASOPRESSIN
CORTISOL


QUALITY QUANTITY
ALLOSTATIC LOAD
DOHAD
optimal development or outcome
ideal
benign
malevolent
unsuitable
OXYTOCIN
VASOPRESSIN
CORTISOL


QUALITY QUANTITY
optimal development or outcome
ALLOSTATIC LOAD
DOHAD
Allostasis is the relationship between psychoneurohormonal responses to stress and physical and psychological manifestations of health and illness.
ideal benign
malevolent
unsuitable
OXYTOCIN VASOPRESSIN CORTISOL


QUALITY QUANTITY
ALLOSTATIC LOAD
DOHAD
optimal development or outcome
STRESS
RESPONSE
ALLOSTATIC STATE
ALLOSTATIC LOAD
ALLOSTATIC OVERLOAD
ideal benign
malevolent
unsuitable
OXYTOCIN VASOPRESSIN CORTISOL


optimal development or outcome
ALLOSTATIC LOAD
SUSCEPTIBILITY
MORBIDITY
Lifespan less
DISEASE
DEATH
MORTALITY
ALLOSTATIC STATE
ALLOSTATIC LOAD
ALLOSTATIC OVERLOAD
EEA Distance genome assesses actual from ideal
ideal benign malevolent unsuitable


QUALITY
QUANTITY
Brain 1500cc
Brain 1400cc
Brain 600cc
OXYTOCIN
VASOPRESSIN
CORTISOL
Tend & befriend
Vigilance & distrust
Fight & flight
Resilience
Susceptibility
Morbidity
EXPECTED
UNEXPECTED
HEALTH
DISEASE

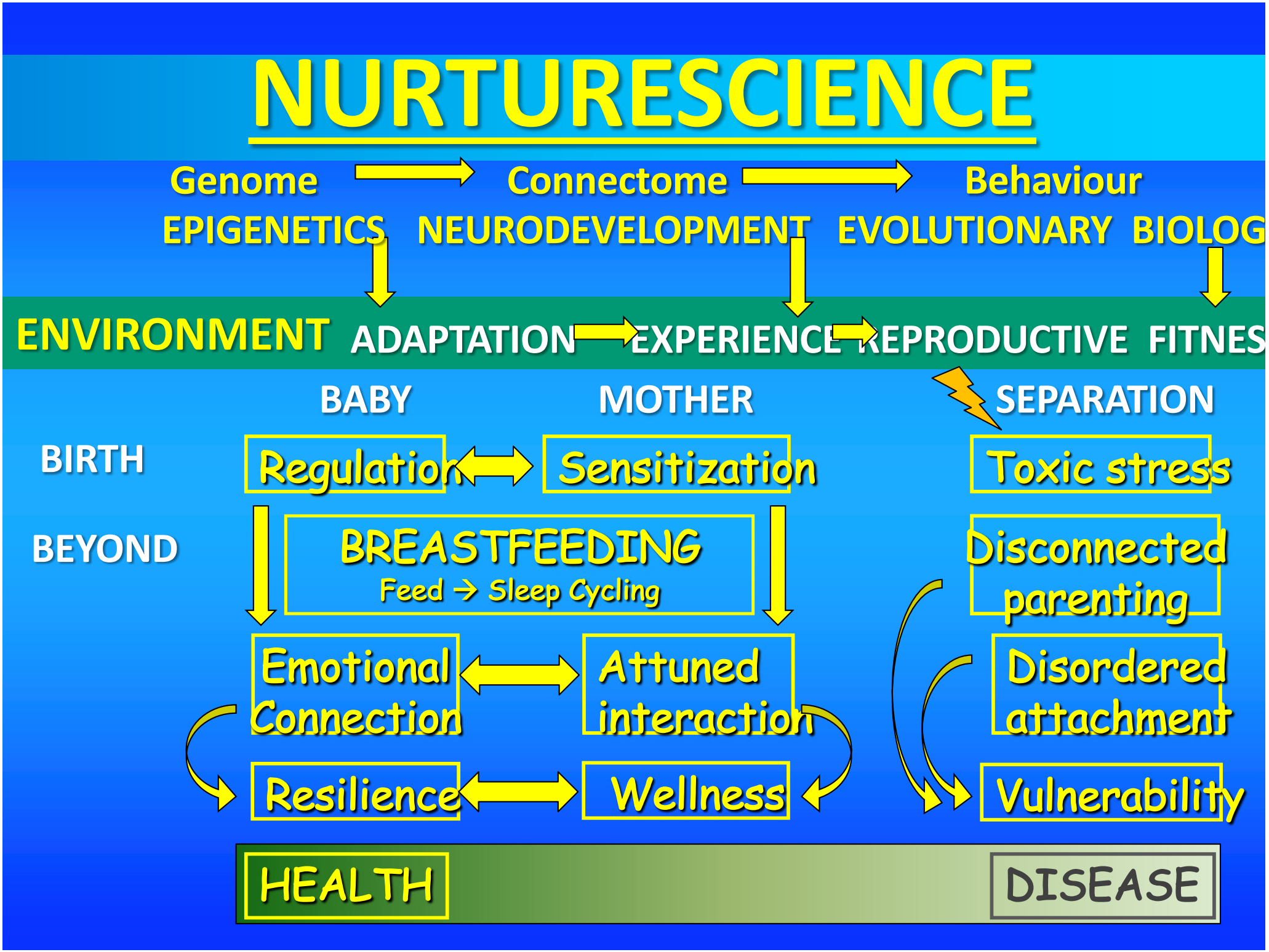
Platform for better understanding of PUBLIC HEALTH policy and practice that impacts the care of mothers and babies.

SPECTRUM of expression in POPULATION

NURTURESCIENCE

Platform for better understanding of PUBLIC HEALTH policy and practice that impacts the care of mothers and babies.

SPECTRUM of expression in POPULATION


NURTURESCIENCE
Genome
Connectome
Behaviour
EPIGENETICS
NEURODEVELOPMENT
EVOLUTIONARY
BIOLOG
ENVIRONMENT
ADAPTATION
EXPERIENCE
REPRODUCTIVE
FITNES
BABY
MOTHER
SEPARATION
BIRTH
Regulation
Sensitization
Toxic stress
BEYOND
BREASTFEEDING
Feed → Sleep Cycling
Disconnected parenting
Emotional Connection
Attuned interaction
Disordered attachment
Resilience
Wellness
Vulnerability
HEALTH
DISEASE

NURTURESCIENCE

Platform for better understanding of PUBLIC HEALTH policy and practice that impacts the care of mothers and babies.

SPECTRUM of expression in POPULATION

NURTURESCIENCE

Global Public Health Imperative

Platform for better understanding of PUBLIC HEALTH policy and practice that impacts the care of mothers and babies.

SPECTRUM of expression in POPULATION

EXPECTED ⟷ UNEXPECTED

NURTURESCIENCE

Essentially ecological:

ENVIRONMENT → ADAPTATION → EXPERIENCE → REPRODUCTIVE FITNESS

BABY	MOTHER
Regulation	⟷ Sensitization

HEALTH — DISEASE

NURTURESCIENCE

Essentially ecological:

ENVIRONMENT → ADAPTATION → EXPERIENCE → REPRODUCTIVE FITNESS

BABY ⟷ MOTHER

Regulation ⟷ Sensitization

ecology

/ɪˈkɒlədʒi,ɛˈkɒlədʒi/

noun

(from Greek: οἶκος, "house", or "environment"; -λογία, "study of")

The branch of biology that deals with the relations of organisms to one another and to their physical surroundings.

except in light of mother's body

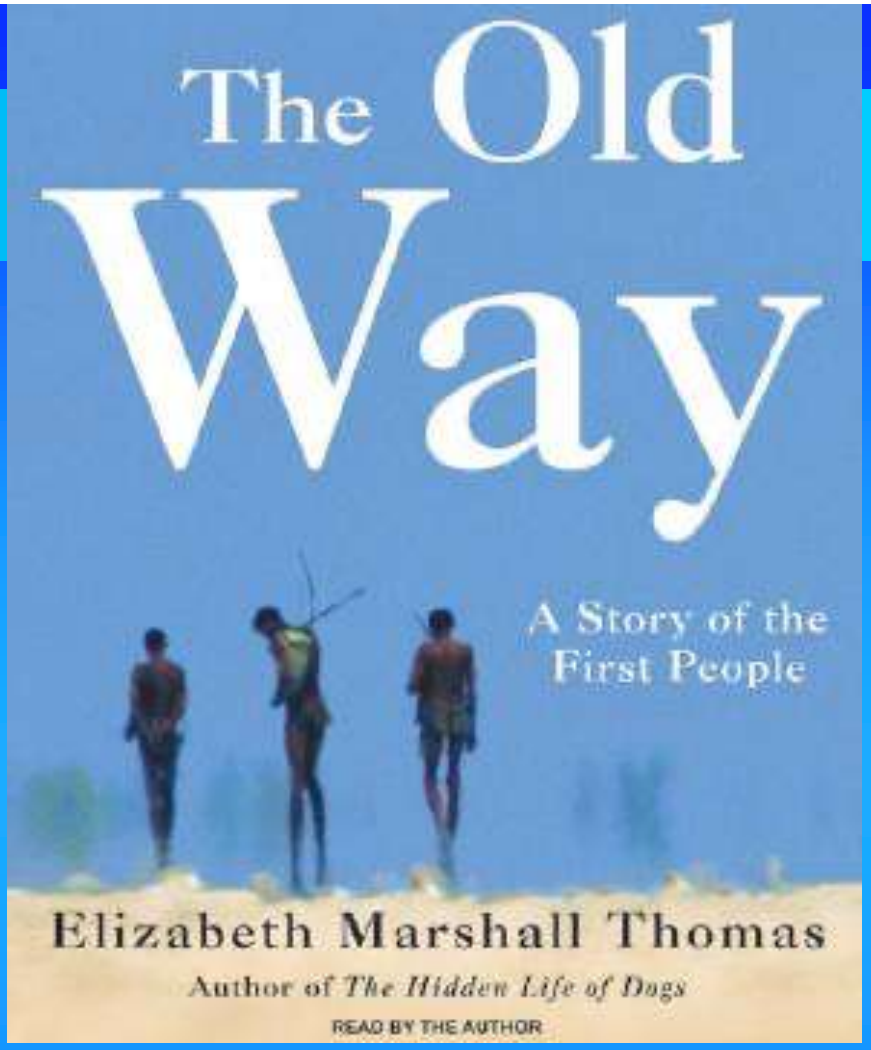
ANTHROPOLOGY

Essentially ecological:

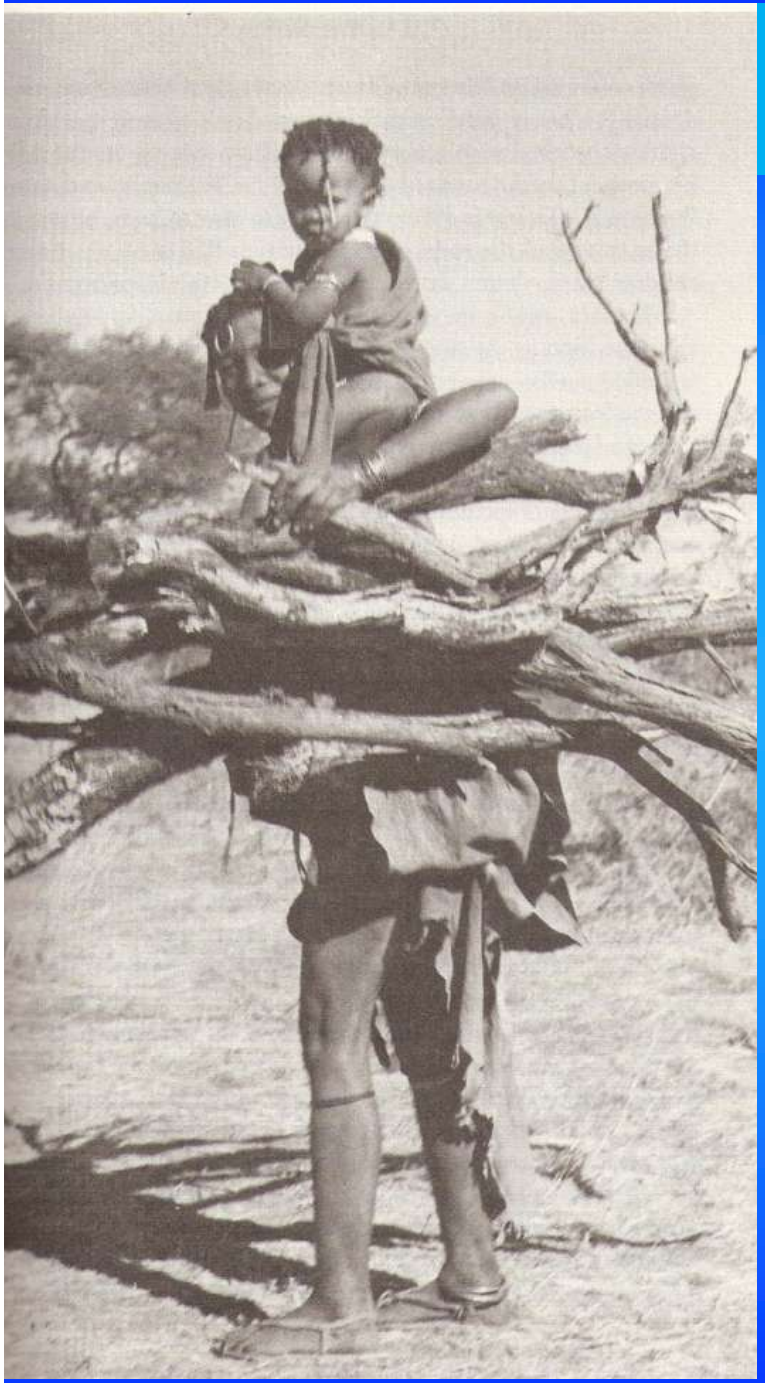
ENVIRONMENT ADAPTATION → EXPERIENCE → REPRODUCTIVE FITNESS

anthropology n. The scientific study of the origin, the behavior, and the physical, social, and cultural development of humans.

The social science that studies the origins and social relationships of human beings.



The social science that studies the origins and social relationships of human beings.



San (Bushman) Mother and Child, Kalahari, Namibia

Charles Roffey

≠Toma once said of himself,
"From the day I was born, I was born for meat."

≠Toma returns from a foraging trip carrying a net lined with skin and filled with nuts. A gathering party of men and women would walk for several days over waterless country to pick clean the nut groves or the groundnut patches and would carry home their harvest in big leather bags that could hold from fifty to one hundred pounds of nuts.

UNIQUE
hominin feature:
carry food home
to share …

BERGMAN
'sharing phenotype'

≠Toma returns from a foraging trip carrying a net lined with skin and filled with nuts. A gathering party of men and women would walk for several days over waterless country to pick clean the nut groves or the groundnut patches and would carry home their harvest in big leather bags that could hold from fifty to one hundred pounds of nuts.

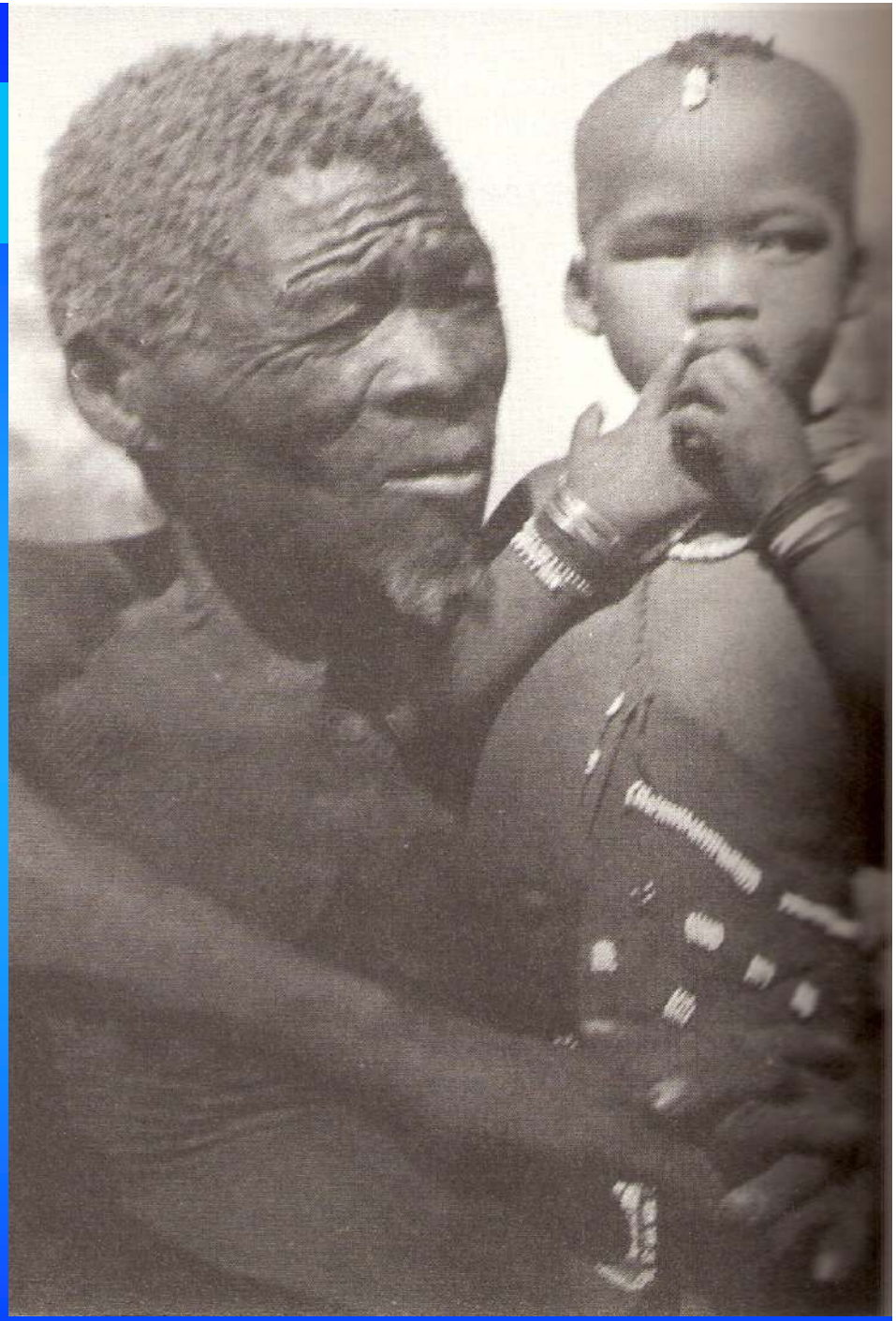
THE HUNTER GATHERER (cont)

Infant care patterns in such societies
(which are closest to our origins):

1 Infant carried most of time
2 Mother sleeps with infant same bed
3 Immediate feeding response to crying
4 Breastfeeding 24 months or more
5 Father frequently and closely involved ...

