

Chapter 3

Behavior Genetics

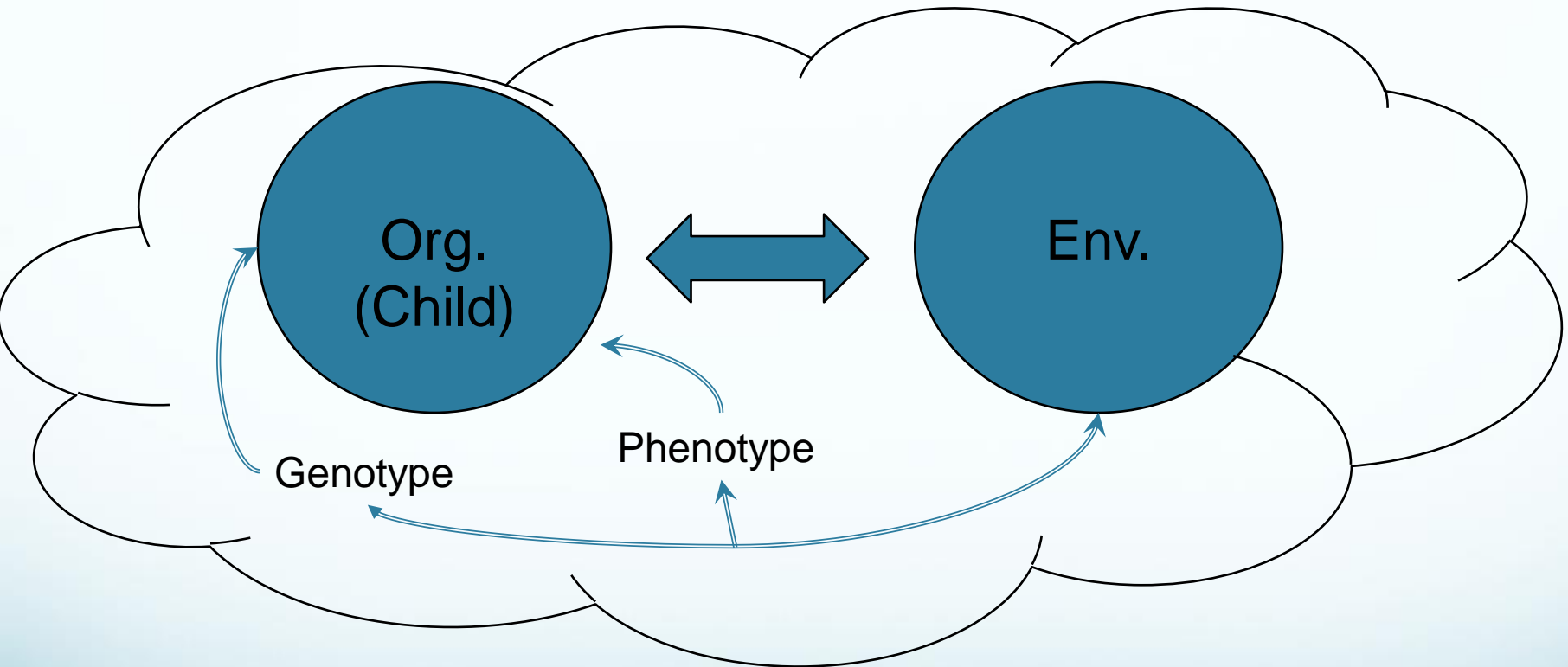
Our Main Focus

- The “big picture”
 - How does this material relate to what we have learned (and what we are going to learn) about child psychology?
- Understand the general idea/concept:
 - P. 80-92
- Know in detail:
 - P.78-79, P. 92-104

The Controversy

- The role of genetics in development
 - We cannot separate heredity (genetics) out of the organism in the ORG \leftrightarrow ENV interactions of psychological development
 - Genes interact with the environment to create the physical person
 - The whole organism then interacts with the environment produces behavior
 - It is never nature OR nurture; both always have a role in the psychological event
 - So how do they work together, *dynamically*?

Remember the Psychological Event Model



- Genetics are part of the organism and therefore part of understanding psychology.
- Need to look at WHOLE organism and dynamic interactions with environment to understand psychology.

Behavior Genetics

- The field that studies behavioral and genetic aspects of development
 - Differences in expression
 - Investigating the role of genetics on behavior
 - Level of influence
- Why study genetics?
 1. Genetics is a good example of how parsimonious causes can produce highly complex results
 2. To understand “how” they contribute to development

Genetic Variability

- Important to process of natural selection and survival of the species
- This is similar in importance to behavioral variability
- Variability = Survival
 - Questions to ask yourself:
 - What problems might arise if the human species was all genetically the same?
 - What about if we were all behaviorally the same?

