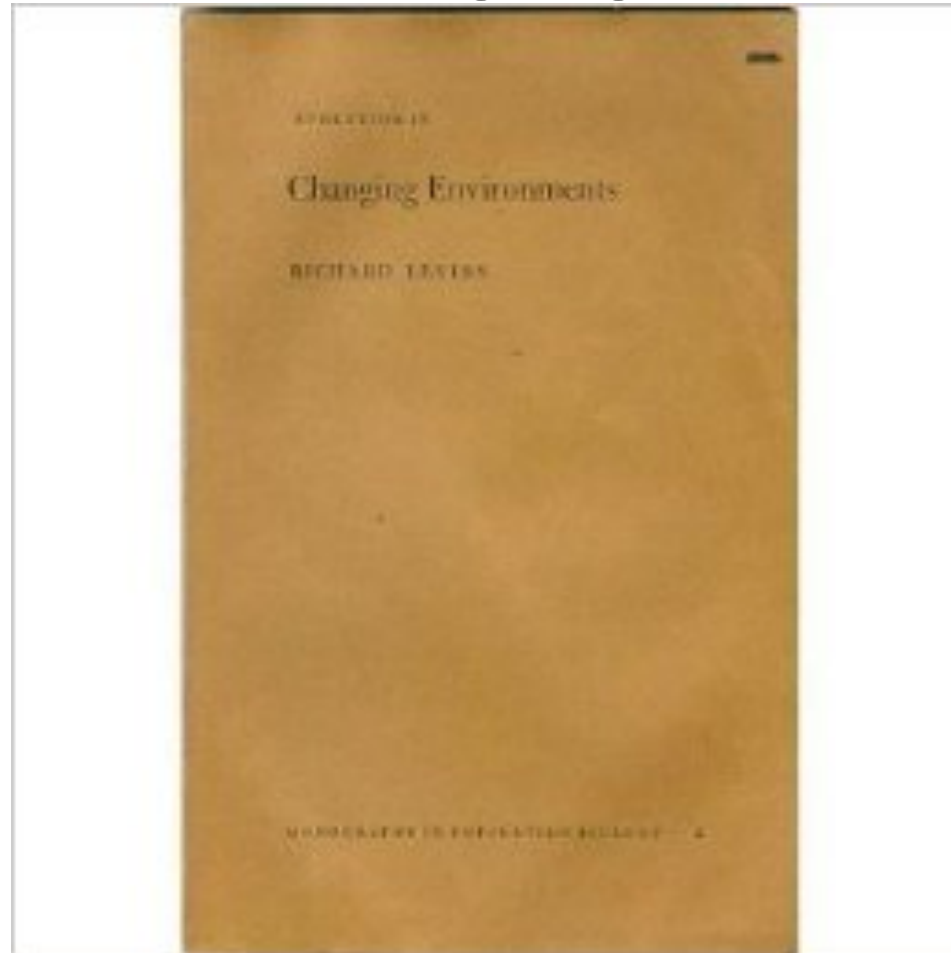


Changing Science in Heterogeneous Environments

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Shortlink, bit.ly/RLMay15

Levins, 1968,