Immediate feeding
response to crying

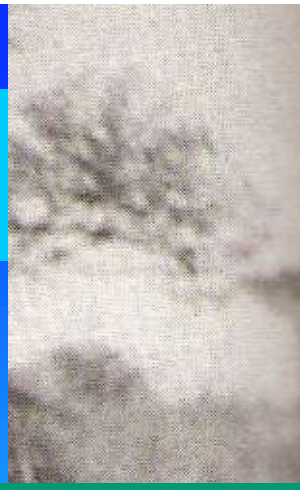
Father frequently
and closely involved ...



Hominines were prey at Sterkfontein, "Cradle of Mankind"

Annual Review of Psychology

Developmental Adaptation to Stress: An Evolutionary Perspective



ENVIRONMENT **ADAPTATION** → **EXPERIENCE** → **REPRODUCTIVE FITNESS**

Life History Theory

as a Framework for Adaptive Plasticity

In evolutionary biology, a major framework for explaining coordinated patterns of developmental plasticity is life history theory. Life history theory addresses how organisms allocate their limited stocks of time and energy to the various activities (including growth, maintenance of bodily tissues, mating, and parenting) that compose their life cycle.

Bruce J. Ellis[1] and Marco Del Giudice[2]

The Neuroscience of Birth & Breastfeeding

The DNA → The Brain → Behaviour

EPIGENETICS NEURODEVELOPMENT EVOLUTIONARY BIOLOGY

ENVIRONMENT → ADAPTATION → EXPERIENCE → REPRODUCTIVE FITNESS

"EEA"

Environment of Evolutionary Adaptedness

Attachment Theory

EEA Environment of Evolutionary Adaptedness

ENVIRONMENT → **ADAPTATION** → **EXPERIENCE** → **REPRODUCTIVE FITNESS**

Bowlby 1969, 1973, 1980

Narvaez 2016

EDN Evolved Developmental Niche

Recently, attention has been drawn to caregiving environments that evolved to optimize development of the young … Every animal has a niche for its offspring that matches up with the maturational schedule of the infant and represents a set of inherited extra-genetic features that foster thriving or optimal development in offspring

Early Childhood Research Quarterly
Volume 28, Issue 4, 4th Quarter 2013, Pages 759-773

The evolved development niche: Longitudinal effects of caregiving practices on early childhood psychosocial development

Darcia Narvaez [a], Tracy Gleason [b], Lijuan Wang [a], Jeff Brooks [a], Jennifer Burke Lefever [a], Ying Cheng [a], the

Every animal has an EVOLVED DEVELOPMENTAL NICHE for its young.

Humans are not following their evolved developmental niche (EDN).

The EDN for young children includes
- breastfeeding,
- positive touch,
- responsiveness, and
- social support (among other characteristics).

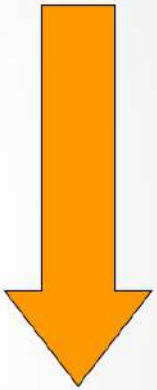
The EDN matters for child psychosocial and cognitive development.

NURTURESCIENCE

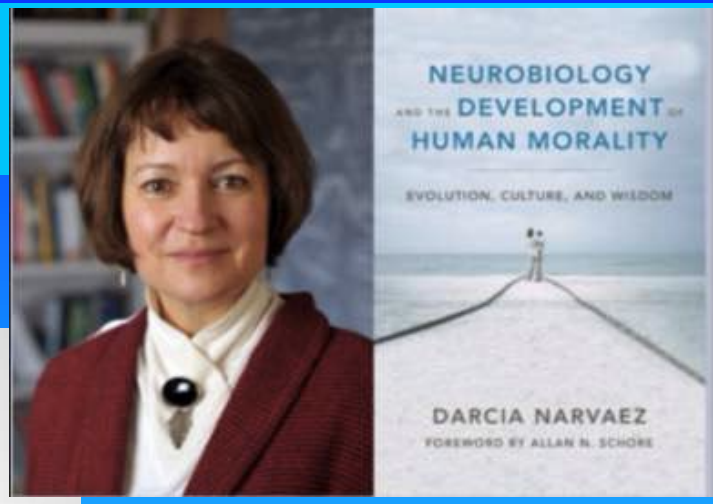
EVOLVED DEVELOPMENTAL NICHE

(EDN)

- **TOUCH:** *Held or kept near others constantly*
- **RESPONSIVITY:** *Prompt responses to fusses and cries*
- **BREASTFEEDING:** *Nursed frequently (2-3 times/hr initially) for 2-5 years*
- **ALLOMOTHERS:** *Frequently cared for by individuals other than mothers (fathers and grandmothers, in particular)*
- **PLAY**: *Enjoy free play in natural world with multiage playmates*
- **SOCIAL SUPPORT:** High social embeddedness
- **NATURAL CHILDBIRTH**



EVOLVED DEVELOPMENTAL NICHE (EDN)



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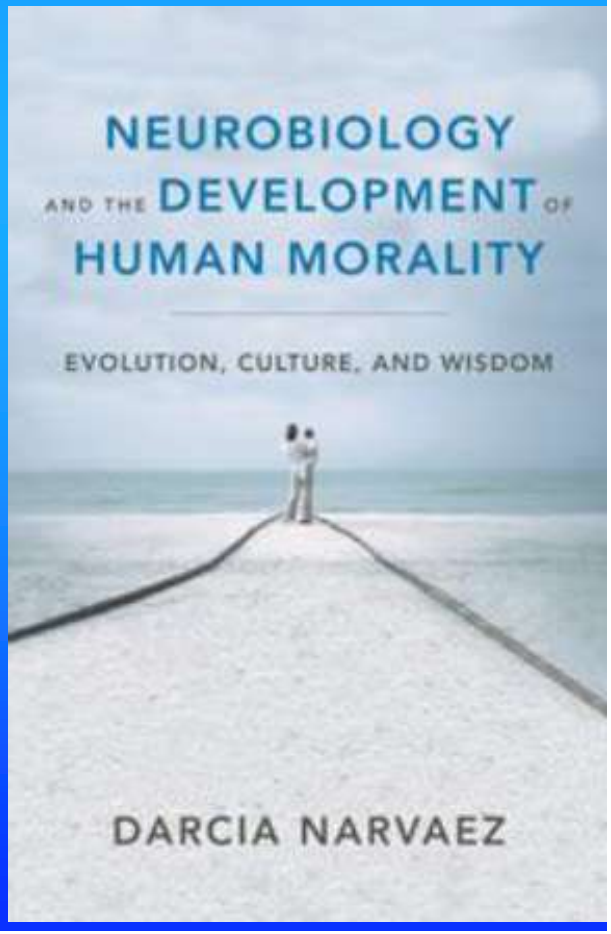
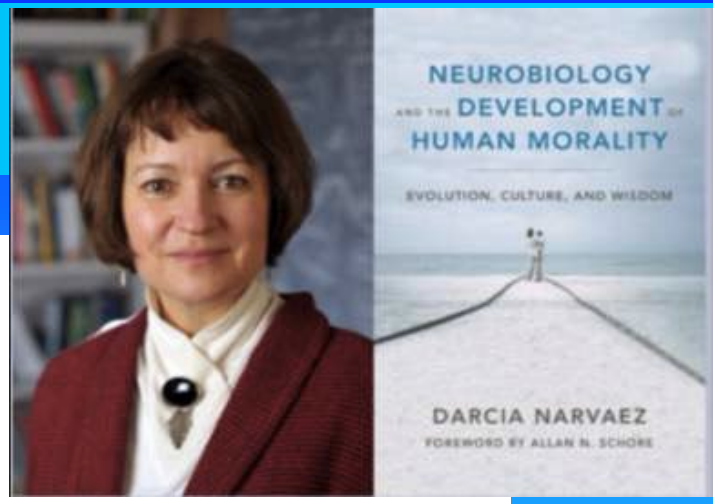




Developmental niche

Parental ethnotheories
Practices (e.g., hygiene, schooling)
Settings and routines

Moderators

Parent characteristics
Family relationships
Family stress/support
Infrastructure (services, amenities)
Domestic, material, and political economies
Physical ecology

Child

Endogenous factors
biological characteristics,
functional characteristics,
capacities, temperament

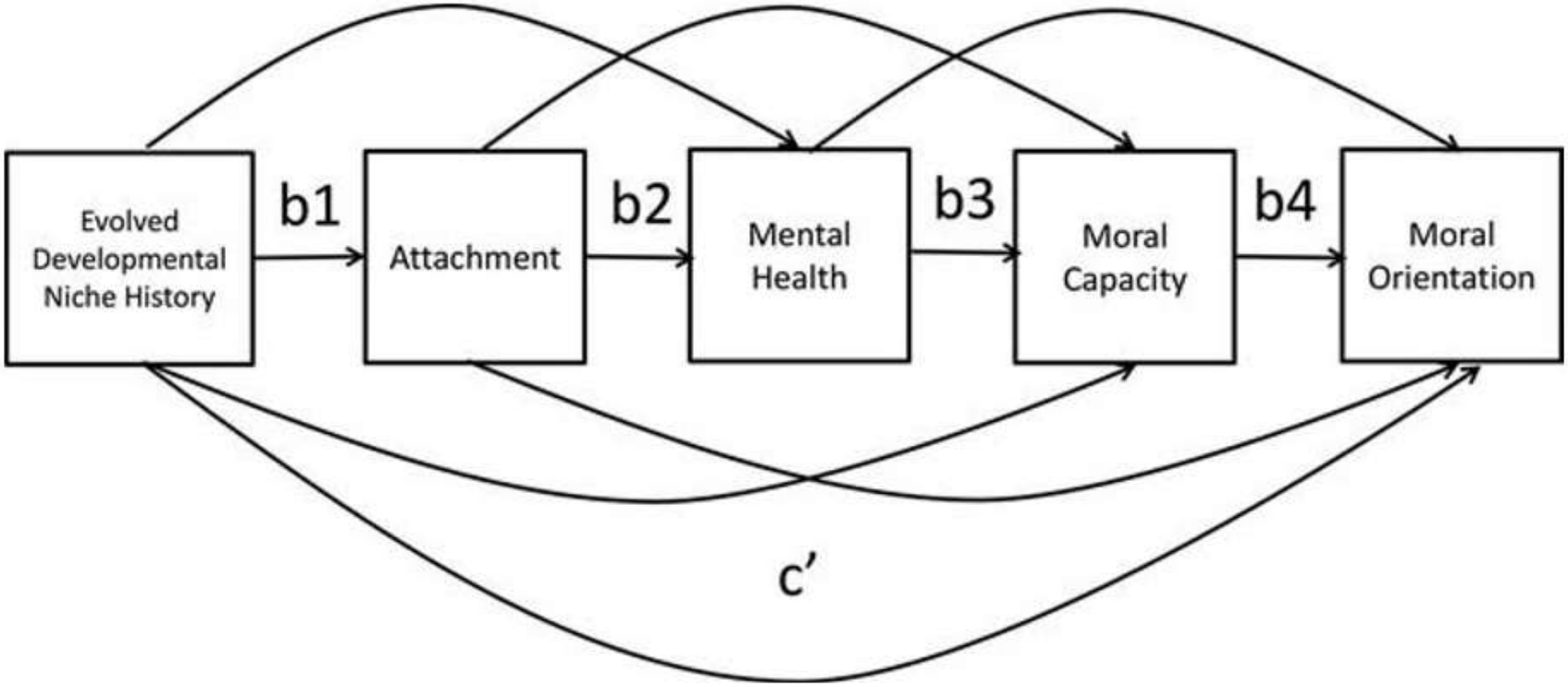
Developmental outcomes

Physical health
Mental health
Self-regulation
Learning, adaptation
Social competence

ISSN: 1088-8691 (Print) 1532-480X (Online) Journal homepage: http://www.tandfonline.com/loi/hads20

The evolved developmental niche in childhood: Relation to adult psychopathology and morality