General Concepts of p. 80-92

- Processes that lead to genetic variability:
 - Random assortment
 - Crossing over
 - Mutations
- Genotype vs phenotype
- Recessive traits that are “leading factors”
 - Diabetes, Cystic Fibrosis, Hemophilia

Heredity & Environment

- The effect of genes on behavior is multifactorial; human behavior is polygenic
 - Genes contribute to behavior by determining the physical structures (e.g., eyes, muscles, etc.) that interact with the environment to produce behavior
- Discussion of twins
 - shared vs. unshared
 - .4 for cognitive abilities, .2 personality, .1 psychopathology

Interactional View of Genetics and Environment

- Reciprocal and dynamic
- Remember Ross' four sources of influence? How genetics interact with these sources:
 1. Genetics-constitutional makeup
 2. Previous interactional history
 3. Current physiological conditions
 4. Current environmental conditions

Interactional View of Genetics and Environment

- Reciprocal and dynamic
- Remember Ross' four sources of influence? How genetics interact with these sources:
 - 1. Genetics-constitutional makeup**
 - Genetic makeup: genetic inheritance and the resulting physical characteristics of the individual
 - Fixed at conception (these immediately interact with environment, expression changes but what is there doesn't)
 2. Previous interactional history
 3. Current physiological conditions
 4. Current environmental conditions

Interactional View of Genetics and Environment

- Remember Ross' four sources of influence? How genetics interact with these sources:
 1. Genetics-constitutional makeup
 - 2. Previous interactional history**
 - Once a change has occurred the organism is *different*
 - Behavior genetics views history as an organismic dimension. In other words, learning is primarily environmental but history “stays with” the organism
- 1. Current physiological conditions
- 2. Current environmental conditions

Interactional View of Genetics and Environment

- Remember Ross' four sources of influence? How genetics interact with these sources:
 1. Genetics-constitutional makeup
 2. Previous interactional history
 - 3. Current physiological conditions**
 - Lack of necessary elements lead to prevented biological growth (lack of food, stimulation and reflexes)
 - Presence of necessary elements promote desirable biological growth
 4. Current environmental conditions

Interactional View of Genetics and Environment

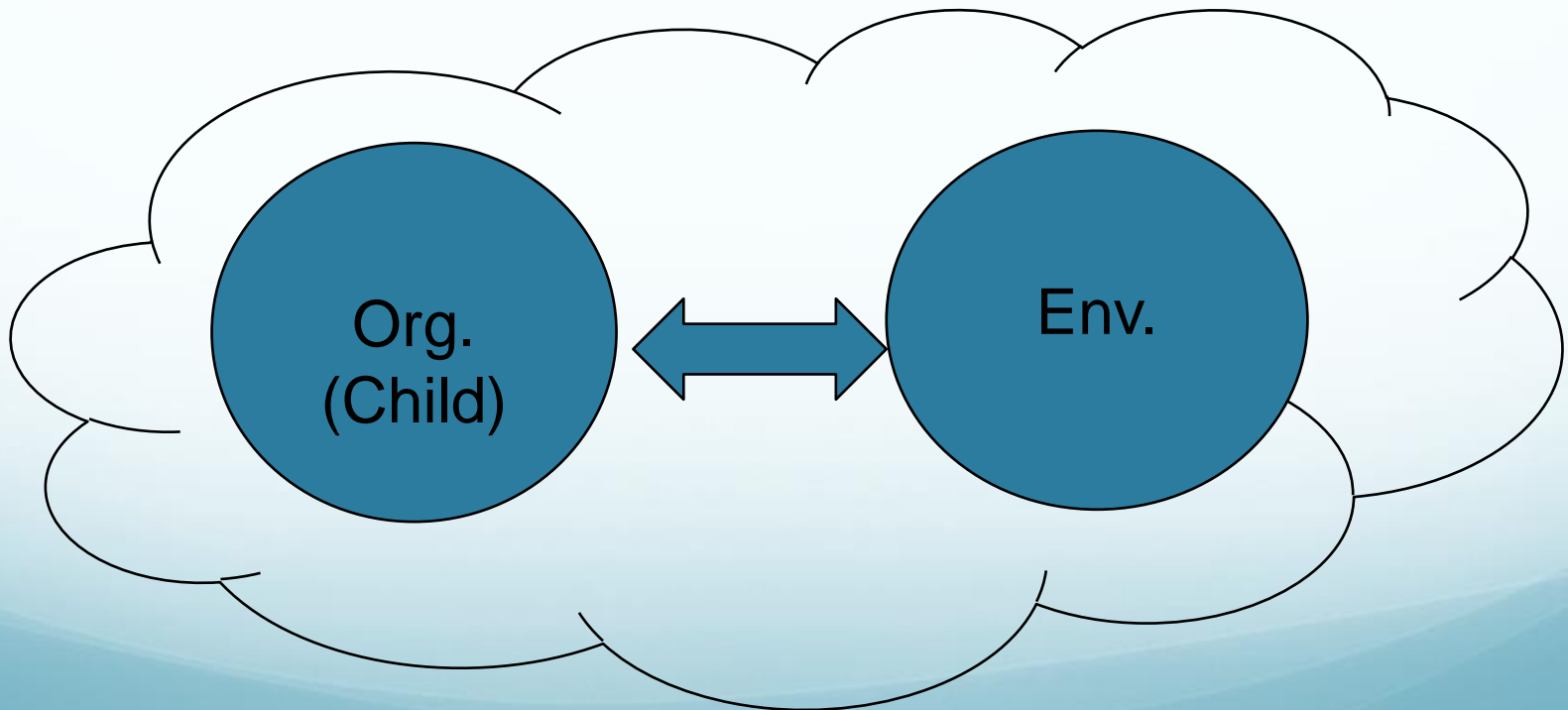
- Remember Ross' four sources of influence? How genetics interact with these sources:
 1. Genetics-constitutional makeup
 2. Previous interactional history
 3. Current physiological conditions
 - 4. Current environmental conditions**
 - From moment of conception, the interactions begin (intrauterine drugs, inflammation, gender boys = blue, girls = pink)
 - Functional environment surround; not just “environment” but the functional environment
 - Only those factors that exert some control
 - **Fetuses and newborns can be conditioned!**
 - Habituation, classical conditioning, exposure learning, kicking = mobile