Evolution in Changing Environments



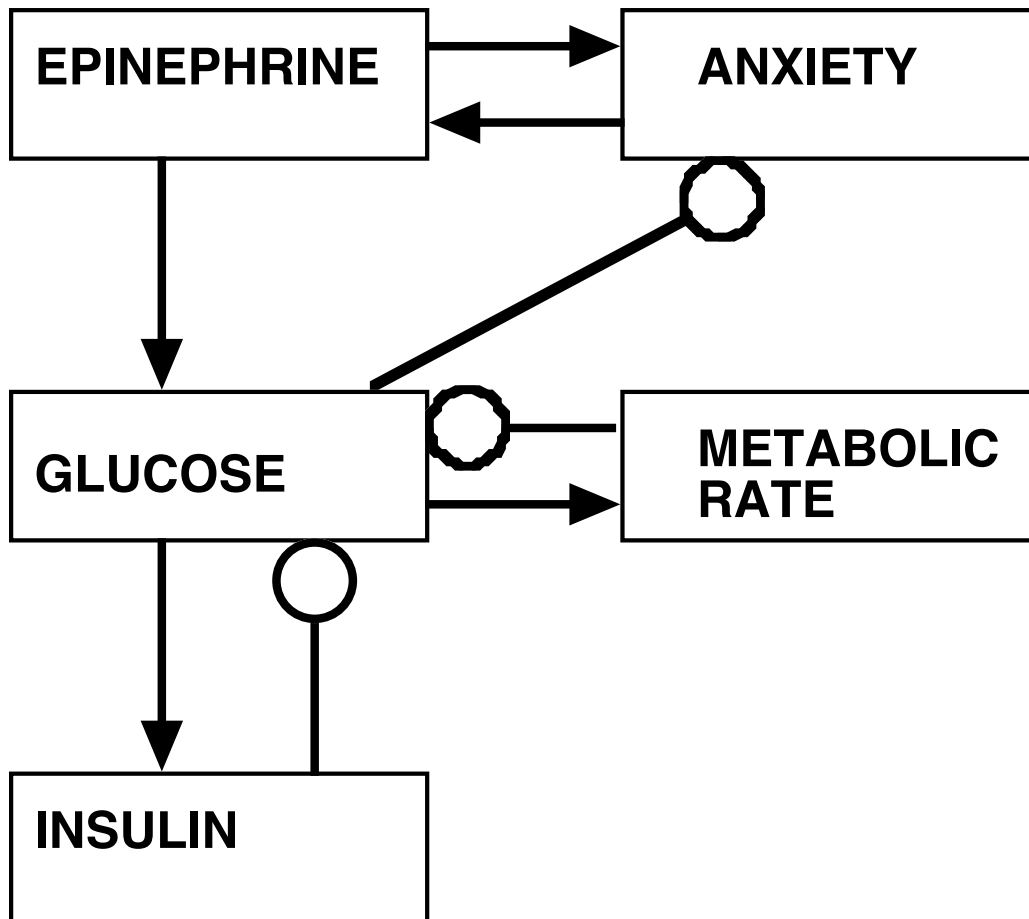
Levins, 1930-present,
explorations of complexity

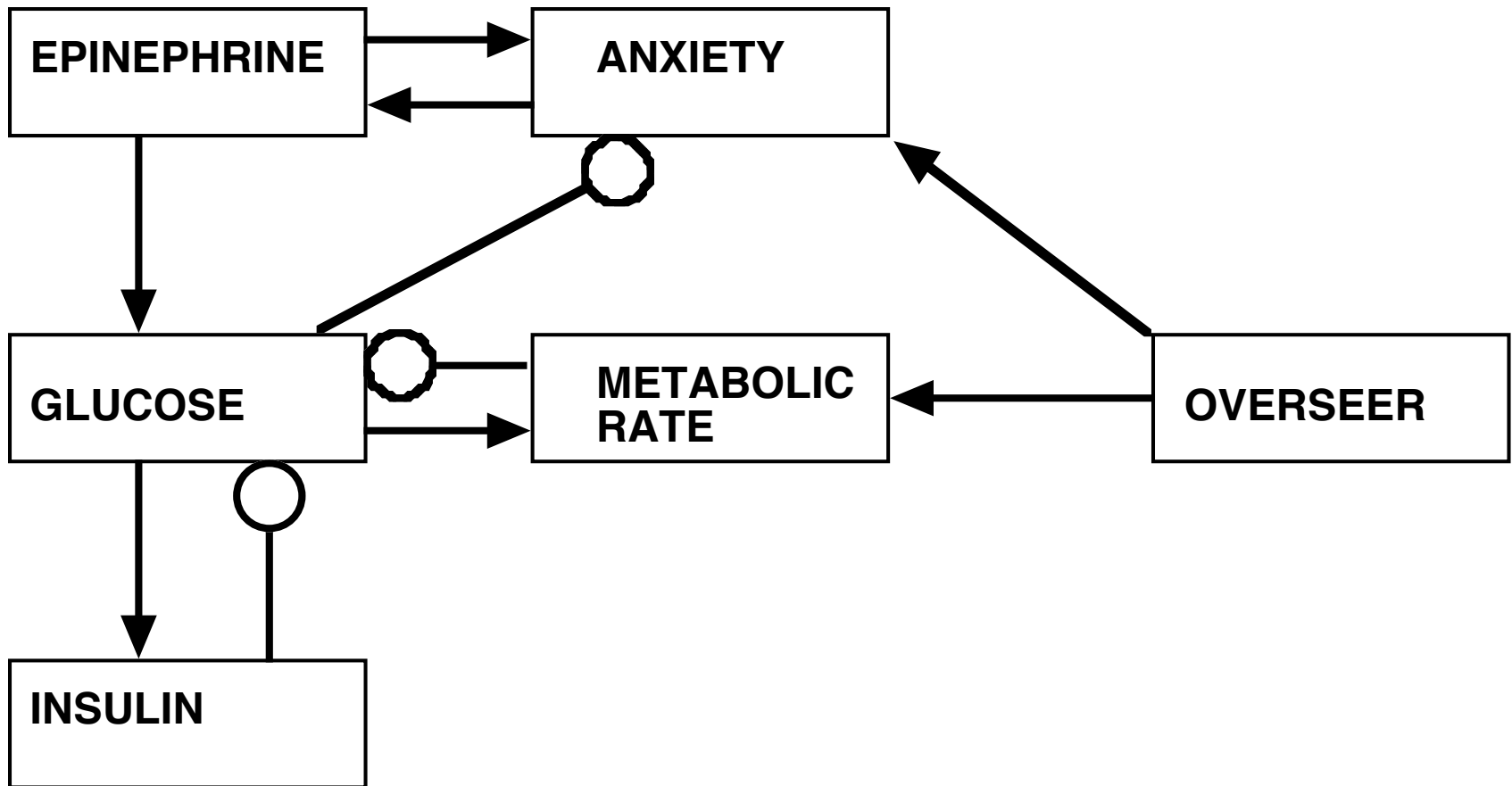
Levins, 1930-present, explorations of complexity