Darcia Narvaez, Lijuan Wang & Ying Cheng

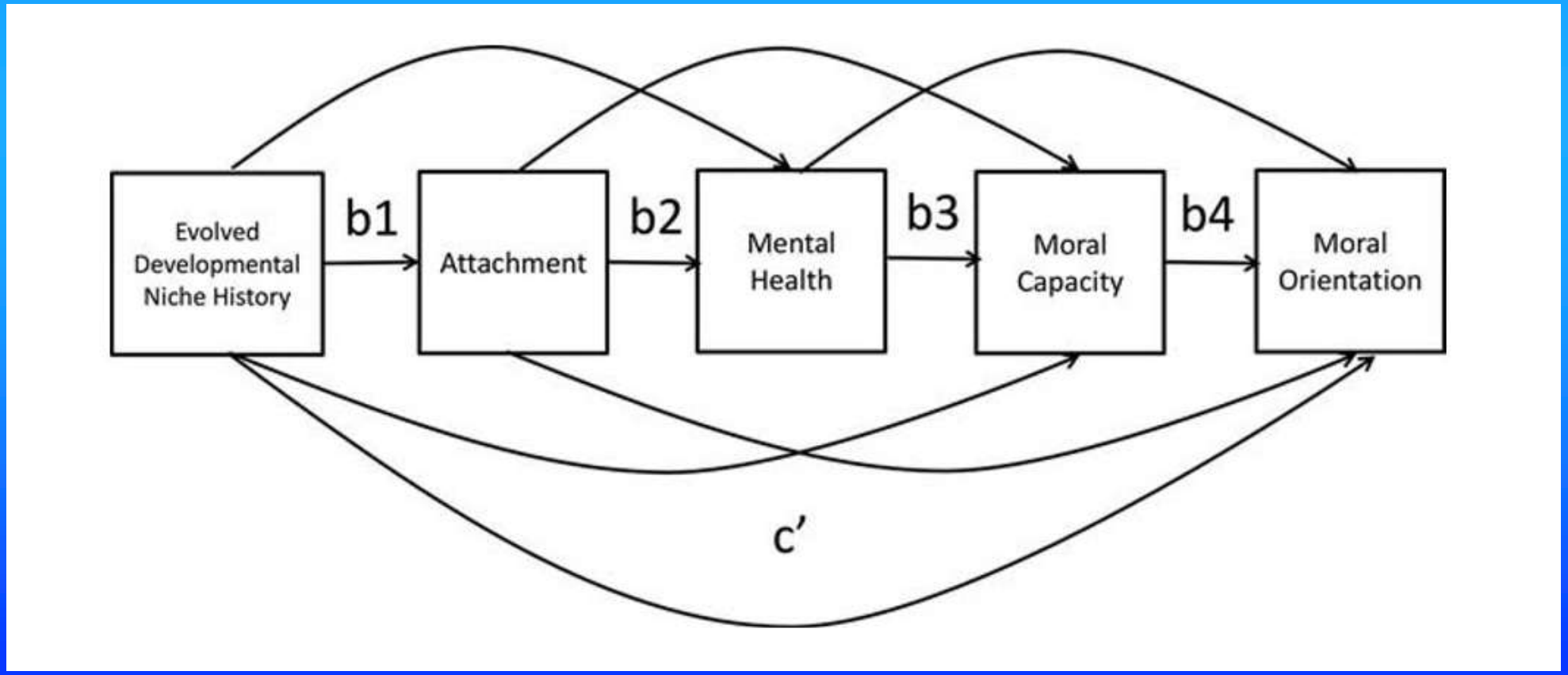


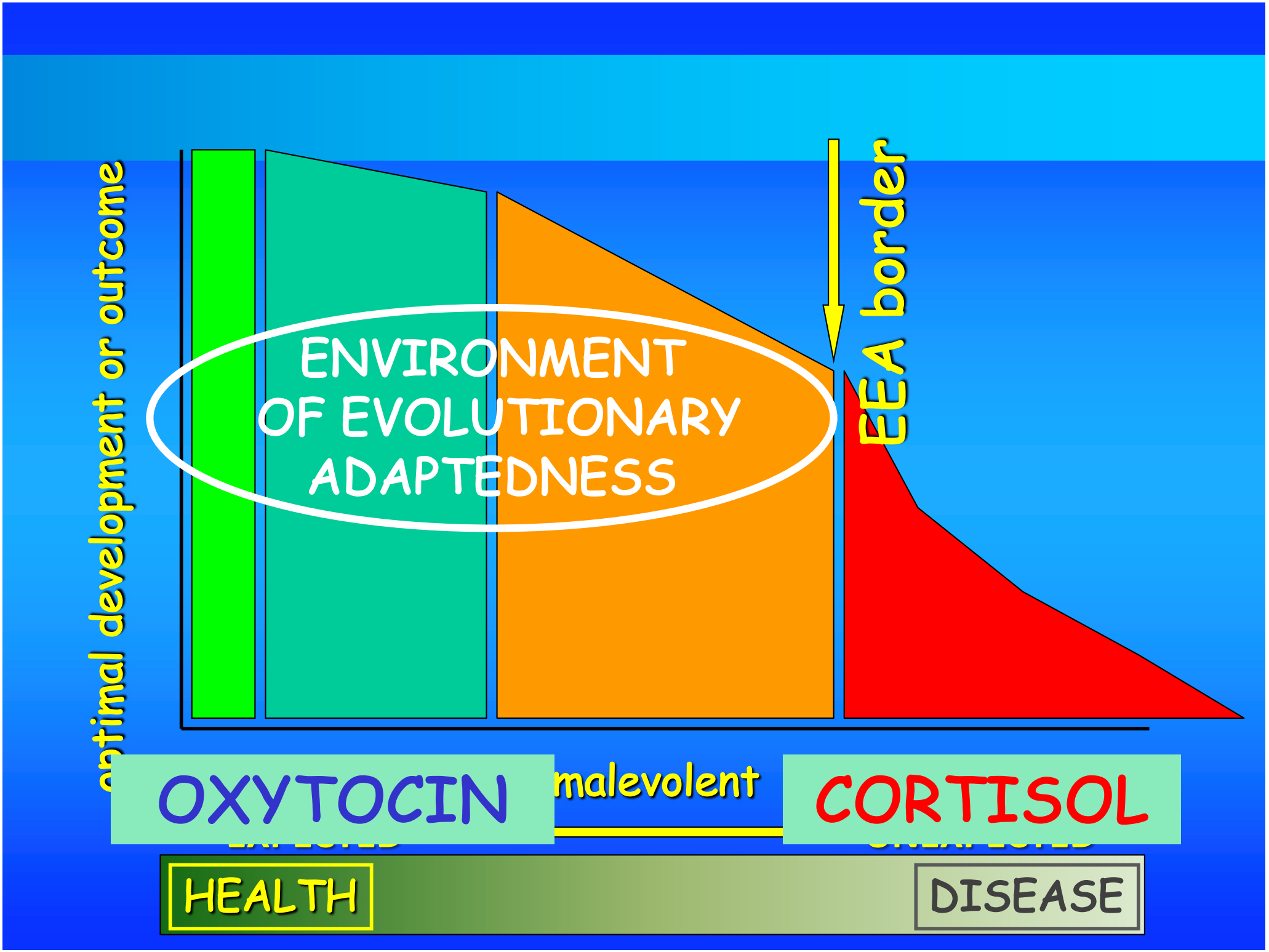
NURTURESCIENCE

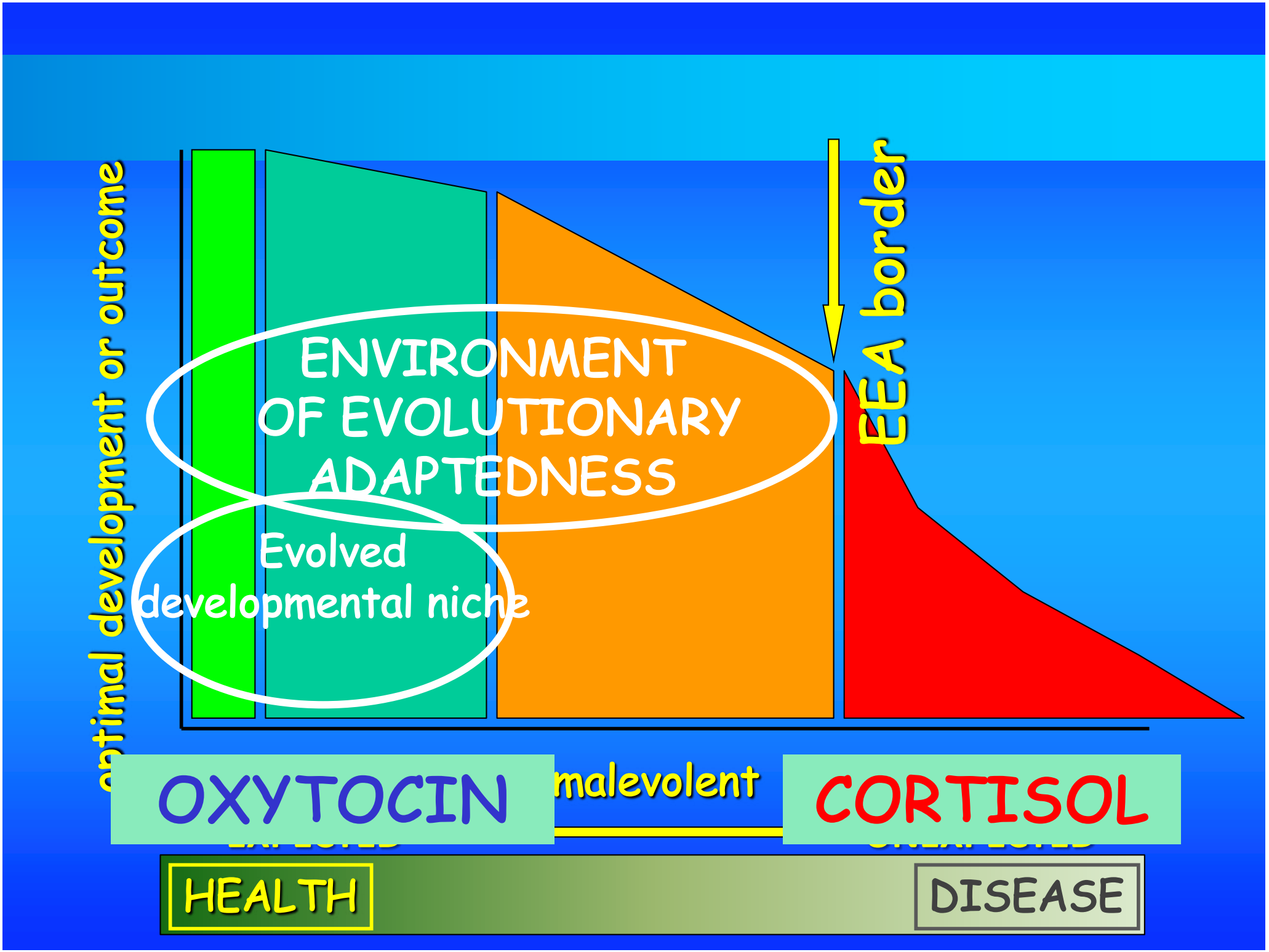
Genome → Connectome → Behaviour

EPIGENETICS NEURODEVELOPMENT EVOLUTIONARY BIOLOG

ENVIRONMENT ADAPTATION → EXPERIENCE → REPRODUCTIVE FITNESS




optimal development or outcome
ENVIRONMENT
OF EVOLUTIONARY
ADAPTEDNESS
EEA border
OXYTOCIN
malevolent
CORTISOL
HEALTH
DISEASE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DISEASE

Early Childhood Research Quarterly
Volume 28, Issue 4, 4th Quarter 2013, Pages 759-773

The evolved development niche: Longitudinal effects of caregiving practices on early childhood psychosocial development

Darcia Narvaez [a], Tracy Gleason [b], Lijuan Wang [a], Jeff Brooks [a], Jennifer Burke Lefever [a], Ying Cheng [a], the

Every animal has an EVOLVED DEVELOPMENTAL NICHE for its young.

Humans are not following their evolved developmental niche (EDN).

The EDN for young children includes
- breastfeeding,
- positive touch,
- responsiveness, and
- social support (among other characteristics).

The EDN matters for child psychosocial and cognitive development.

THE HUNTER GATHERER (cont)

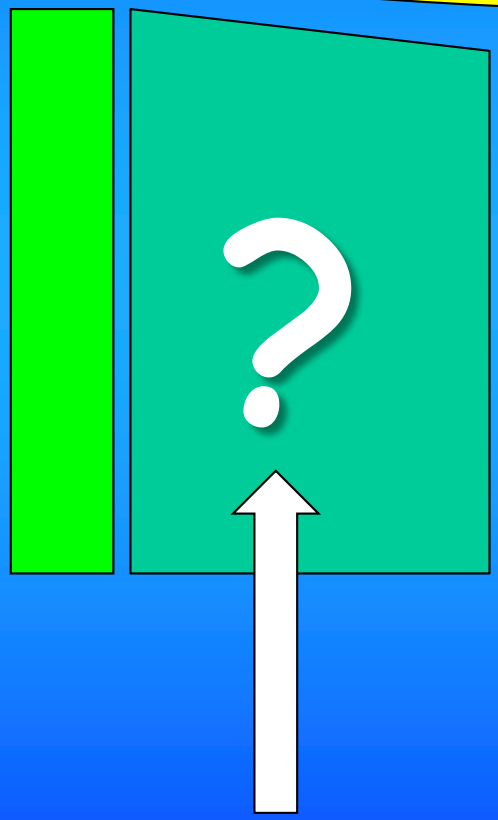
Infant care patterns in such societies
(which are closest to our origins):

1 Infant carried most of time
2 Mother sleeps with infant same bed
3 Immediate feeding response to crying
4 Breastfeeding 24 months or more
5 Father frequently and closely involved ...

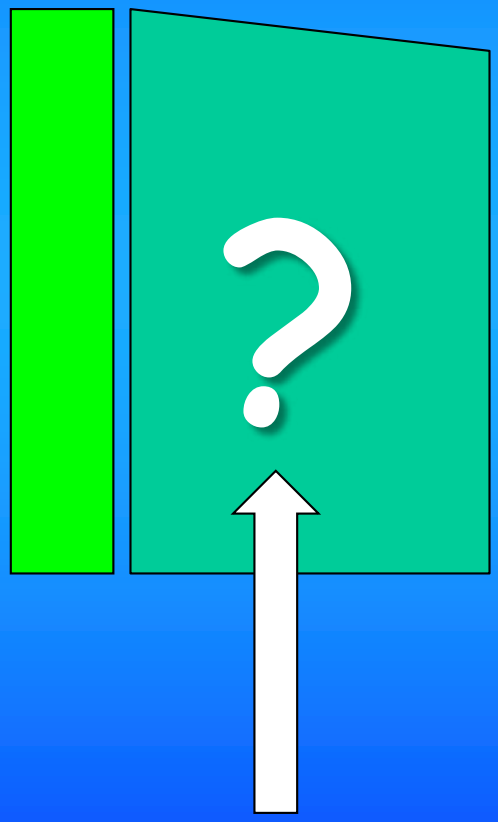
THE HUNTER GATHERER (cont)

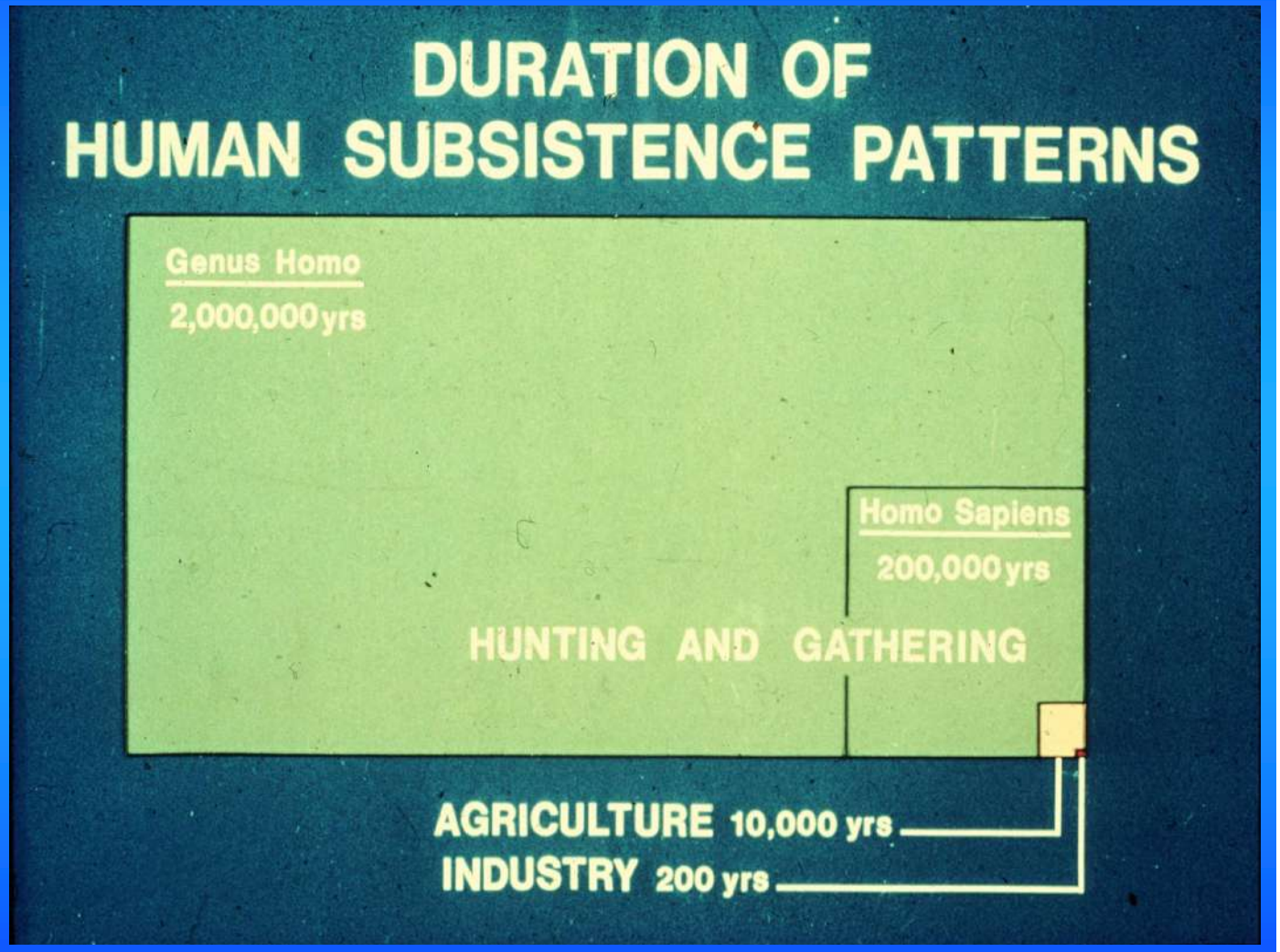
Infant care patterns in such societies (which are closest to our origins):

THE HUNTER GATHERER (cont)



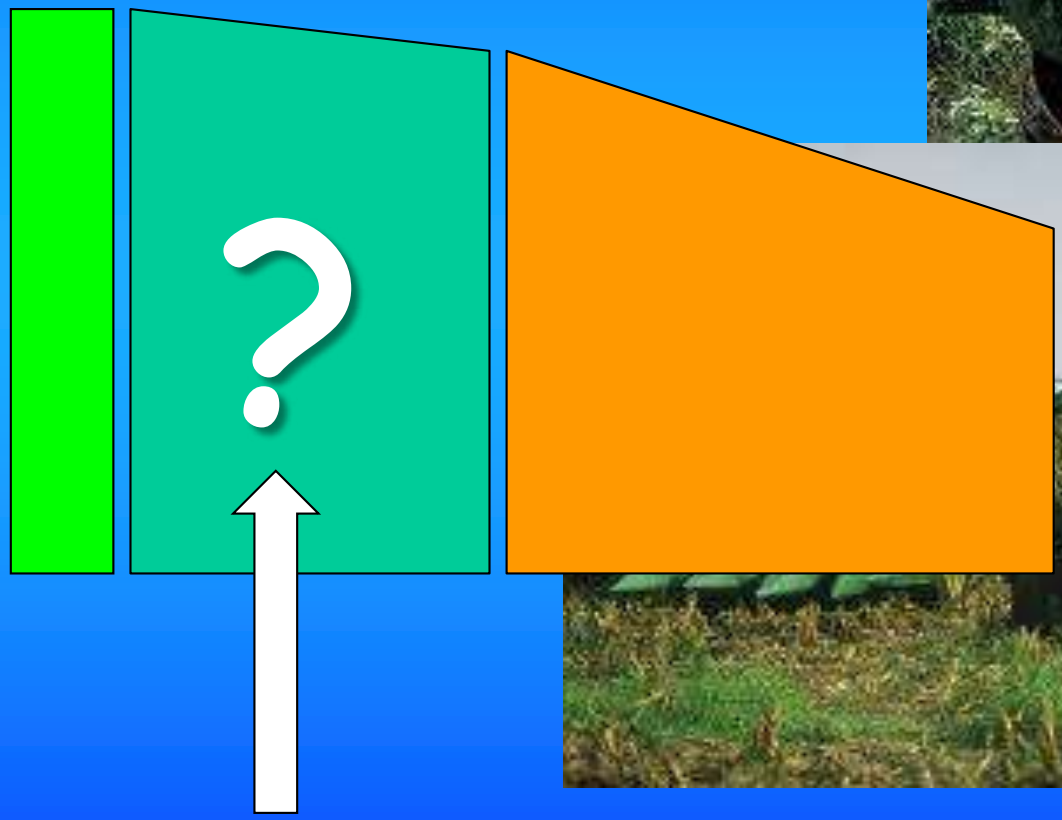
Debate: do we have CHOICE ?





From James McKenna

AGRICULTURE



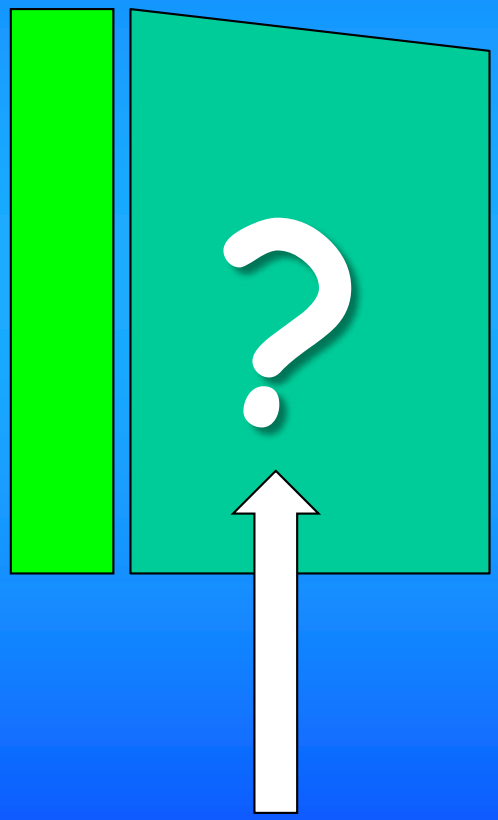
Debate: do we have CHOICE ?

INDUSTRY

?

Debate: do we have CHOICE ?

