HUMAN ADAPTATION

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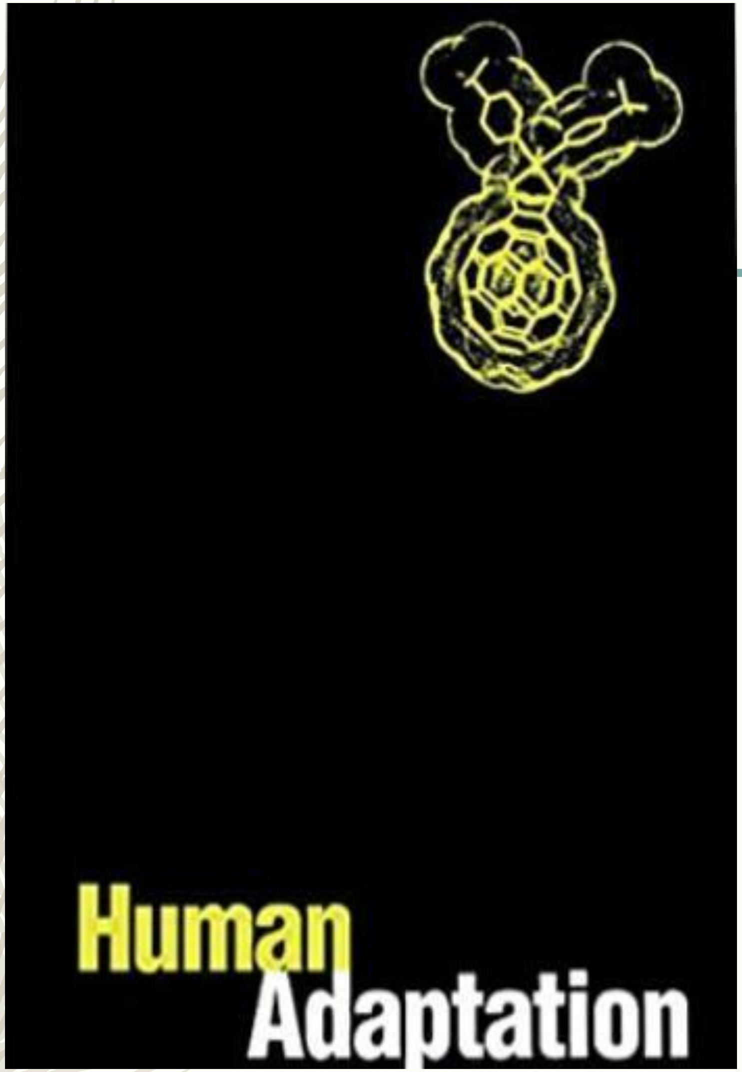
HUMAN ADAPTATION

– Human have biological plasticity,or an ability to adapt biologically to our environment
– An Adaption is any variation that can increase once biological fitness in a specific environment
– More simply it is the successful interaction of a population with it’s environment

Introduction

– Human adaptation to environmental change is both a new imperative in the face of climate change and the oldest problem in our species' history (Smithers and Smit 1997; NRC 1999; Janssen and Ostrom 2006; IPCC 2014). Human societies have always been subject to risks and vulnerabilities posed by changes in their material circumstances as a result of social, economic, ecological, and other environmental factors (Moran 2008). The diverse processes by which societies have dealt with social and environmental change throughout their history on the land and sea are well established in the scientific literature (Fagan 2008; Leichenko and Eisenhauer 2017). Humans have evolved a wide range of strategies in response to localised environmental changes, which have contributed strongly to specific social and ecological developments, including both biocultural diversification and homogenization (Smithers and Smits 1997; Moran 2008). The evolving set of locally driven, 'bottom-up' responses to environmental change is often collectively termed autonomous adaptation (Carter et al. 1994), while its obverse, planned adaptation, is typically used to reference 'top-down' (from without or State-driven) efforts to adjust a society, community or social-ecological system to existing or anticipated environmental change, as in climate adaptation (Fankhauser et al. 1999; Howard and Pecl unpublished results