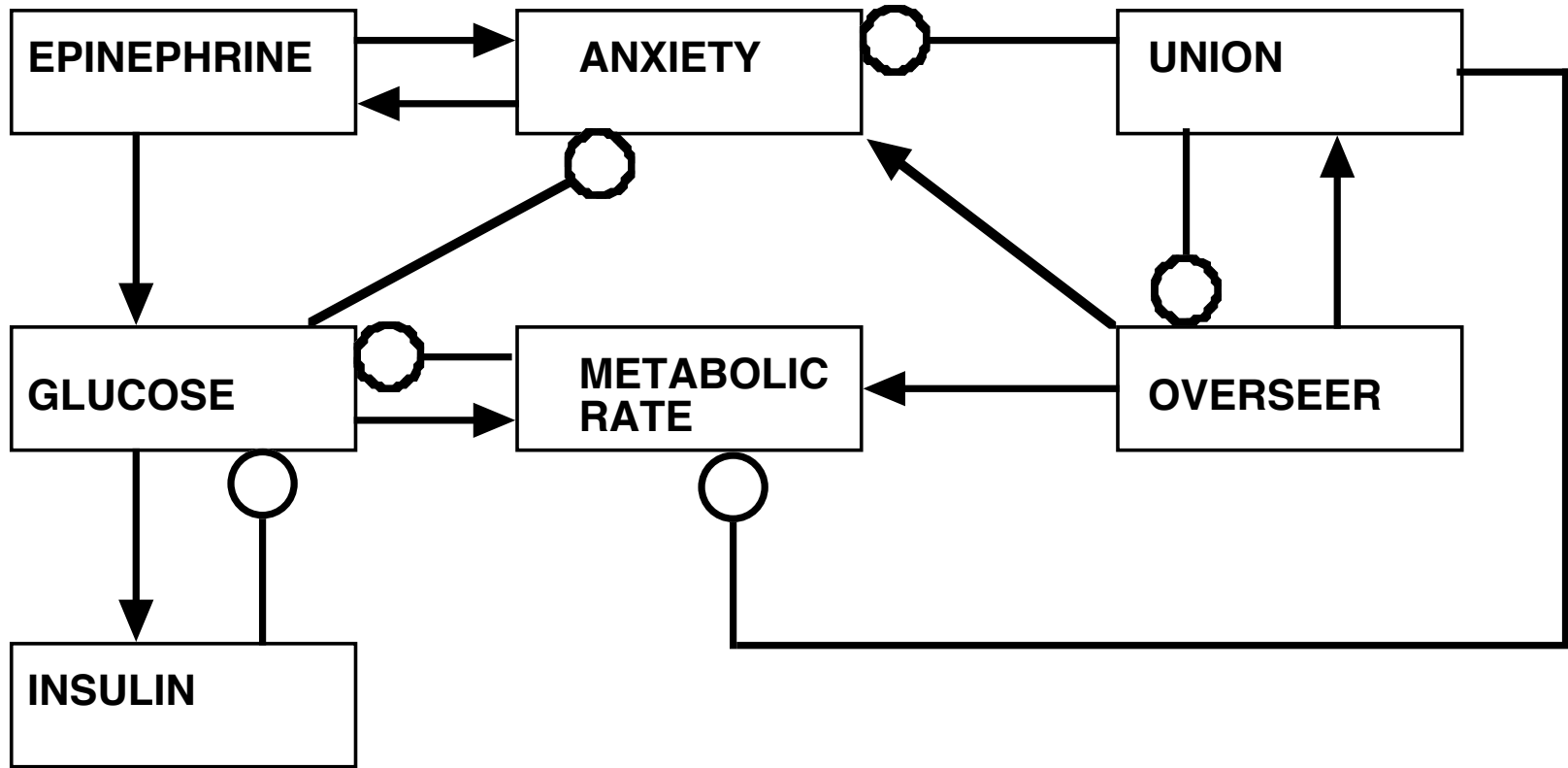
= situations that

1. consist of **heterogeneous components**
2. are built up over time and subject to **ongoing restructuring**
3. are **embedded** in wider dynamics