HUNTING AND GATHERING



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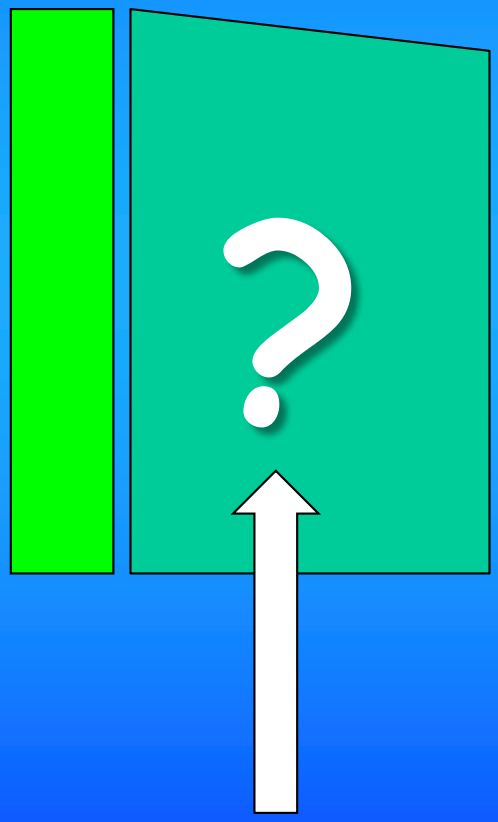
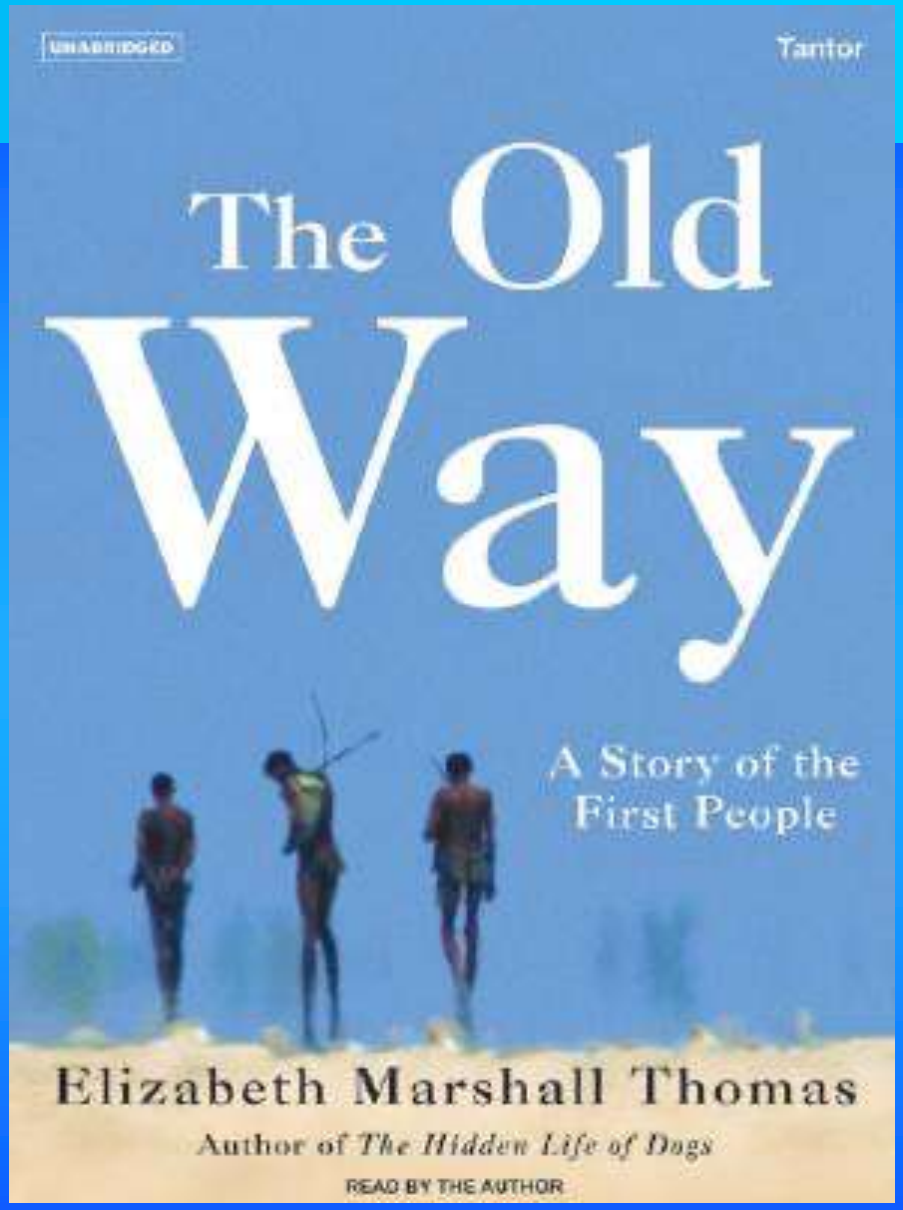

?

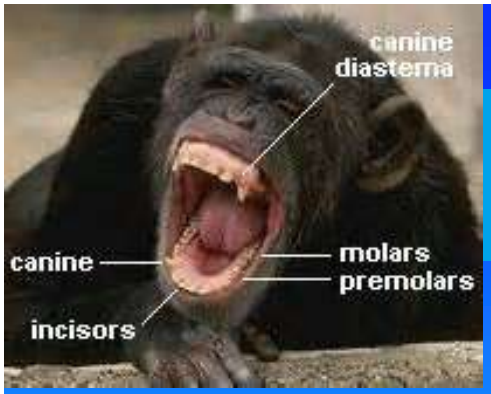

UNABRIDGED
Tantor
The Old Way
A Story of the First People
Elizabeth Marshall Thomas
Author of The Hidden Life of Dogs
READ BY THE AUTHOR

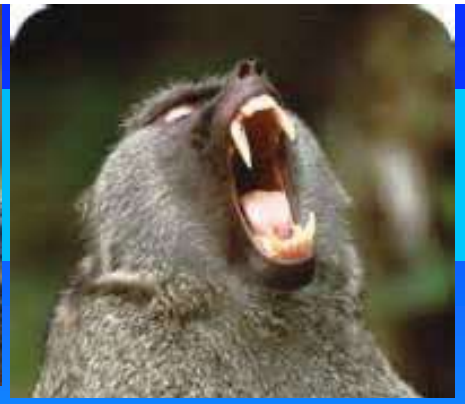
EXTREME EGALITARIANISM

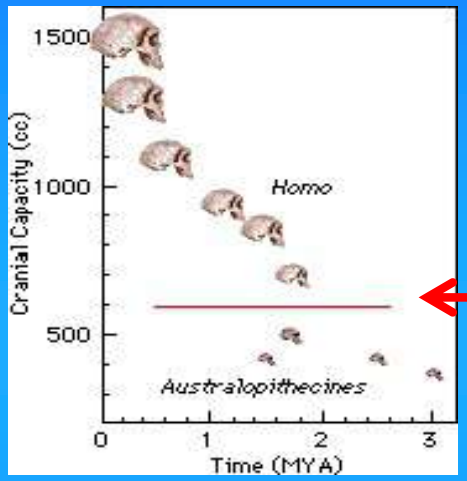
EQUALITY (gender, age, capacity)

INTENSE SOCIAL COHESION

→ NO AGGRESSION !!!!!





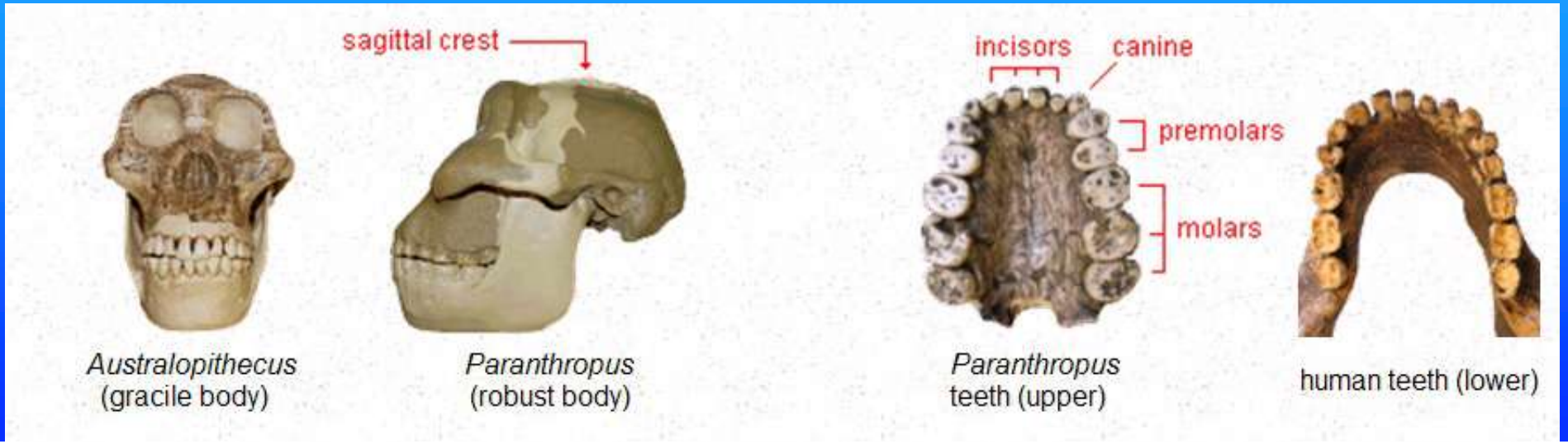


CANINE TEETH → MALE AGGRESSION

HOMININS … a unique defining feature

Canines small

and then brain growth increase starts



Robin DUNBAR

The social brain hypothesis and its implications for social evolution

THE SOCIAL BRAIN: Mind, Language, and Society in Evolutionary Perspective

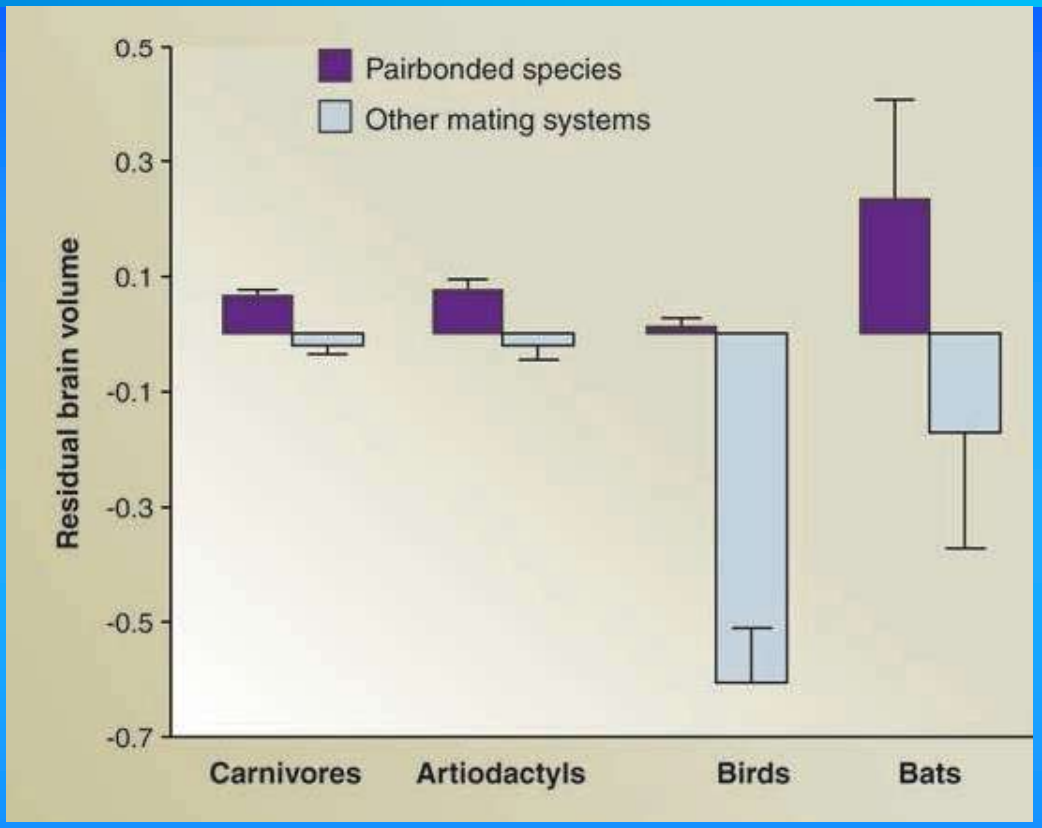
R.I.M. Dunbar
School of Biological Sciences, University of Liverpool, Biosciences Building, Crown St., Liverpool L69 7ZB, United Kingdom; email: rimd@liv.ac.uk

Key Words brain size, social cognition, theory of mind, social group size, culture

■ **Abstract** The social brain (or Machiavellian Intelligence) hypothesis was proposed to explain primates' unusually large brains: It argues that the cognitive demands of living in complexly bonded social groups selected for increases in executive brain (principally neocortex). The evidence for this and alternative hypotheses is reviewed. Although there remain difficulties of interpretation, the bulk of the evidence comes down in favor of the social brain hypothesis. The extent to which the cognitive demands of bonding large intensely social groups involve aspects of social cognition, such as theory of mind, is explored. These findings are then related to the evolution of social group size, language, and culture within the hominid lineage.

R. I. M. Dunbar. *Annual Review of Anthropology* Vol. 32, (2003), pp. 163-181

Robin DUNBAR



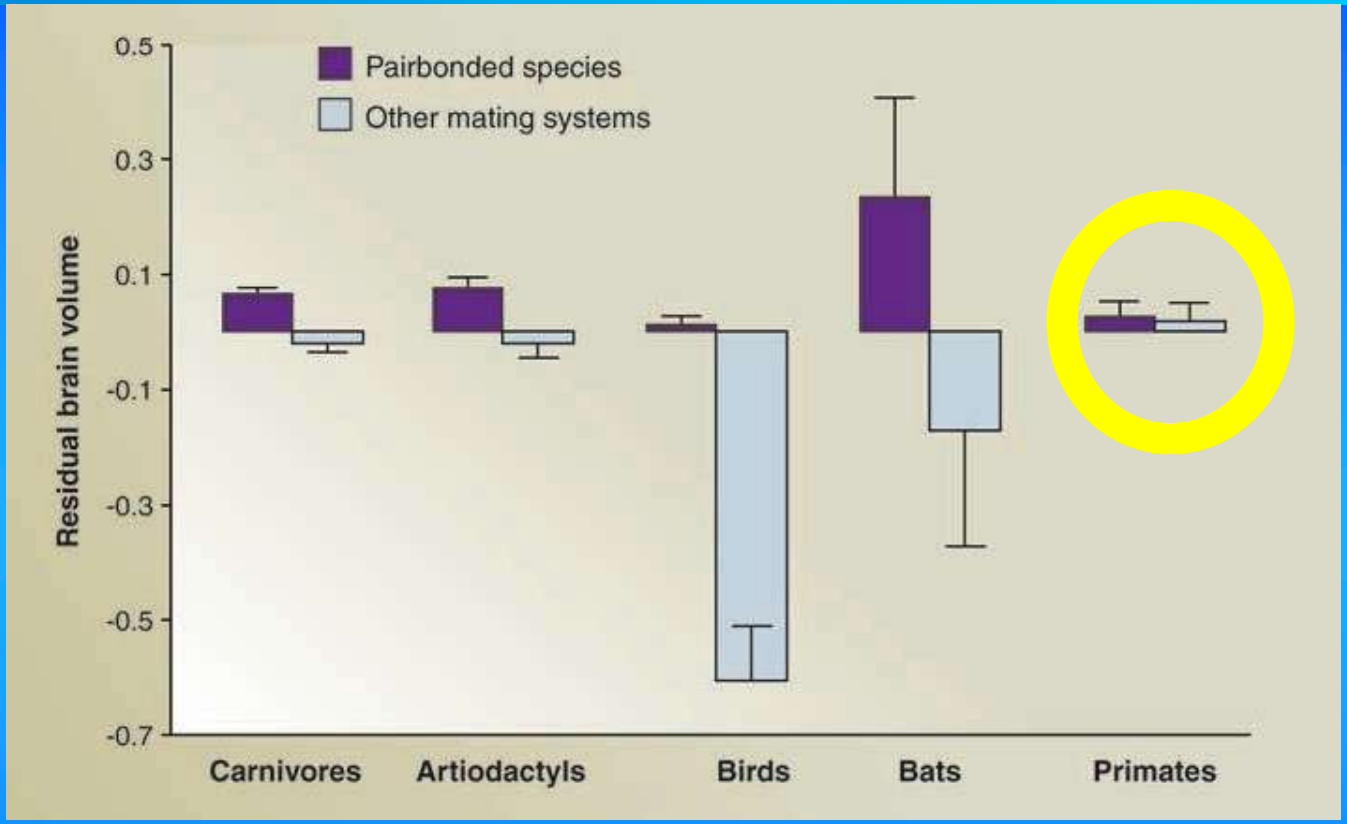
OXYTOCIN

species with pair-bonded mating have the largest brains …

Dunbar & Schultz 2007

Dunbar, R., & Shultz, S. (2007). Evolution in the Social Brain *Science, 317* (5843), 1344-1347 DOI: 10.1126/science.1145463

Robin DUNBAR



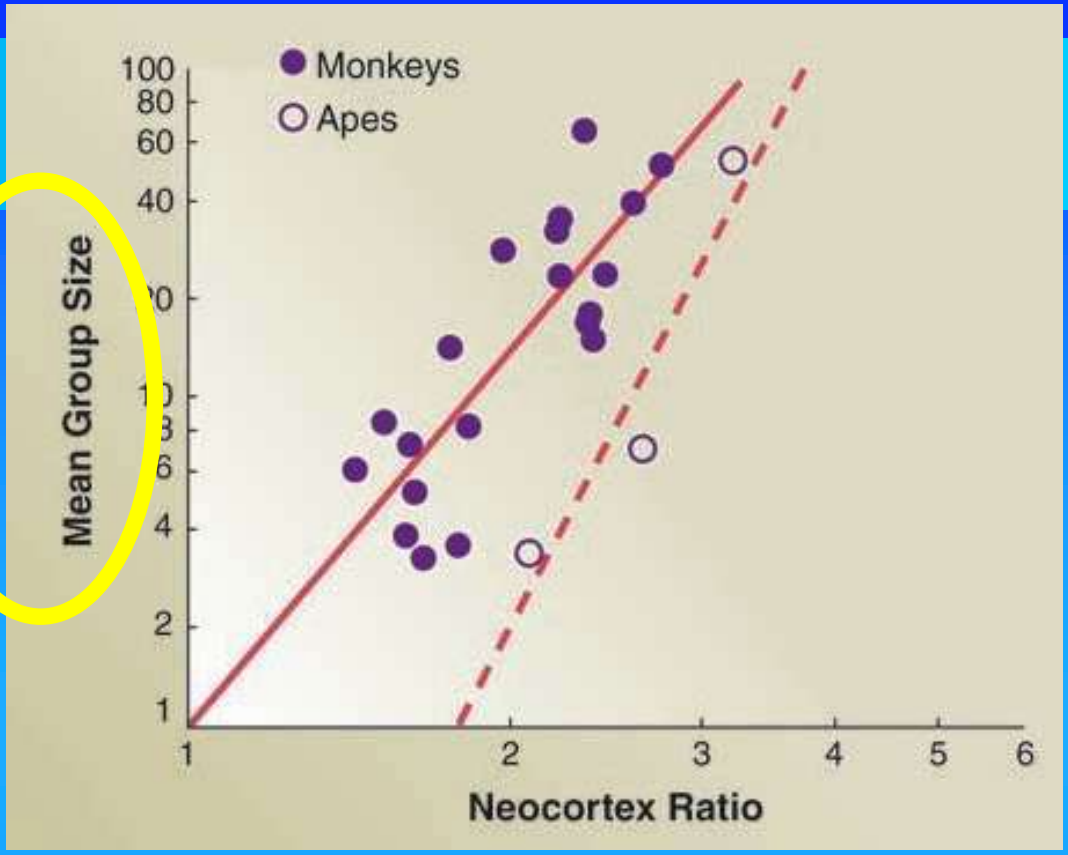
species with pair-bonded mating have the largest brains …
EXCEPT IN PRIMATES !!