...Equals 5. Behavior Dynamics

- Think about how these 5 factors fit into the

ORG \leftarrow \rightarrow ENV model

- 1. Genetics-constitutional makeup, 2. previous interactional history, 3. current physiological conditions, 4. current environmental conditions and 5. behavior dynamics



Gene-Environment Interaction

- Genotype fixed at birth
 - “sets the limits of development” or potentialities (holding our breath =22 min w/ hyperventilating on Oxy; flying; hearing high frequencies - singers)
 - Different genotypes have different ranges. Canalization = the extent to which a genotype can be influenced by the environment
 - Eye color – small range of influence
 - Non universal behaviors (reading, writing, playing sports) much larger range of influence
 - Rubber band metaphor

Gene-Environment Interaction

- How Genotypes influence behavior
 - Passive genotype-environmental effects
 - Environment is compatible with genotypic factors (eyesight, hearing)
 - Evocative genotype-environment effects
 - Genetically inherited characteristics evoke different responses from parents and others (small size, gentle care; large size, roughhousing; gender)
 - Active genotype-environment effects
 - People with certain genotypes may actively seek particular environments (“niche picking”)
 - This is heavily tied to evocative effects
 - Person may “choose” a peer group in adolescence, but personality, preferences, and abilities depend on history

Epigenetics

- Epigenetics
 - Lead to changes in the phenotype
 - changes in a chromosome that affect gene activity and expression
- Behavioral epigenetics
 - How nurture (environmental interactions) shapes nature (heredity)
 - Attempts to provide a framework for understanding how the expression of genes is influenced by experiences and the environment
 - A few areas of research:
 - Anxiety
 - Stress
 - Memory
 - Addiction

Epigenetics Examples

Use these as terms + “epigenetics” in a web search to read more

- Rhesus monkeys (Suomi)
 - Short formers v. long formers (serotonin)
- Hypertensive rats
- Female rats and fungal infections
- Twins
- WWII Dutch Hunger Winter
- Queen bees and royal jelly
- Handling of rats at birth – reverse by handling later
 - DNA Methylation
- Animal Enrichment (lower: anxiety, higher: immune system, learning, memory, reverse: brain damage, lead poisoning)
 - Human implications
 - LEARNING = THE FORMATION OF NEURONS
- Stroke Victims (Consequences = brain plasticity)

Questions to Ponder

- Do you think personality traits are primarily inherited or influenced by environment? Why?
- Discuss the idea of retention of ontogenetic learned behavior. Where is it? Do we need to locate it at all? What benefit/harm might this cause to psychology and other sciences?