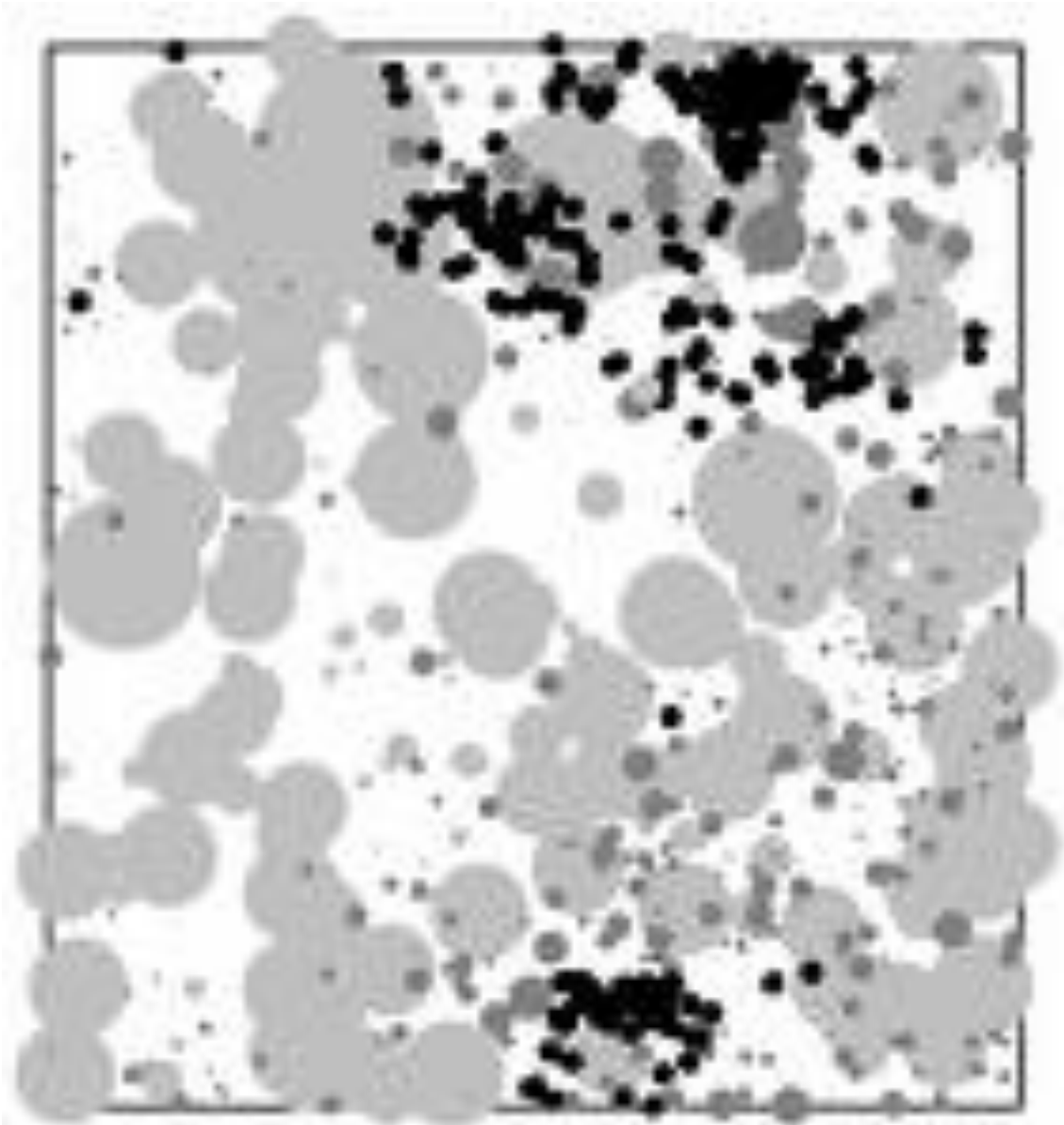
embeddedness







heterogeneity



Taxonomy of heterogeneities

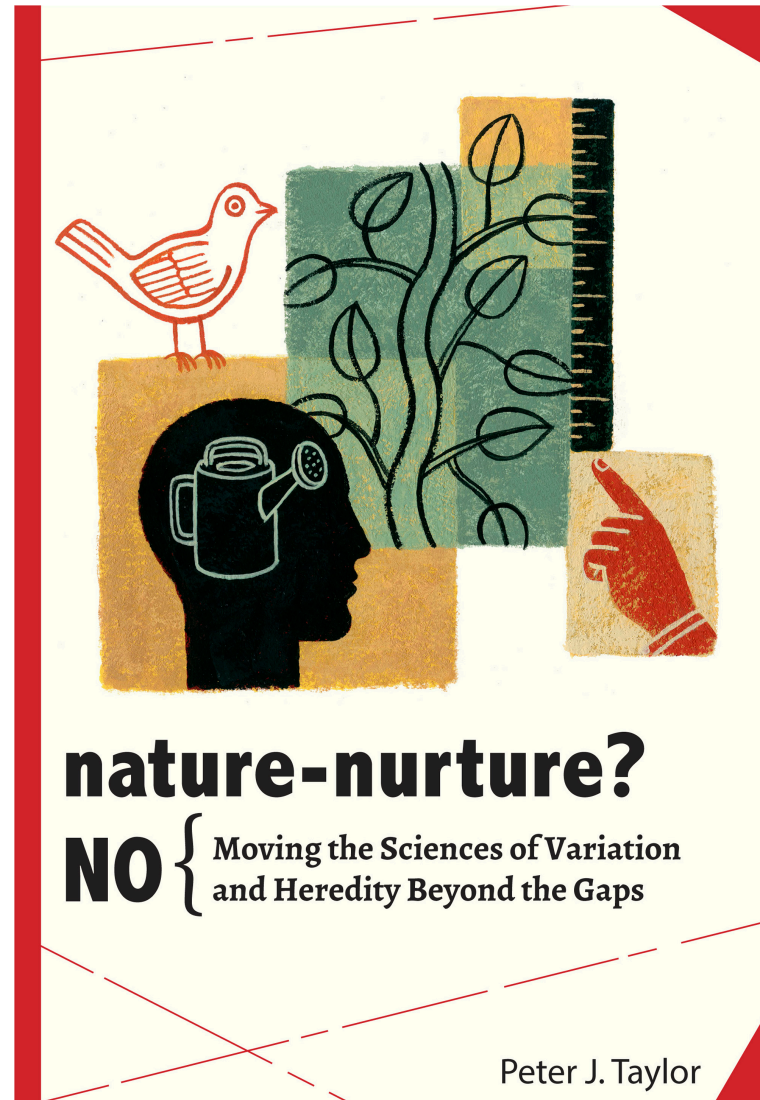
Static	1. There is an <i>assortment</i> , each a separate type ("cabinet of curiosities")
	2. <i>Mixture</i> of types (e.g., allelic heterogeneity & locus heterogeneity in genetics)
	3. Trait = <i>composite</i> of types (analogy: the 3 components of a triathlon)
Variational	4. There is noise or error, but that is <i>deviation from the type</i> or essential trajectory
	5. Variation in a set of traits involves a <i>composite of variance/covariance structures</i> (statistical heterogeneity)
	6. There is <i>variation, not types</i>
	7. <i>Possibility of underlying heterogeneity</i> : When similar responses of different individual (e.g., genetic) types are observed, it is not necessarily the case that similar conjunctions of risk or protective factors have been involved in producing those responses
Dynamic	8. Variation produces <i>qualitative changes in results</i> from standard theory based on uniform units (e.g., theory about Malthusian population growth, tragedy of the commons, prisoner's dilemma)
	<p>9. Heterogeneity in <i>pathways of development</i> Variants, from Taylor (2005):</p> <p>9a. <i>Intersecting processes</i>--Processes operating at different spatial and temporal scales that cut across the boundaries of the situation under consideration and restructure its "internal" dynamics.</p> <p>9b. <i>Unruly complexity</i>--arises whenever there is ongoing change in the structure of situations that have built up over time from heterogeneous components and are embedded or situated within wider dynamics.</p> <p>9c. <i>Heterogeneous construction</i>--researchers establish knowledge and technological reliability through practices that are developed through diverse and often modest practical choices. This is the same as saying the researchers are involved in contingent and ongoing mobilizing of diverse materials, tools, people, and other resources into webs of interconnected resources.</p>
Dynamic-participatory	10. <i>Participatory restructuring</i> of the dynamics (intersecting processes, unruly complexity, or heterogeneous construction) that generated the data.
	11. <i>Transversal engagement</i> --Participatory restructuring thru multiple points of engagement, occurring in tension with deployment or withholding of trans-local knowledge and resources.