Dunbar & Schultz 2007

Dunbar, R., & Shultz, S. (2007). Evolution in the Social Brain *Science, 317* (5843), 1344-1347 DOI: 10.1126/science.1145463

Robin DUNBAR

PRIMATES BRAIN SIZE IS RELATED TO GROUP SIZE



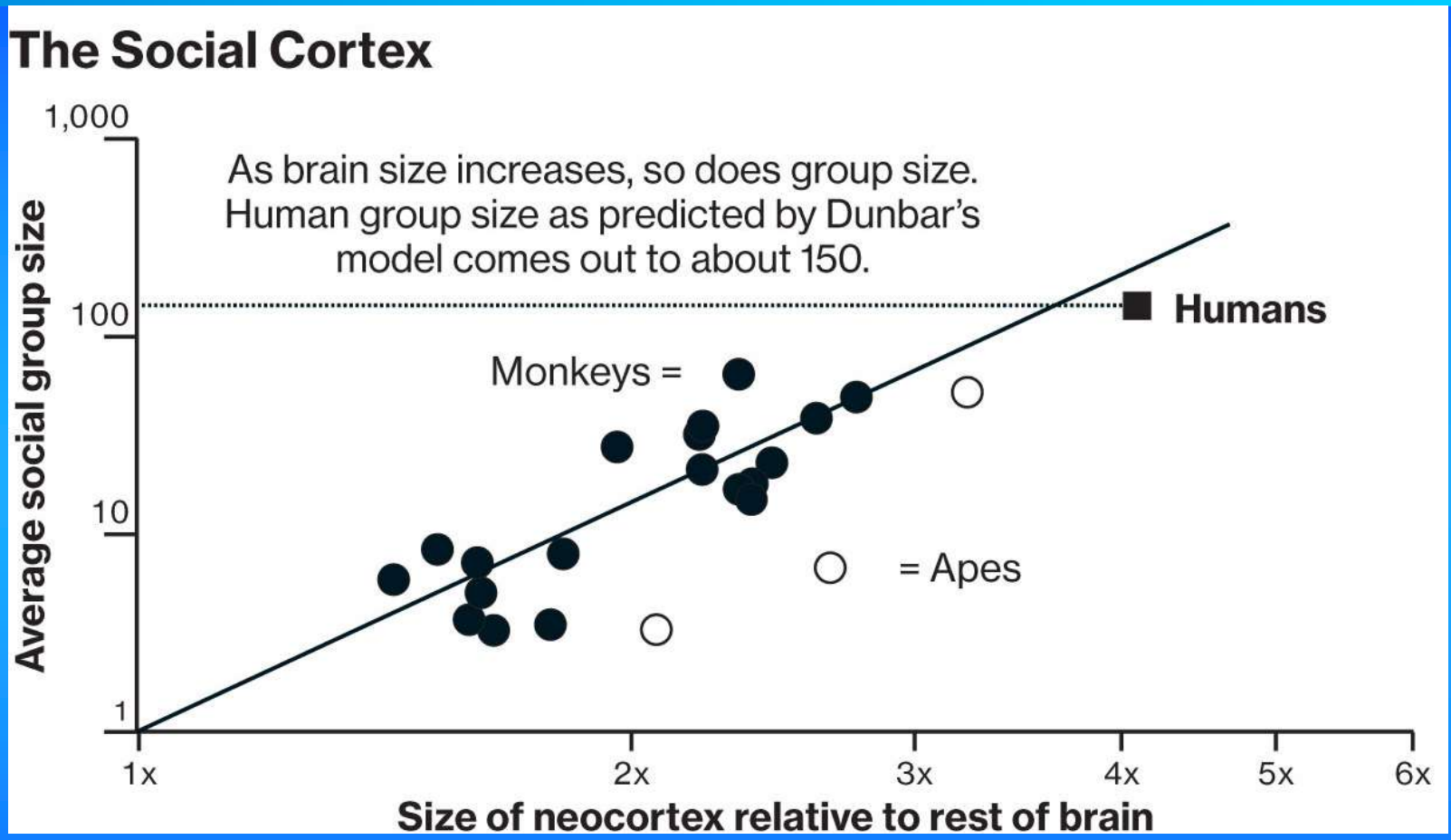
CHANGED "MATE BOND" TO "GROUP FRIEND"

anthropoid primates may have generalized the bonding processes that characterize monogamous pairbonds
to other non-reproductive relationships ('friendships')

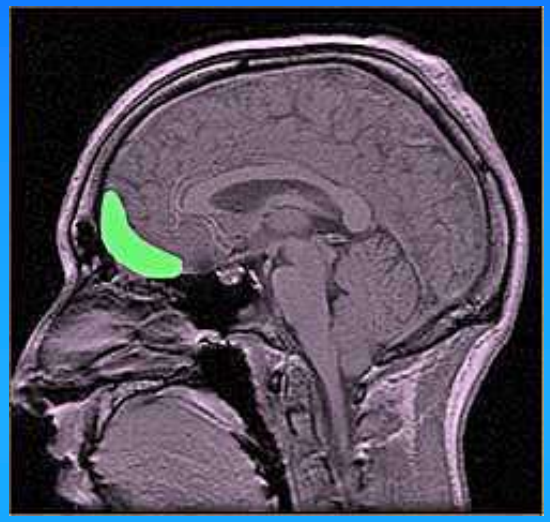
OXYTOCIN

Dunbar & Schultz 2007

Dunbar, R., & Shultz, S. (2007). Evolution in the Social Brain *Science, 317* (5843), 1344-1347 DOI: 10.1126/science.1145463

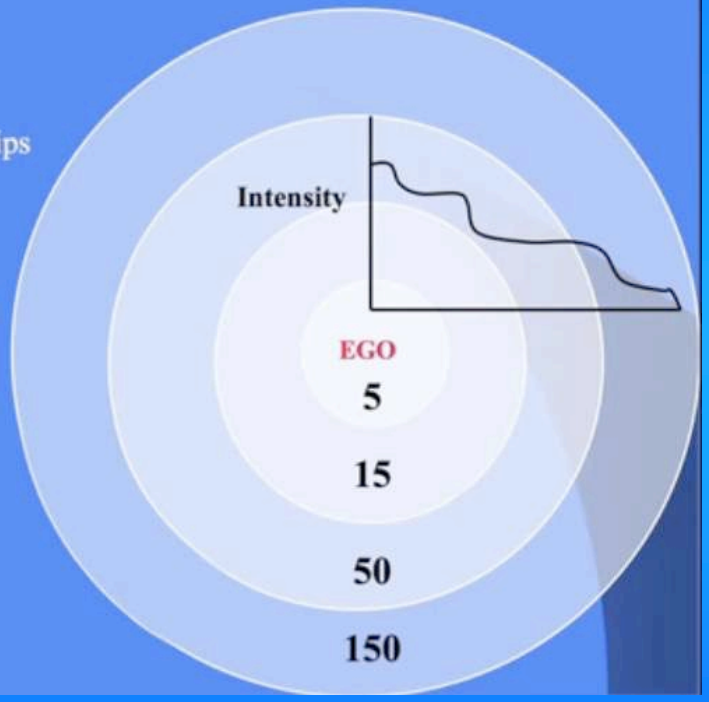

The Social Cortex
1,000
100
10
1
Average social group size
As brain size increases, so does group size.
Human group size as predicted by Dunbar's
model comes out to about 150.
Humans
Monkeys =
= Apes
1x
2x
3x
4x
5x
6x
Size of neocortex relative to rest of brain

DUNBAR'S NUMBER → 150



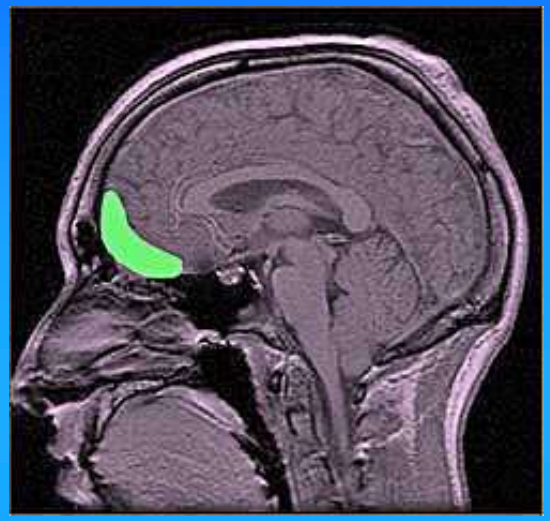
The Expanding Circles

- Your social world consists of scaled layers of relationships
…with 150 as a core number
…but extending beyond to 500, 1500, and 5300 (according to Plato, 350BC)…..



… why are bonded relationships so cognitively so demanding?

Orbital prefrontal cortex volume correlates with social cognitive competence



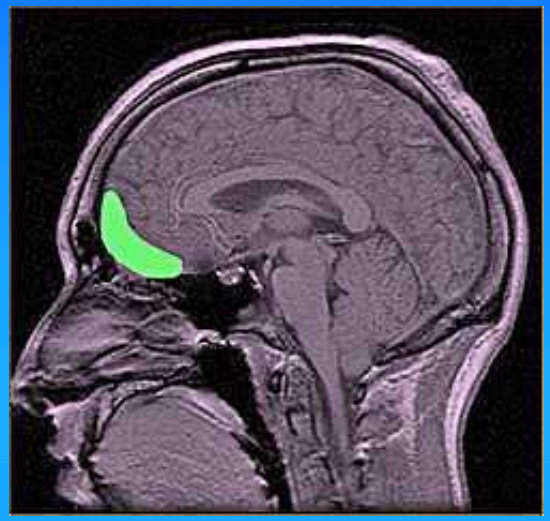
Prefrontal cortex (PFC)
was the last brain region to develop both phylogenetically and ontogenetically,

Intentionality, or Theory of Mind,
is the ability to explain and predict
the behaviour of others by attributing
to them intentions and mental states

Greater PFC volume → better intentionality competence.
(p = 0.01).
brain size evolution is, at least in part, the result of social cognitive mechanisms supporting social cohesion.

Powell **Neuropsychologia** Volume 48, Issue 12, October 2010, Pages 3554–3562

Orbital prefrontal cortex volume correlates with social cognitive competence



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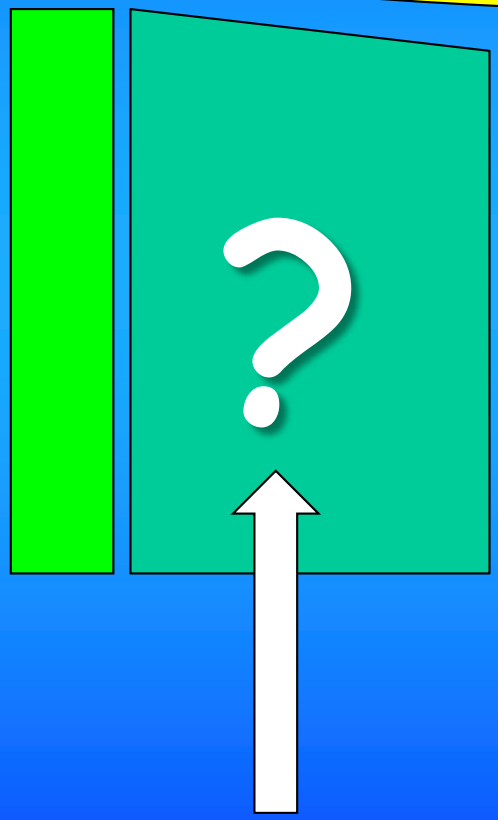
Orbital prefrontal cortex volume
correlates with social cognitive competence

OXYTOCIN

AFFILIATIVE NEUROCIRCUITRY
that prompts **AFFILIATION**

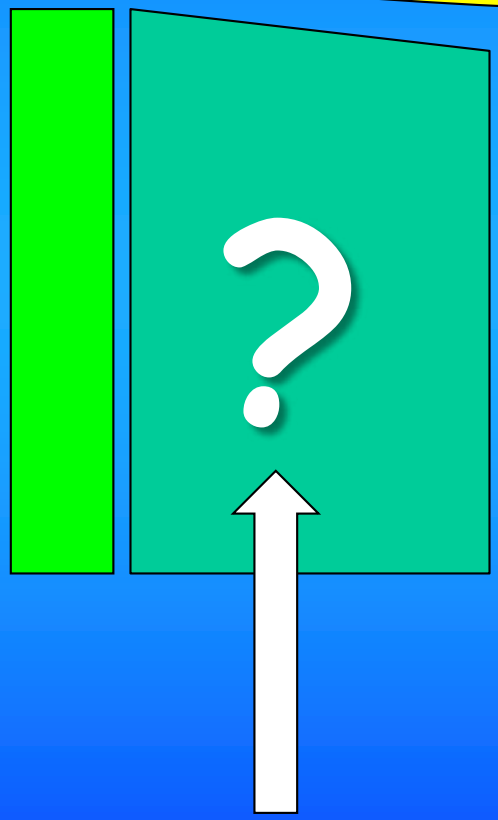
TEND AND BEFRIEND
(versus FIGHT OR FLIGHT)

THE HUNTER GATHERER (cont)



Debate: do we have CHOICE ?

THE HUNTER GATHERER (cont)

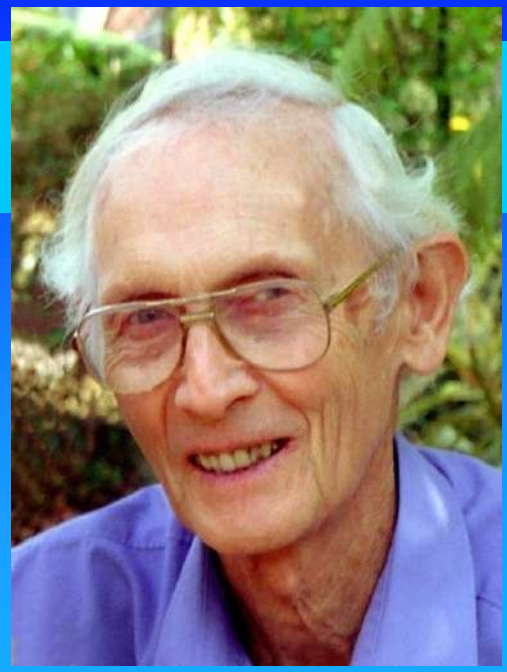


WE DO HAVE CHOICE:

We can't choose to be hunter gatherers, but we can chose to "work with Nature"

Debate: do we have **CHOICE ?**

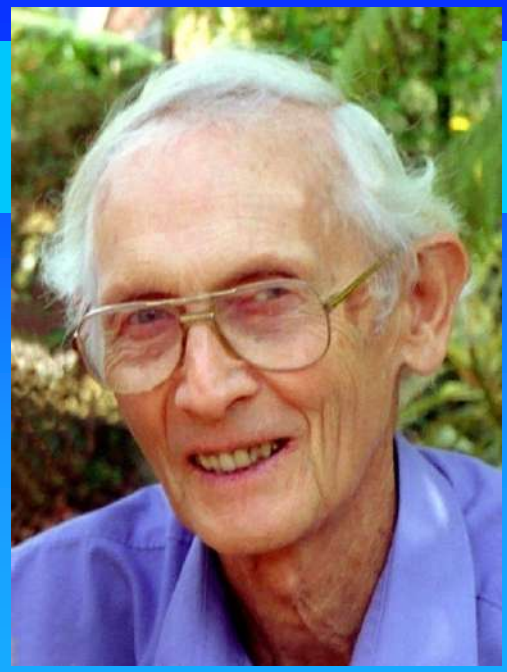
MOTHERING DENIED



'MOTHERING'
we can aim to bring our society,
that we can change,
into better harmony with
our biological "givens"
that we cannot change ...

Peter Cook

MOTHERING DENIED



"It is necessary to work with Nature and not against her if we are to promote health and wellbeing in young children, their mothers, and society."

Infancy cannot be re-run later.

NURTURESCIENCE

"It is necessary to work with Nature and not against her if we are to promote health and wellbeing in young children, their mothers, and society."