Human
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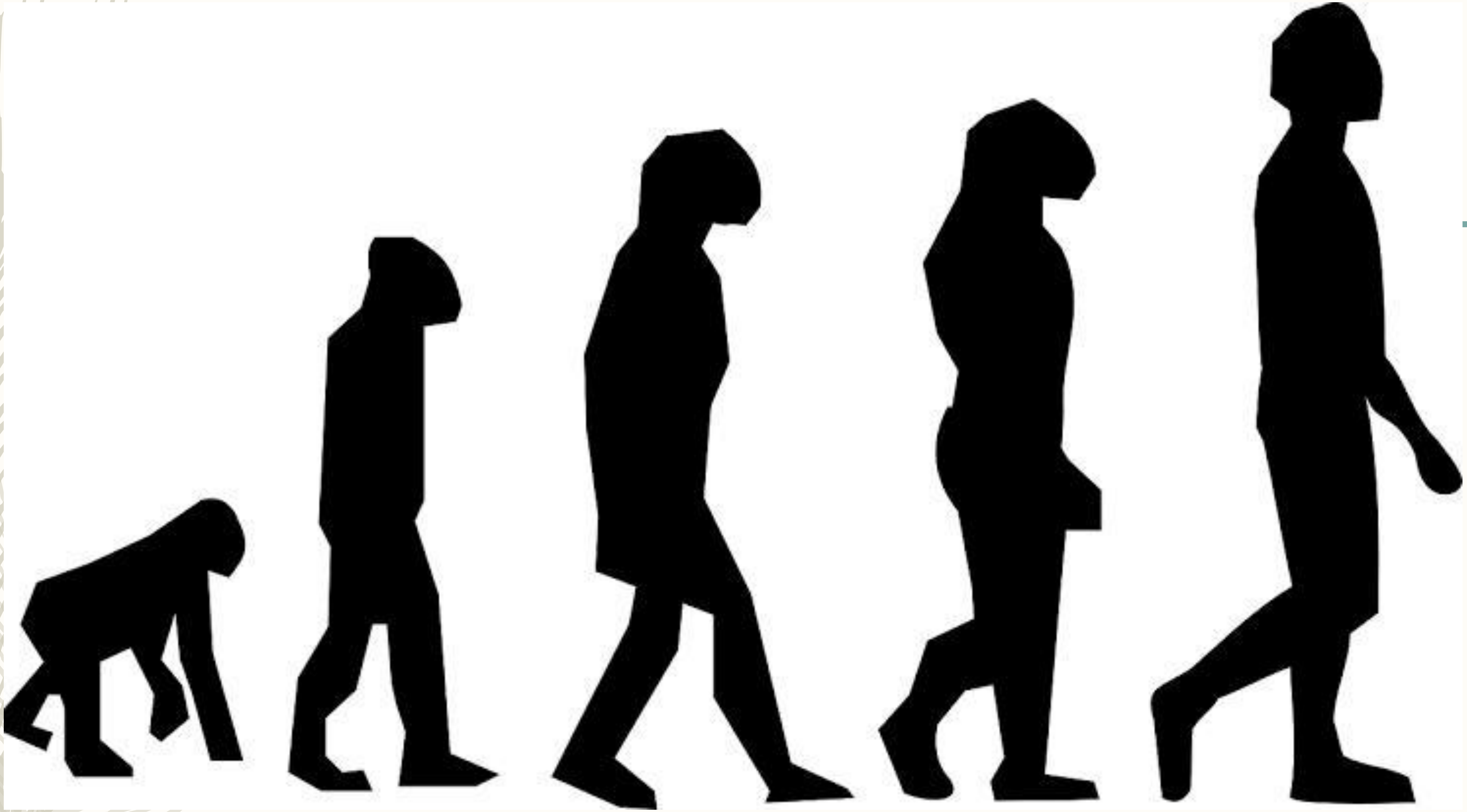
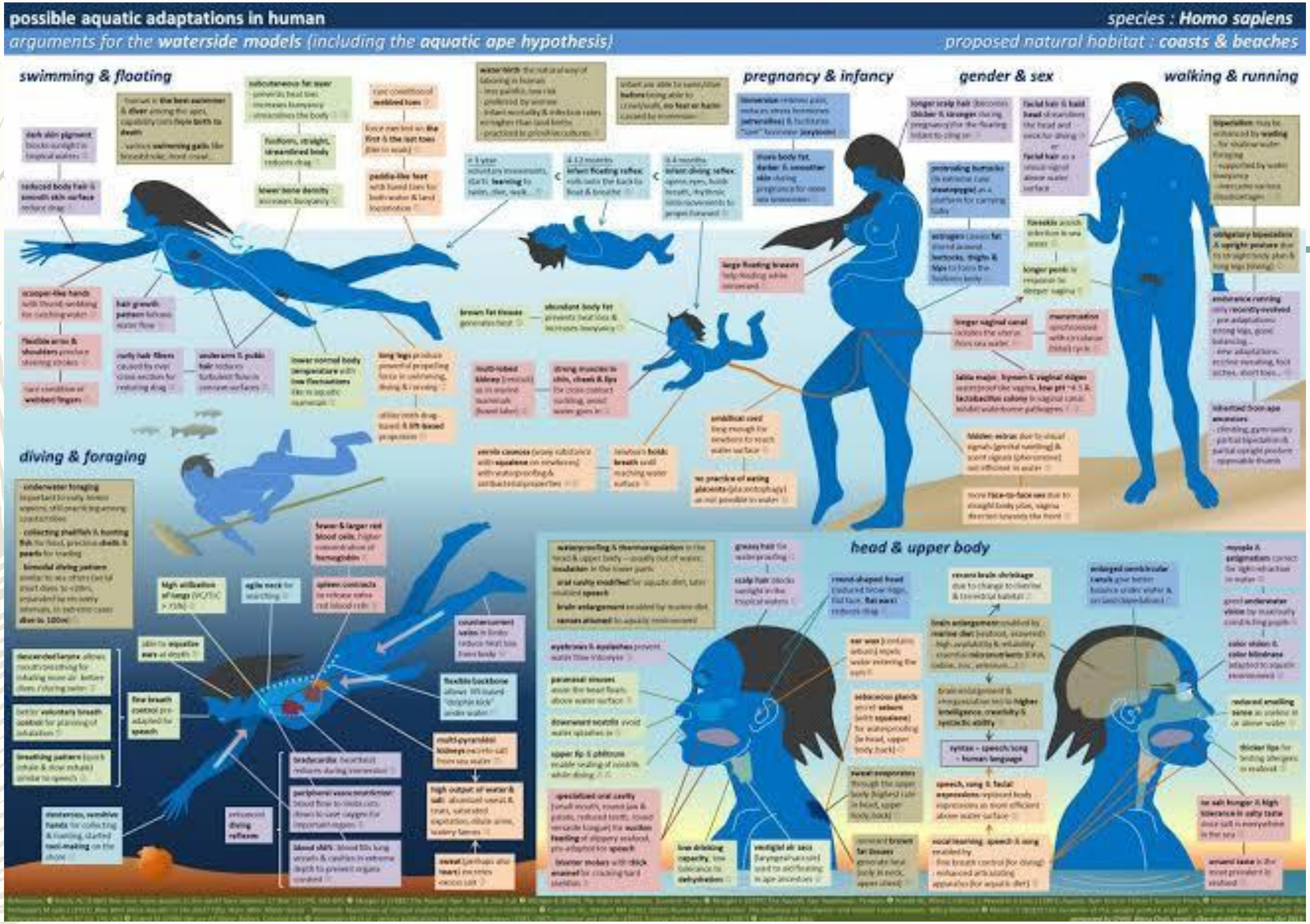