Taxonomy of heterogeneities

Static	1. <i>assortment</i>
	2. <i>Mixture of types</i>
	3. <i>composite of types</i>
Variational	4. <i>deviation from the type</i>
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Dynamic	8. Variation produces <i>qualitative changes in results</i>
	9. Heterogeneity in <i>pathways of development</i> Variants, from Taylor (2005): 9a. <i>Intersecting processes</i> 9b. <i>Unruly complexity</i> 9c. <i>Heterogeneous construction</i>
Dynamic-participatory	10. <i>Participatory restructuring</i>
	11. <i>Transversal engagement</i>

7. Possibility of underlying heterogeneity

7. *Possibility of underlying heterogeneity*



Location → L1 L2 L3 L4 L5 L6 L7 L8

Twin Pair

↓
TP1

{ DZT

TP2

{ MZT AAbbccDDee // FghiJ

TP3

{ MZT

genetic factors
(pairs of alleles)

TP4

{ DZT

sequence of
environmental
factors

TP5

{ DZT

TP6

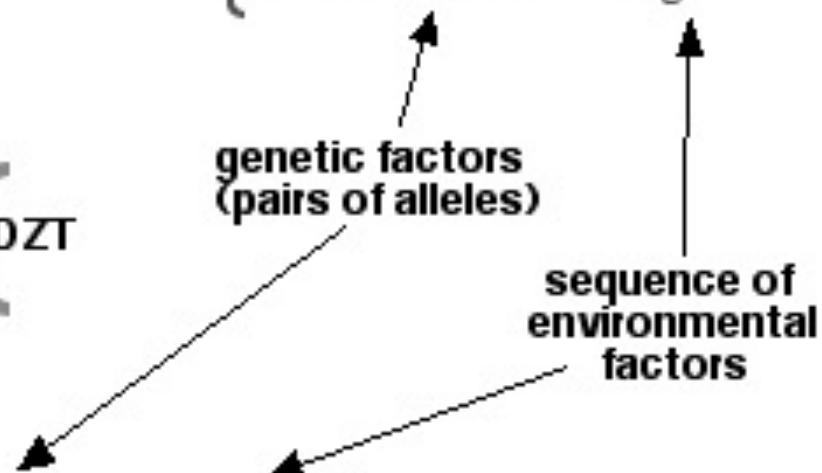
{ MZT aabbCCDDEE // FgHiJ

TP7

{ DZT

TP8

{ MZT

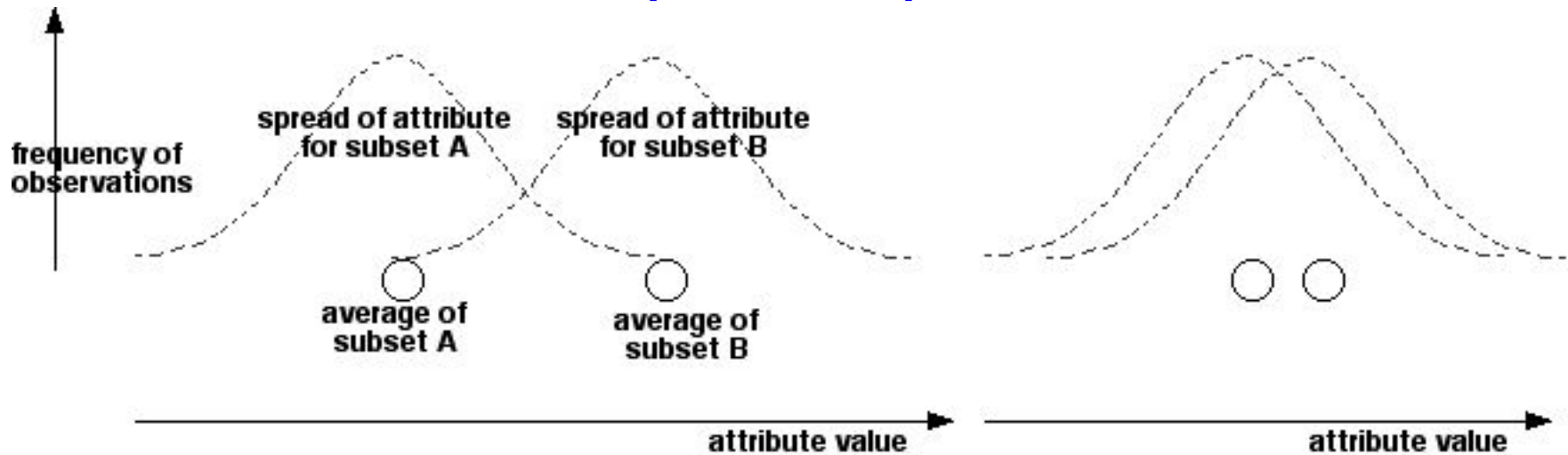


4. Deviation from type

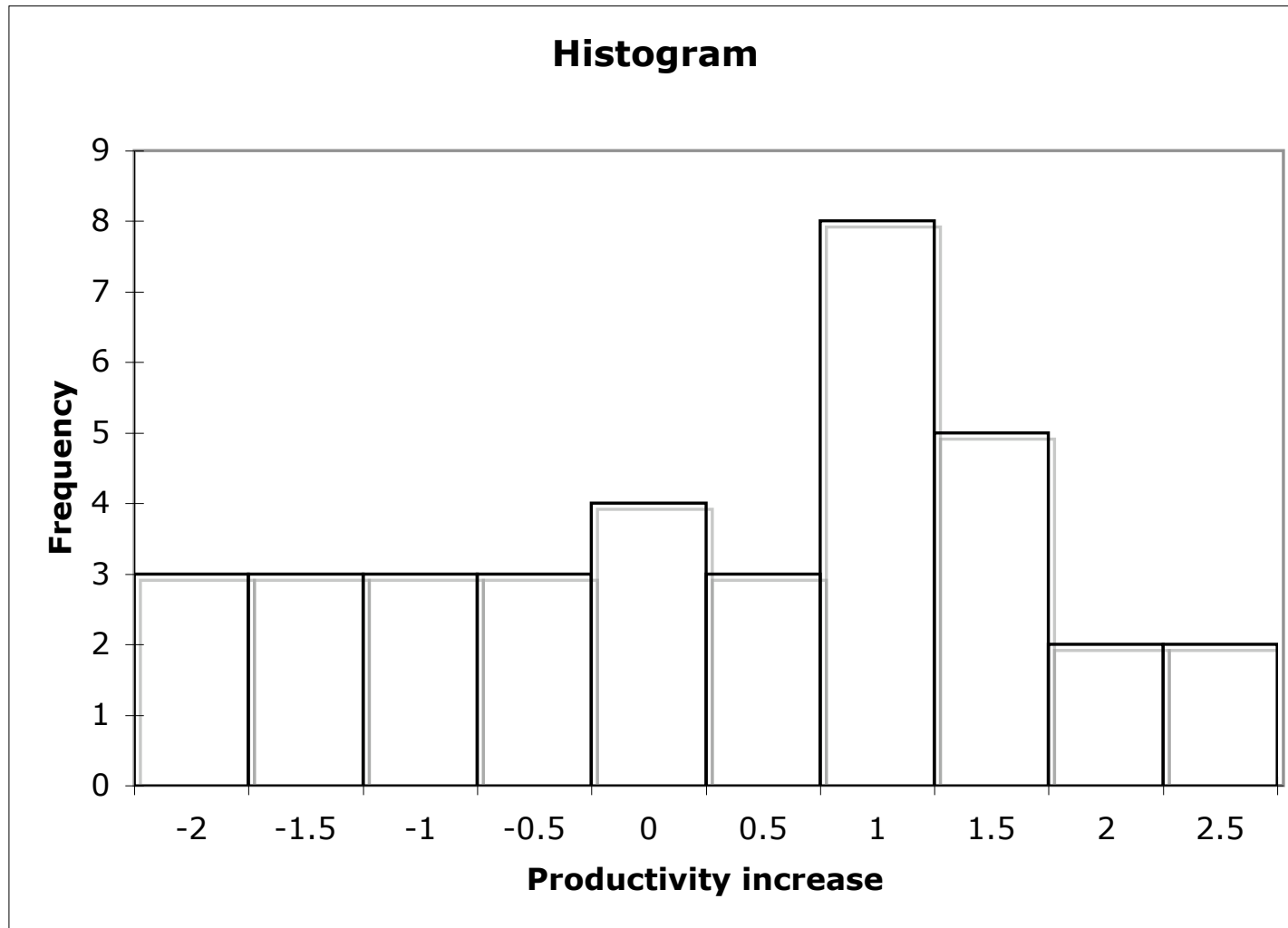