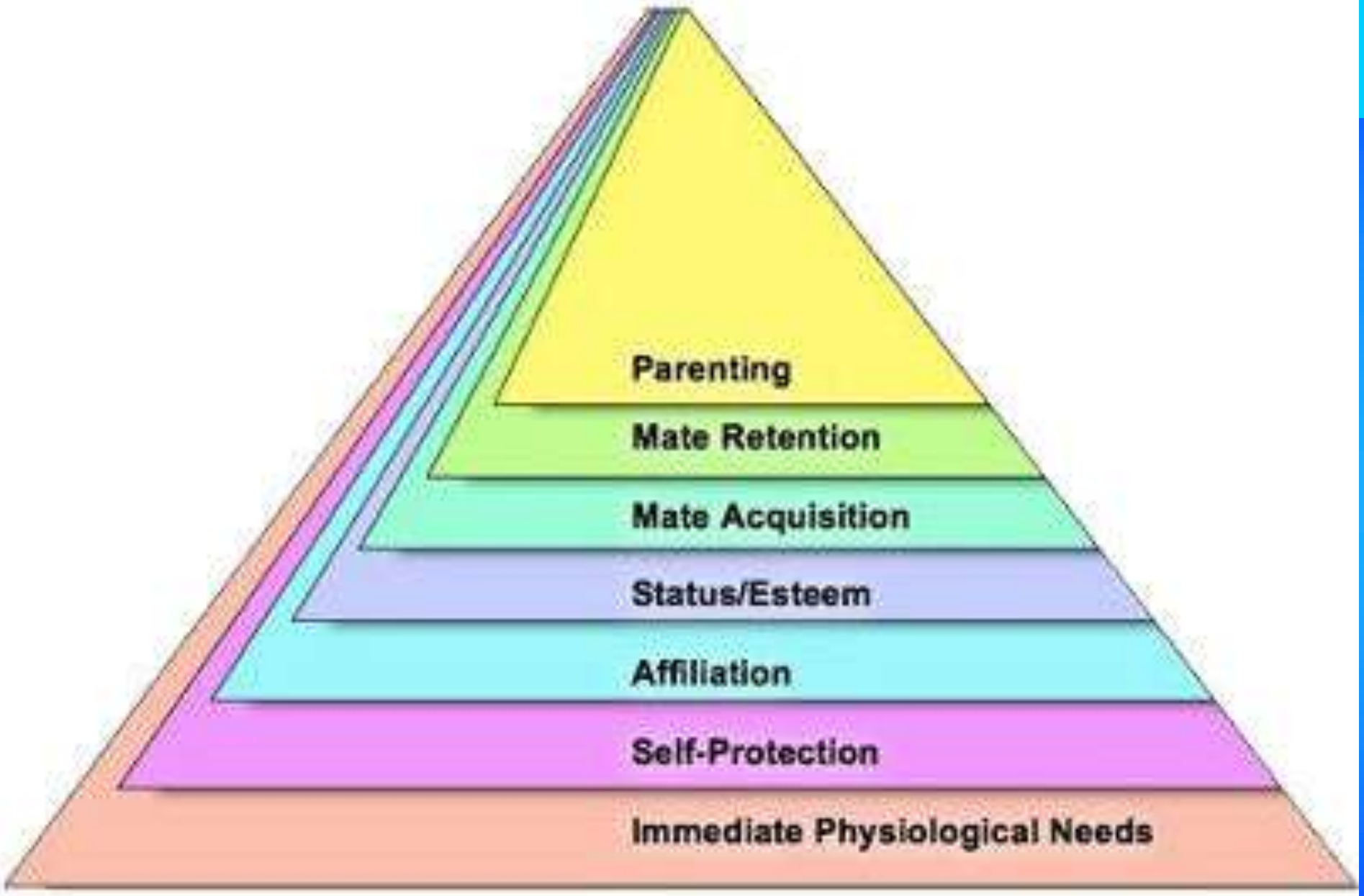
Infancy cannot be re-run later.

Douglas KENRICK (2010)

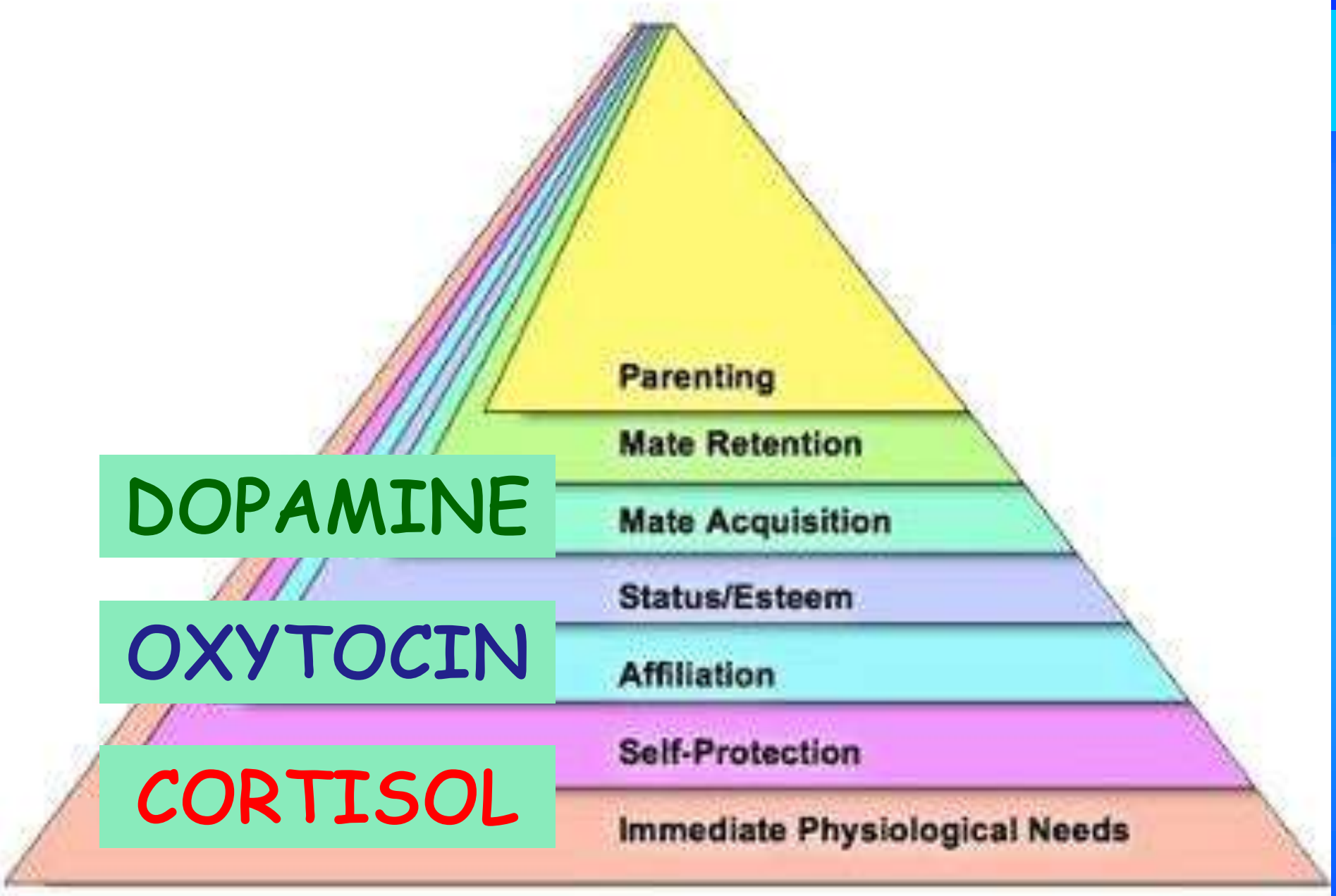
"Maslow's pyramid of human needs, proposed in 1943, has been one of the most cognitively contagious ideas in the behavioral sciences."

Maslow's original pyramid of needs

http://www.psychologicalscience.org/journals/pps/5_3_inpress/Kenrick.pdf



Revised pyramid of needs



Revised pyramid of needs

"Society reaps what it sows in the way that infants and children are treated. .

DOPAMINE

OXYTOCIN

CORTISOL

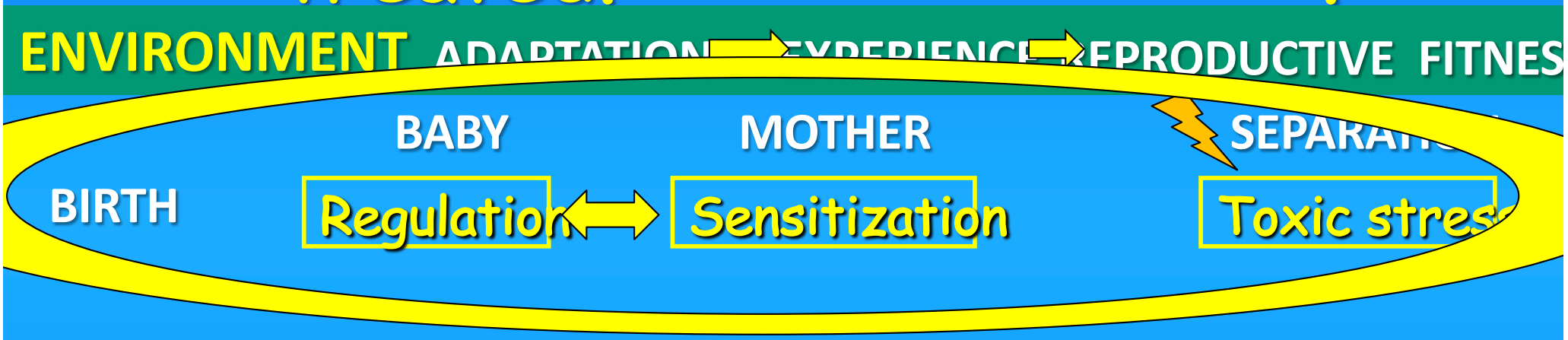
"Society reaps what it sows in the way that infants and children are treated. Efforts to reduce exposure to stress and abuse in early life may have far-reaching impacts on medical and psychiatric

Martin H Teicher

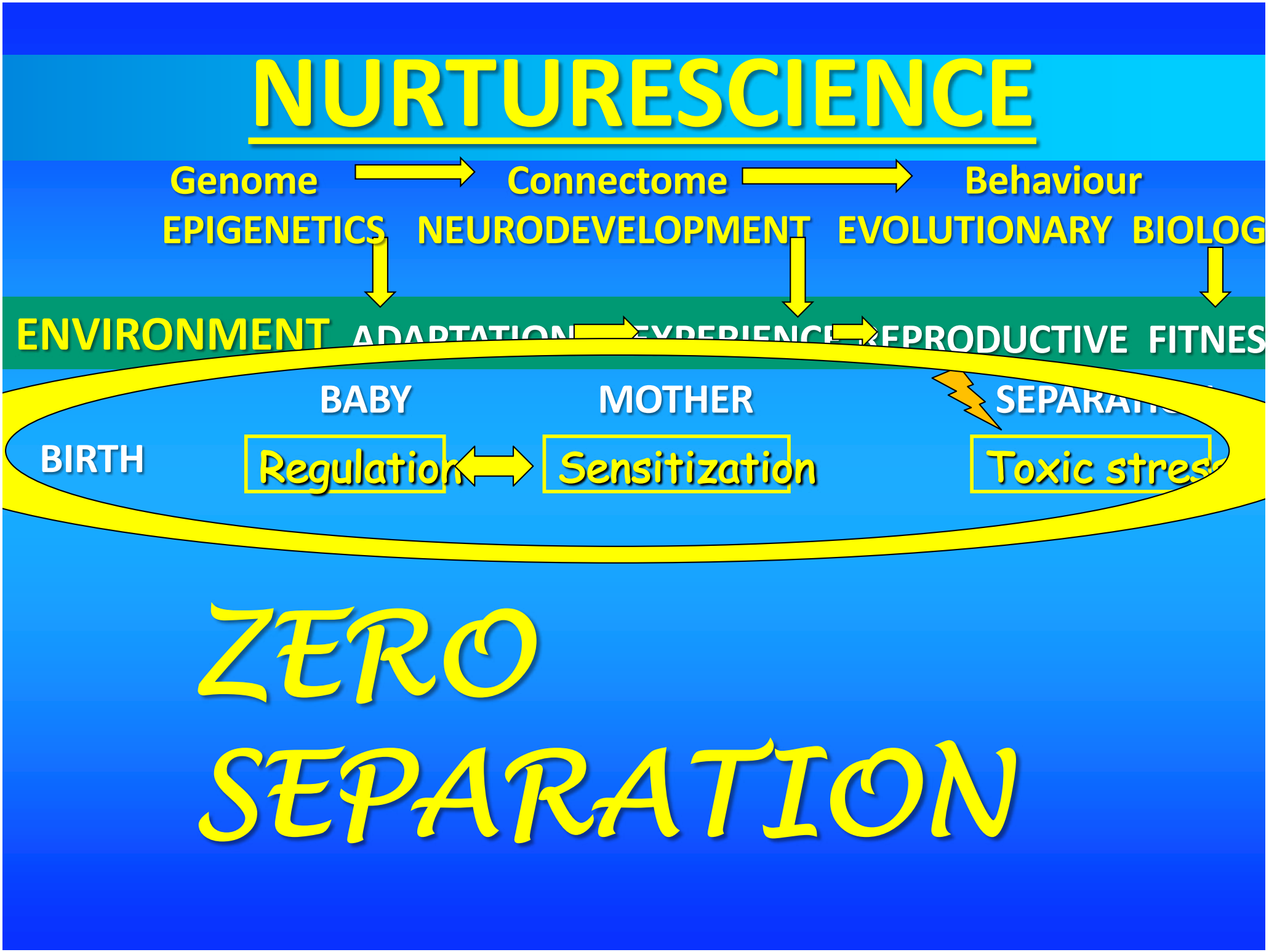
"Society reaps what it sows in the way that infants and children are treated. Efforts to reduce exposure to stress and abuse in early life may have far-reaching impacts on medical and psychiatric health and may reduce aggression, suspicion and untoward stress in future generations."

Martin H Teicher

"Society reaps what it sows in the way that infants and children are treated.



ZERO SEPARATION

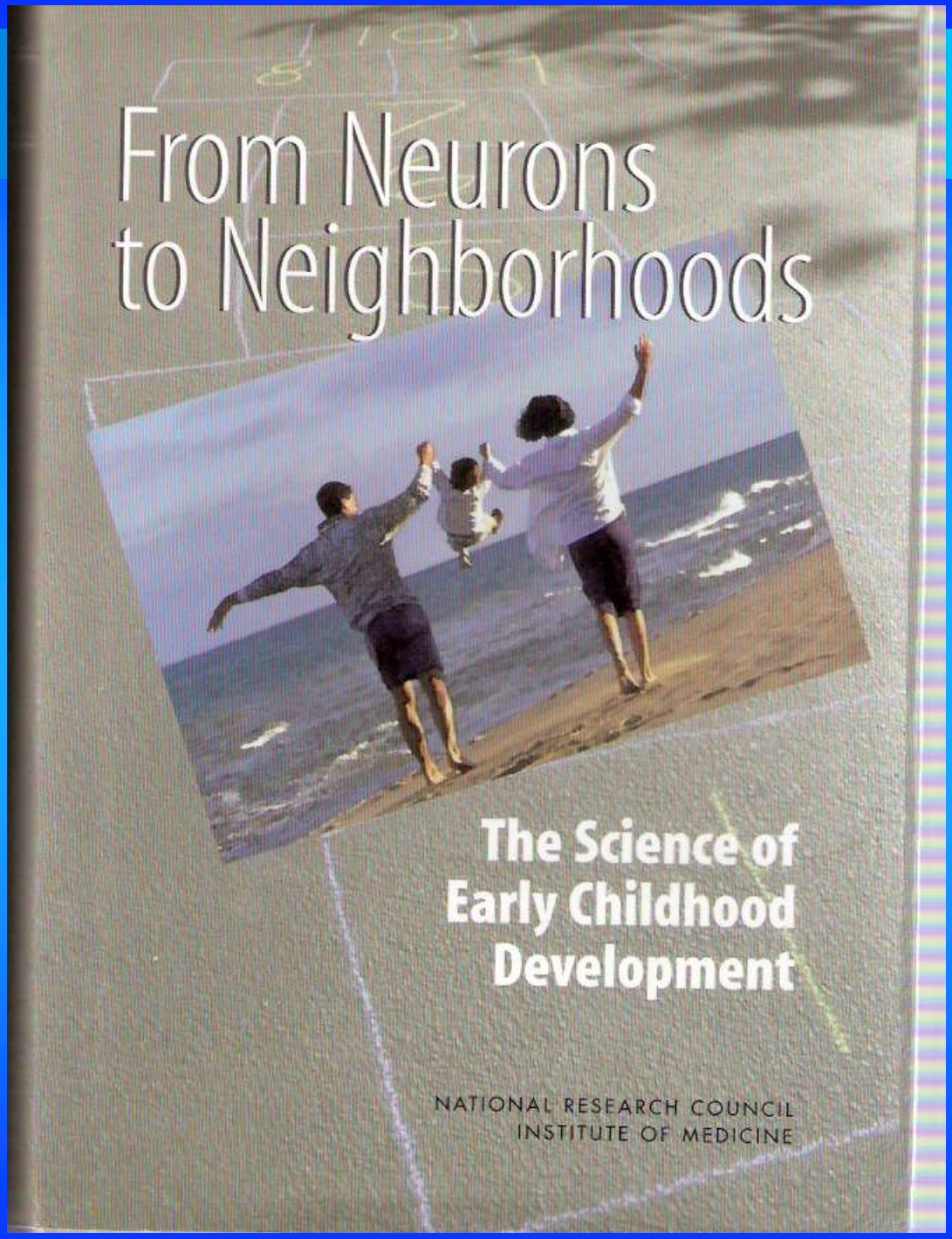

NURTURESCIENCE
Genome
Connectome
Behaviour
EPIGENETICS
NEURODEVELOPMENT
EVOLUTIONARY
BIOLOG
ENVIRONMENT
EPRODUCTIVE
FITNES
BABY
MOTHER
BIRTH
Regulation
Sensitization
Toxic stres
ZERO
SEPARATION