-> *6. Variation, not types*

-> *10. Participatory restructuring*

4. Deviation from type (t-test)



6. *Variation, not types*



10. Participatory restructuring

Vision 20/20

WEST NIPISSING VISION

February 1993

STRONG DIVERSIFIED ECONOMIC BASE			EXCITING ATTRACTIVE COMMUNITY TO LIVE IN			ACTIVELY INVOLVED POPULATION		
WIDELY PROMOTED TOURISM BASE	EXPANDED BUSINESS DEVELOPMENT	APPROPRIATE NATURAL RESOURCES DEVELOPMENT	WELL MAINTAINED EXPANDING INFRA-STRUCTURE	COMMUNITY BASED SERVICES	RESPONSIVE ACCOUNTABLE UNIFIED GOVERNMENT	ACTIVE INVOLVED COMMUNITY	IMPROVED RECREATION OPPORTUNITY	LIFELONG EDUCATION FACILITIES
Broad Based Tourism Promotion	Modern Recycling Facilities	Forestry Development	Improved Transportation Network Locally/Area	First Response Teams	Effective Cooperation Between Municipalities	Active Involvement of Citizens in All Community Developments	Youth Activities Promoted and Supported	Accessible Expanded Adult Education
Improved Four Season Accommodation	Northern Ontario Service Industry Centre	Expanded Local Agricultural Market		Community Based Services for Mental Health & Physically Challenged				
Accessible Waterways and Waterfronts	Appropriate Natural & Resource Based Industry		Fish Hatcheries	Well Serviced Community	Expanded Local Access to Specialized Clinics	West Nipissing Friendly Welcoming Community	Focused Job Training Programs	
	Incentive Programs to Attract Businesses	Environmentally Responsive Community		Coordinated Integrated Services under One Roof	Local Service Boards in Unincorporated Municipalities			Rural Residential Development
Packaged Tourist Attractions & Tours	Francophone Bilingual College		Clean Lake Nipissing	Expanded Vibrant Senior Citizen Community	Re-evaluate Land Use By-laws	Open Communication across West Nipissing	Enhanced Post Secondary Education	
Expanded Coordinated Community Festivals	Local Businesses meet all needs	Restructured Social Assistance System						Youth Involved in Planning All Activities
	Attract Government Offices							

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Changing Science

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