From Cell to Society

2019

KI'S NEW PROFESSORS ON THEIR RESEARCH
MEET THE PRIZEWINNERS

Karolinska Institutet

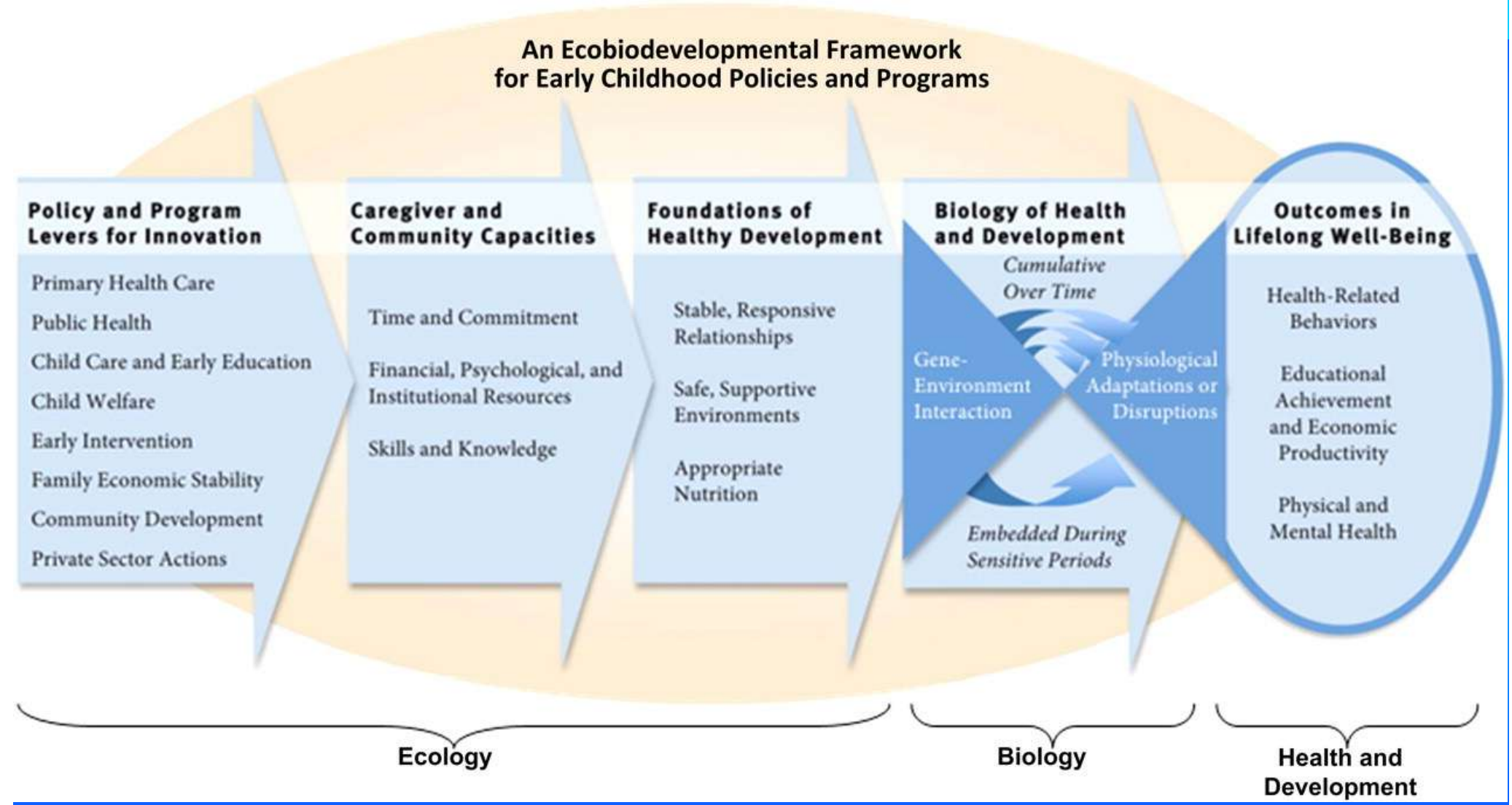


USA:

From Neurons to Neighborhoods

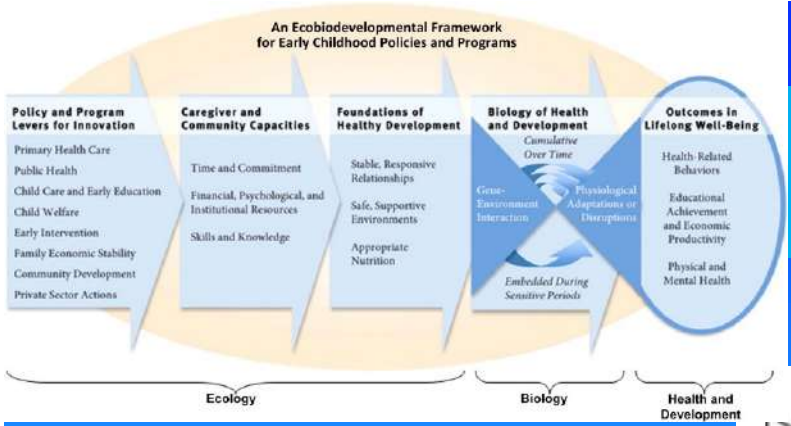
The Science of Early Childhood Development

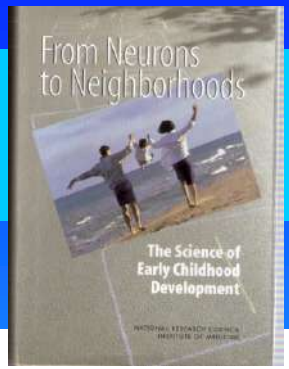
An ecobiodevelopmental framework for early childhood policies and programs.

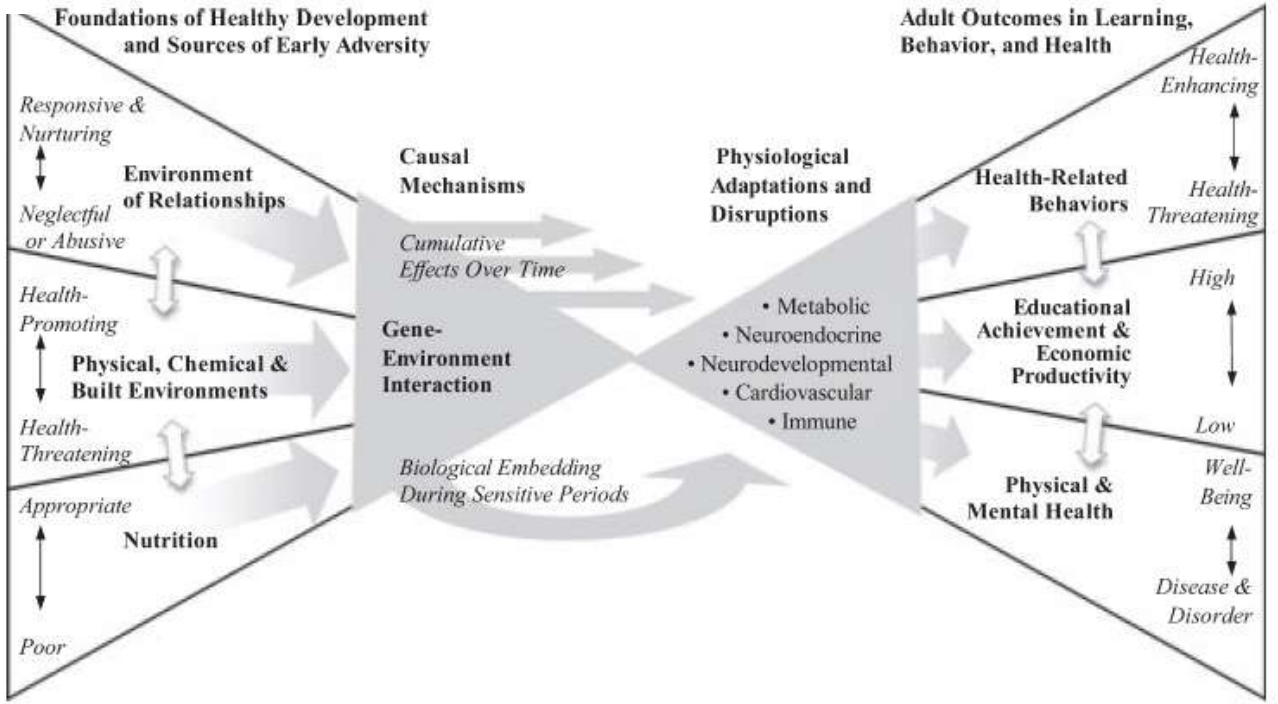


Shonkoff J P et al. Pediatrics 2012;129:e232-e246

PEDIATRICS®







Evolutionary biology

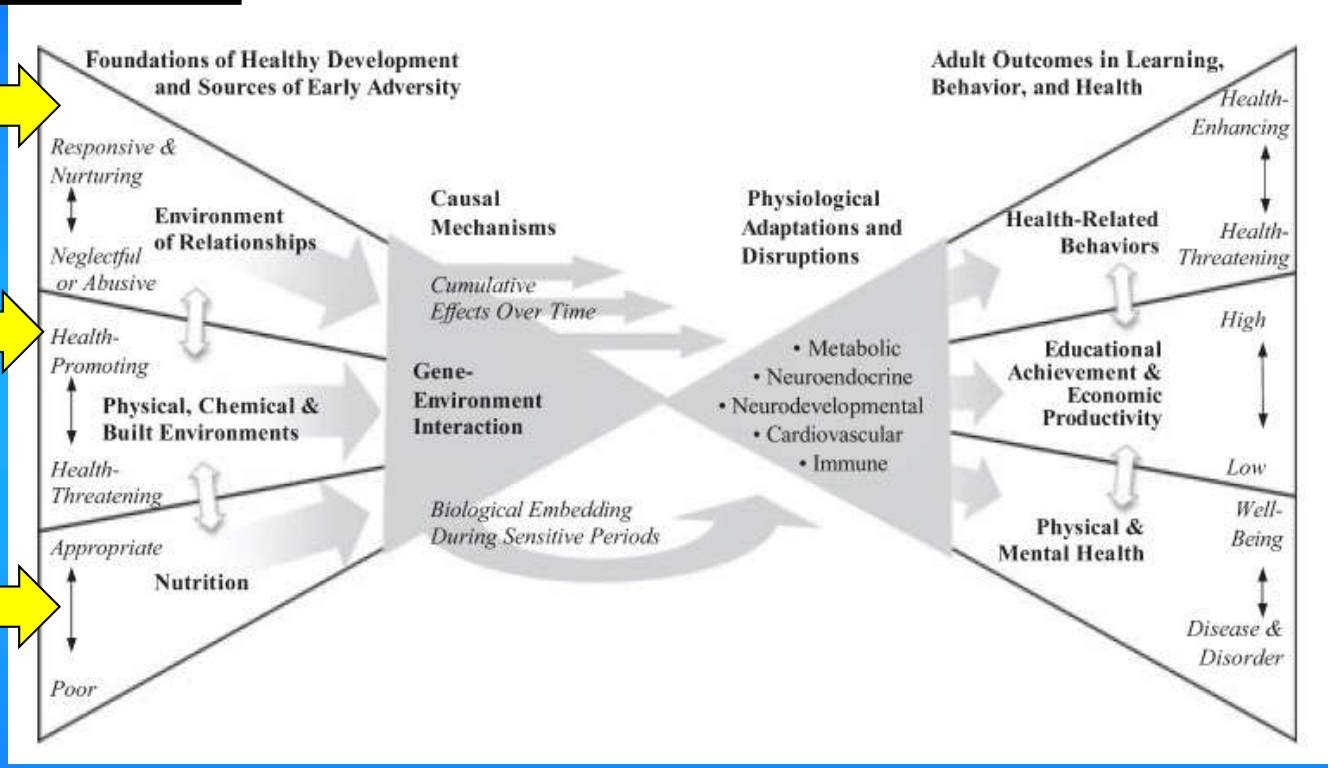
Attachment

Bonding

Skin-to-Skin Contact

Breast-feeding

Regulation



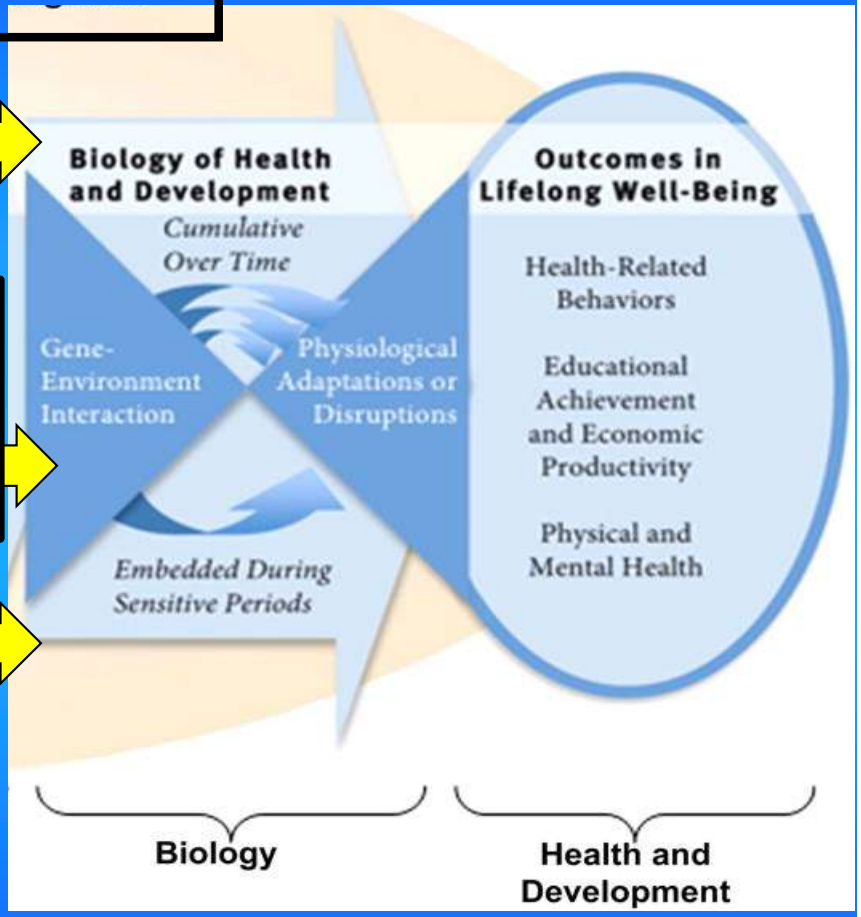
An ecobiodevelopmental framework for early childhood policies and programs.

Attachment

Bonding

Skin-to-Skin Contact

Breast-feeding



BERGMAN COMMENTARY - NEWBORN

Reducing toxic stress IS VERY EASY !!

SEPARATION

ENVIRONMENT → ADAPTATION → EXPERIENCE → REPRODUCTIVE FITNES

VIOLATES

SEPARATION

Toxic stress

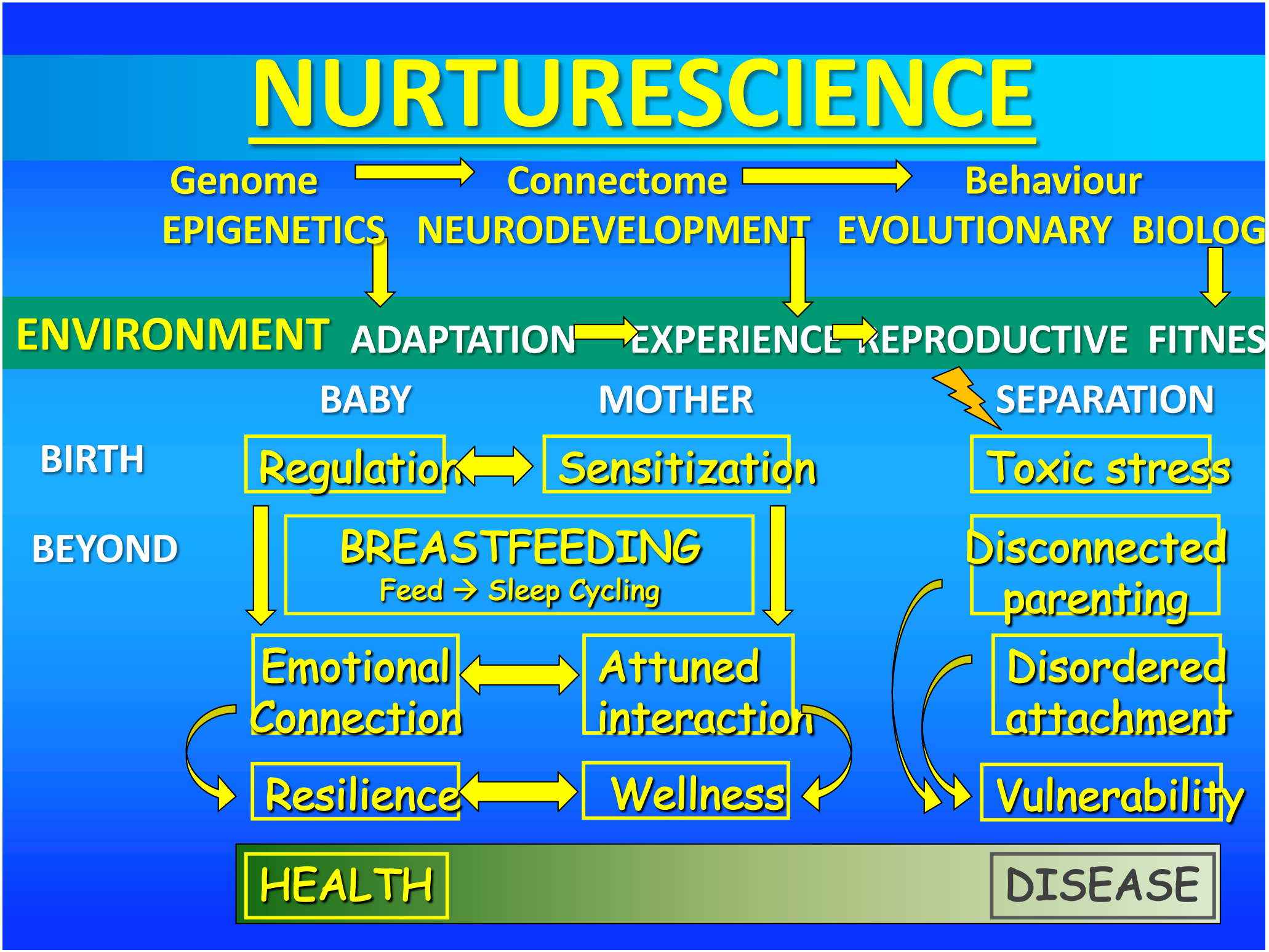
Insensitive parenting

Disordered attachment

Vulnerability

the innate agenda of mother and baby

DISEASE


NURTURESCIENCE
Genome
Connectome
Behaviour
EPIGENETICS
NEURODEVELOPMENT
EVOLUTIONARY
BIOLOG
ENVIRONMENT
ADAPTATION
EXPERIENCE
REPRODUCTIVE
FITNES
BABY
MOTHER
SEPARATION
BIRTH
Regulation
Sensitization
Toxic stress
BEYOND
BREASTFEEDING
Feed → Sleep Cycling
Disconnected parenting
Emotional Connection
Attuned interaction
Disordered attachment
Resilience
Wellness
Vulnerability
HEALTH
DISEASE

NURTURESCIENCE:
Implications for society, LIFE HISTORY THEORY

Instituto Europeo de
Salud Mental Perinatal

… with focus on attachment, development and evolutionary implications

SECURE ATTACHMENT

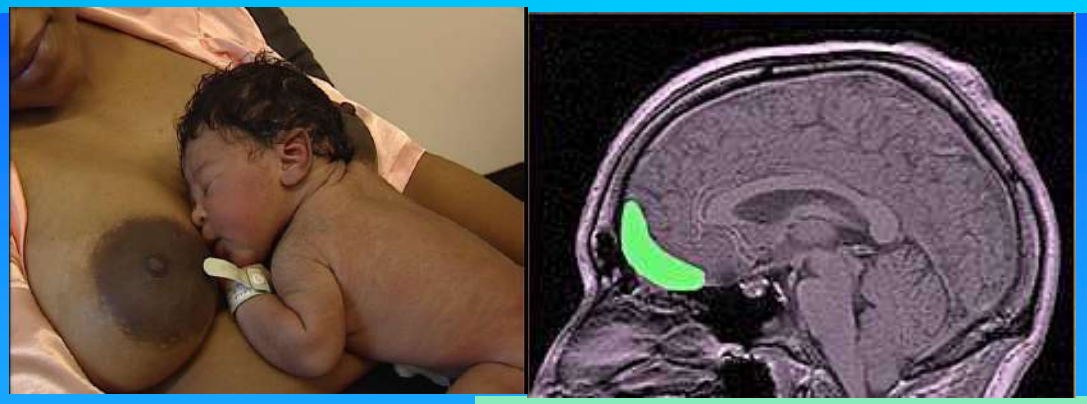
1 world benign/benevolent
2 others can be trusted
3 relationships are
enduring & rewarding

OXYTOCIN

STRONG PAIR BONDS
Parental care investment
SENSITIVE CARE
fewer offspring, better survival

Quality versus quantity

SECURE ATTACHMENT



OXYTOCIN

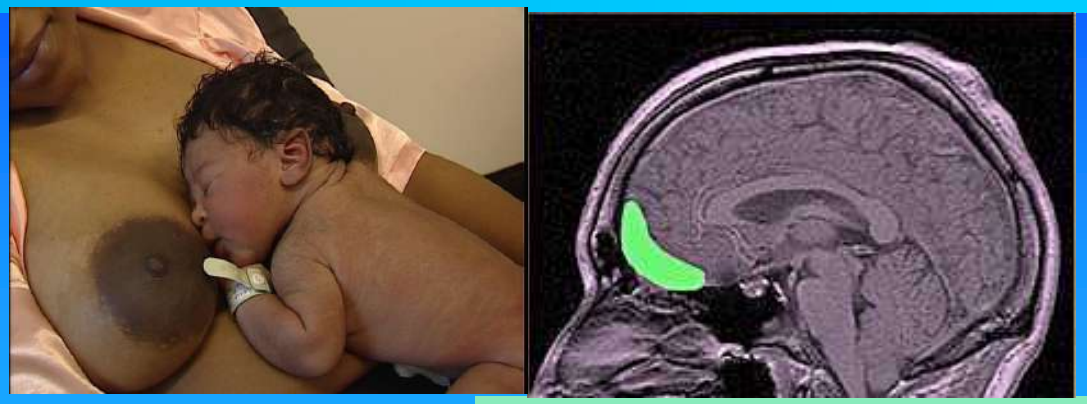
SOURCE OF COMPASSION

optimal development or outcome

ideal benign malevolent

UBUNTU

optimal development or outcome



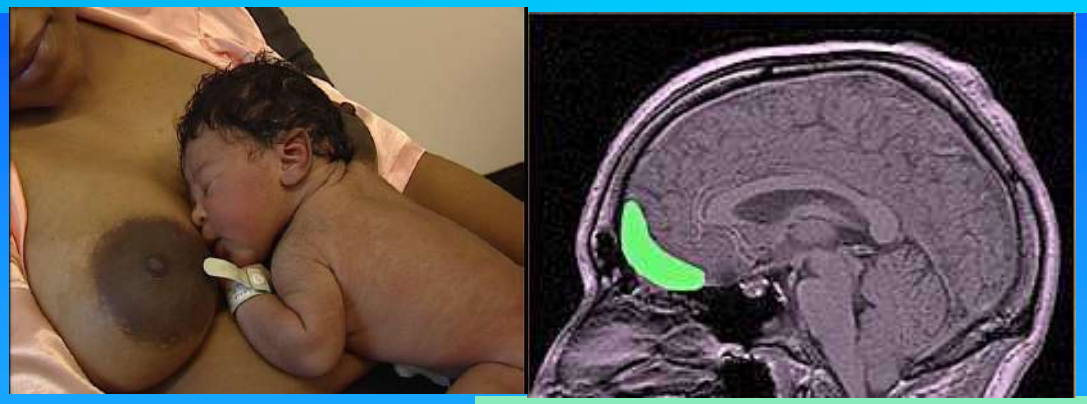
OXYTOCIN

ubuntu =
"I am, because you are".

The concept of common humanity, oneness:
humanity, you and me both.

UBUNTU

optimal development or outcome



OXYTOCIN

INIMBA

Inimba = a capacity unique to mothers because it originates in the pain of childbirth

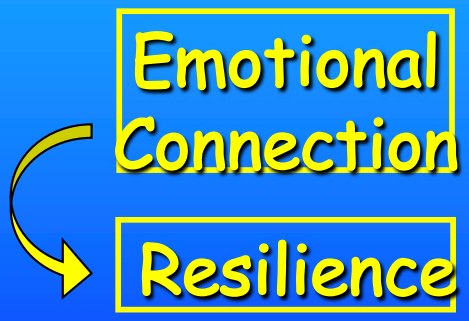
(literally = umbilical cord)

UBUNTU

SOURCE OF COMPASSION

OXYTOCIN

INIMBA



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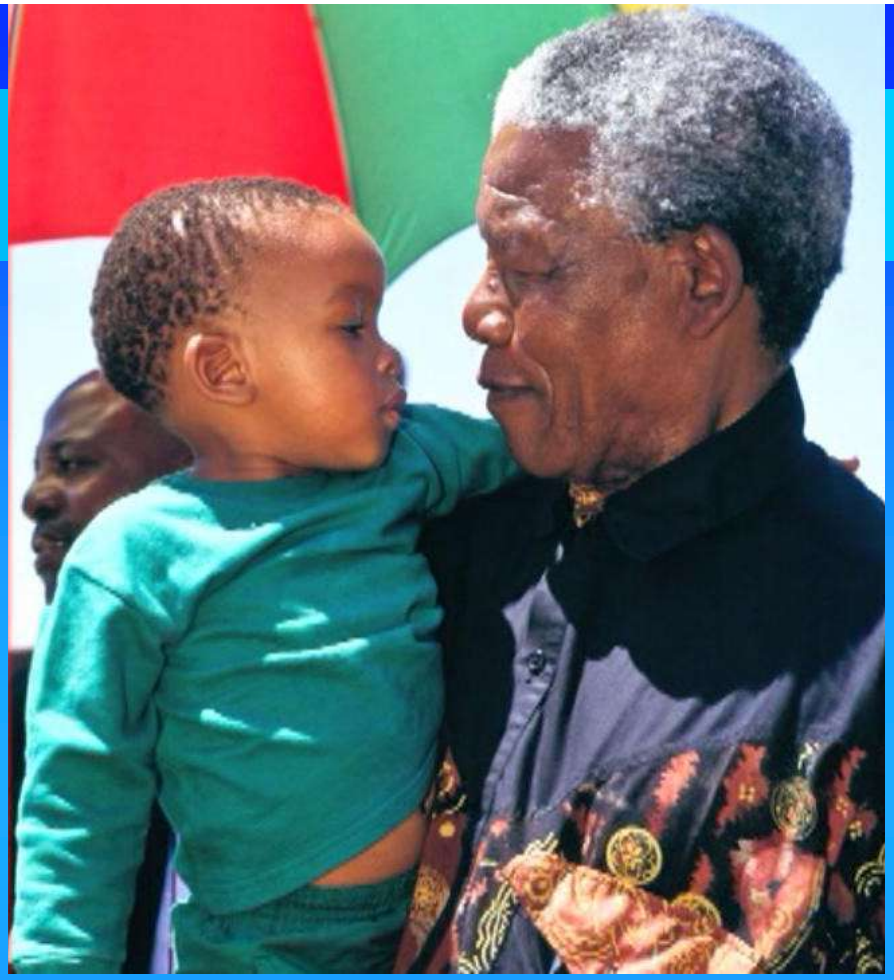
(literally = umbilical cord)

Nelson Mandela

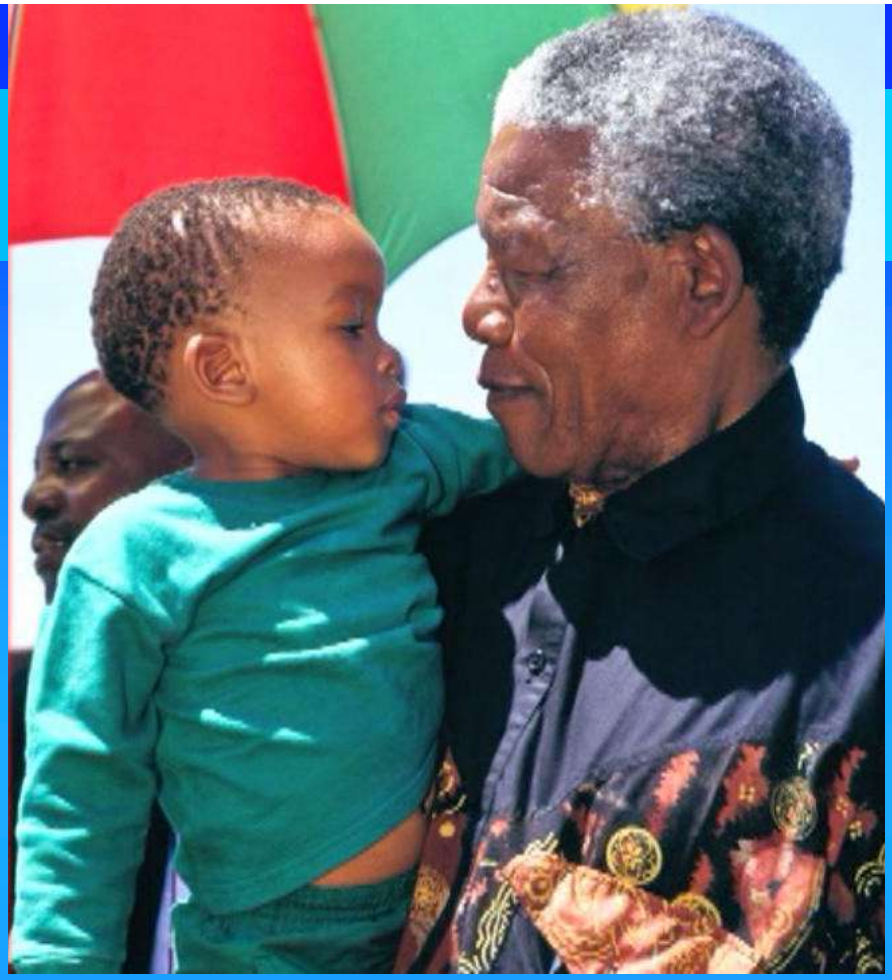


… in describing the measure of a nation, he has argued that:

Emotional Connection

Resilience

Nelson Mandela



… in describing the measure of a nation, he has argued that:

"There can be no keener revelation of a society's soul than the way in which it treats its children."

NURTURESCIENCE:

Implications for society,

LIFE HISTORY THEORY

… in describing the measure of a nation, he has argued that:

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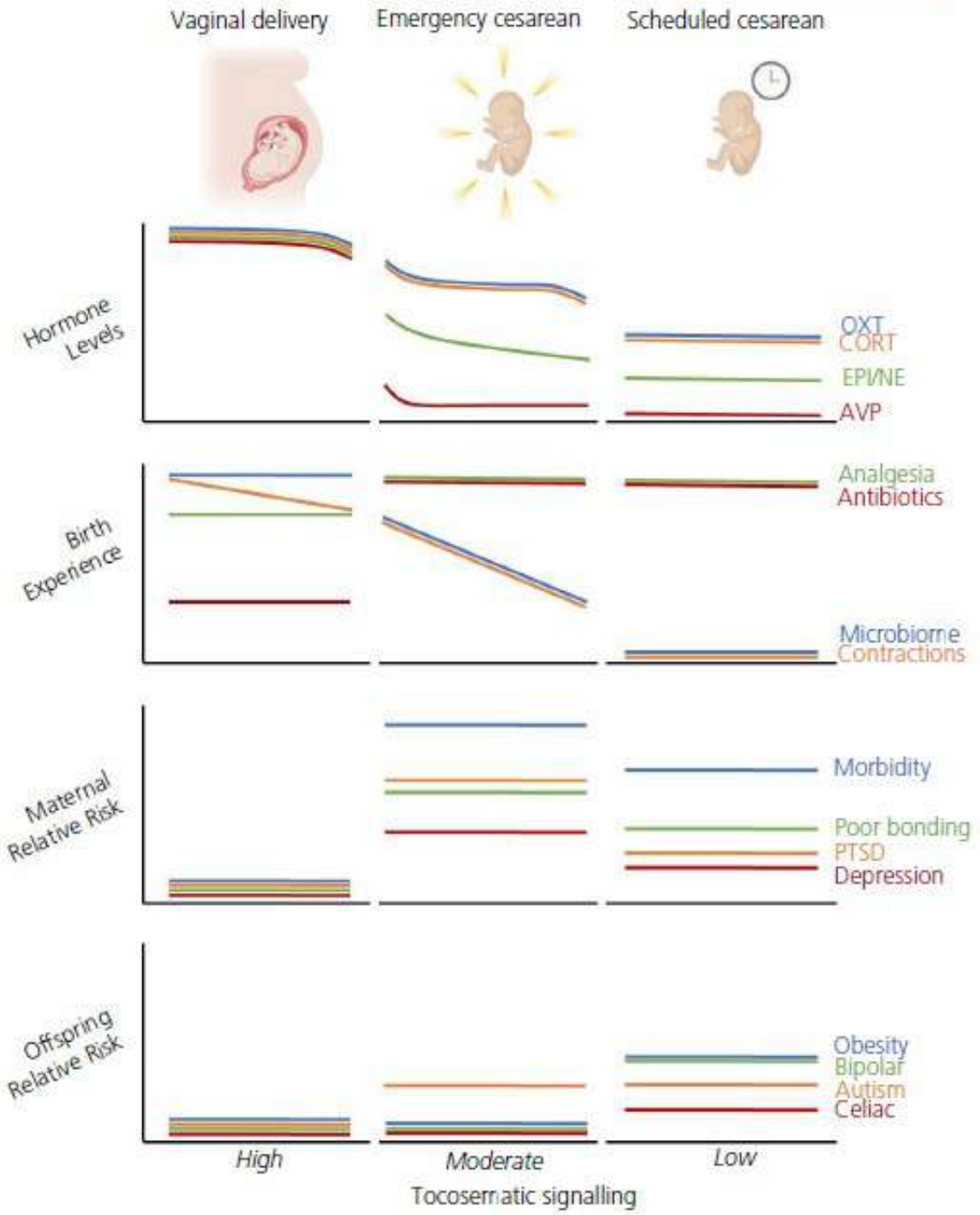
Vaginal delivery
Emergency cesarean
Scheduled cesarean
Hormone Levels
OXT
CORT
EPI/NE
AVP
Birth Experience
Analgesia
Antibiotics
Microbiome
Contractions
Maternal Relative Risk
Morbidity
Poor bonding
PTSD
Depression
Offspring Relative Risk
Obesity
Bipolar
Autism
Celiac
High
Moderate
Low
Tocosemiatic signalling

Received: 28 May 2020 | Revised: 5 October 2020 | Accepted: 6 October 2020

DOI: 10.1111/jne.12912

Check for updates

Journal of Neuroendocrinology WILEY

EARLY CAREER PERSPECTIVE

Birth signalling hormones and the developmental consequences of caesarean delivery

William Kenkel

FIGURE 1 A schematic of how birth mode affects hormone levels and several other tocosematic processes (top two graphs) relative to vaginal delivery. Also shown are relative risk profiles for both mother and offspring. In general, hormones levels and microbiome exposure run parallel; however, high rates of antibiotic exposure, which could disrupt microbial colonisation, act to weaken the association. With the exception of autism spectrum disorders, offspring outcomes are most apparent in cases of scheduled cesarean. The pattern of associations suggests that (i) offspring health outcomes are not likely a result of the negative health outcomes experienced by mothers and (ii) offspring health outcomes (with the exception of autism) are at their worse when hormone levels are at their lowest, particularly, oxytocin (OXT), cortisol in humans/corticosterone in non-human animals (CORT), epinephrine (EPI) and norepinephrine (NE). Hypothetically, comparisons could also be made within each birth mode category; for example, an emergency cesarean delivery that occurred early in labour would have less tocosematic signalling than an emergency cesarean delivery that occurred late in labour, although that has not been shown yet. AVP, arginine vasopressin; PTSD, post-traumatic stress disorder