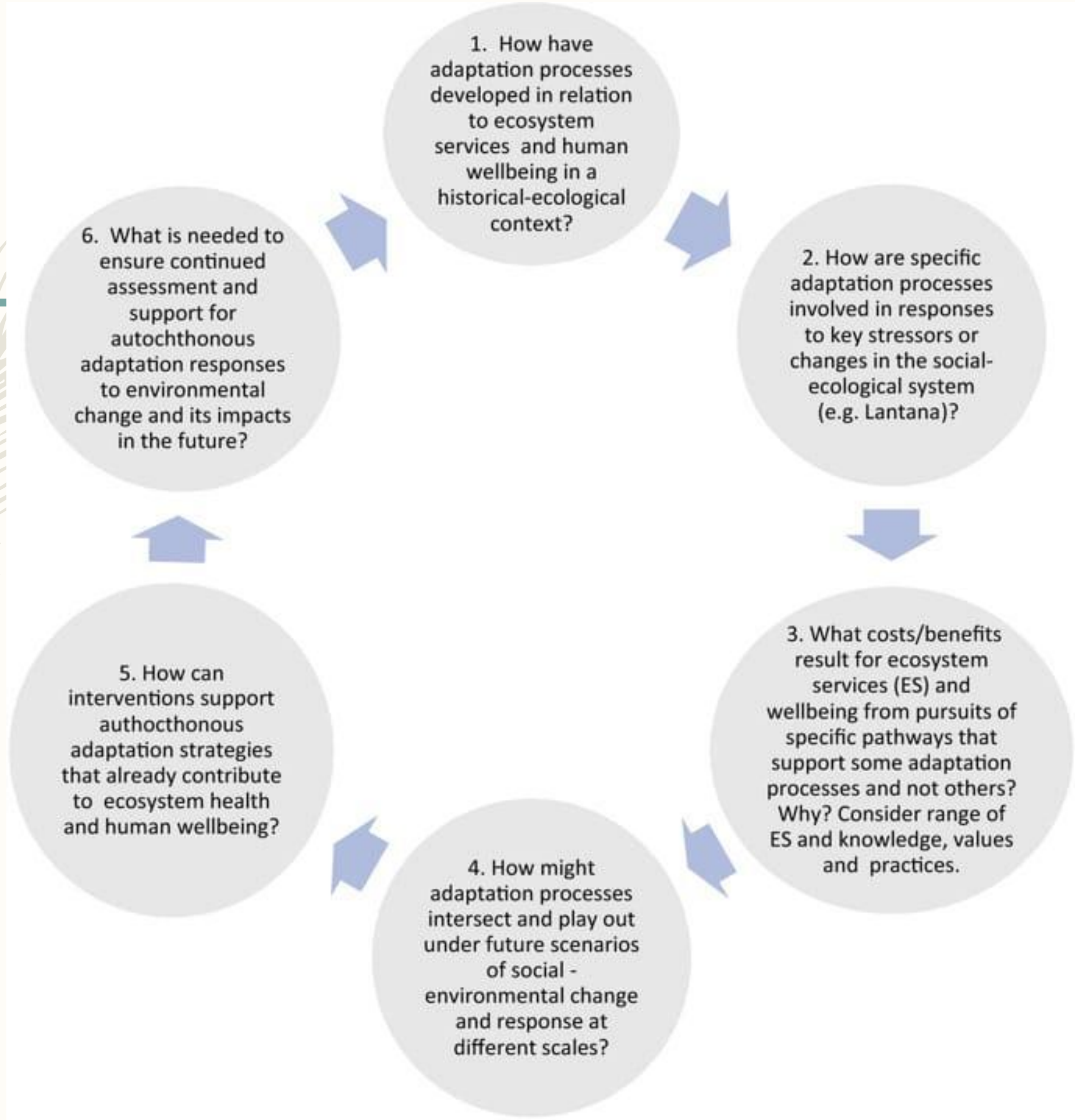

possible aquatic adaptations in human
species : Homo sapiens
arguments for the waterside models (including the aquatic ape hypothesis)
proposed natural habitat : coasts & beaches
swimming & floating
pregnancy & infancy
gender & sex
walking & running
diving & foraging
head & upper body

Beyond risk and vulnerability: Adaptation as a set of interrelated and contingent processes

– Human adaptation to environmental change is best understood over long temporal scales. The pace of environmental and social change is often slow and multigenerational, although it may become rapid when societal or planetary boundaries, or system thresholds (so-called tipping points), are exceeded (cf. Rockström et al. 2009; Raworth 2012, 2017; Howard 2013; Steffen et al. 2015). Similarly, localised plant and animal communities may take time to adjust to changes in climatic conditions. Over time, these shifts are manifested in changes in the structure, health, and diversity of ecological communities (Walther et al. 2002; Campbell et al. 2009). The critical nexus for human adaptation, then, is not so much change in global temperature or precipitation regimes, but rather the consequent and relevant local changes in biodiversity that support the web of life. As discussed in Howard (unpubl. results), species' invasions can occur in a very short time frame, and can also provoke rapid human responses—thus providing a 'real-time' prospective for analysing human adaptation to biodiversity change

Applying the adaptation process framework in a case study in South India

- We applied the adaptation processes-to-pathways framework to a case of rapid human adaptation to biodiversity change, specifically, to the proliferation of the invasive plant Lantana camara. (‘red sage’ or ‘lantana’) in Karnataka, southern India. We chose this case of established but ongoing biodiversity change because Lantana’s impacts are prolific and profound, and thus is reflective of the kind of environmental changes to which humans have long been contributing and adapting (Bhagwat et al. 2012; Howard 2013).


1. How have adaptation processes developed in relation to ecosystem services and human wellbeing in a historical-ecological context?
2. How are specific adaptation processes involved in responses to key stressors or changes in the social-ecological system (e.g. Lantana)?
3. What costs/benefits result for ecosystem services (ES) and wellbeing from pursuits of specific pathways that support some adaptation processes and not others? Why? Consider range of ES and knowledge, values and practices.
4. How might adaptation processes intersect and play out under future scenarios of social - environmental change and response at different scales?
5. How can interventions support authocthonous adaptation strategies that already contribute to ecosystem health and human wellbeing?
6. What is needed to ensure continued assessment and support for autochthonous adaptation responses to environmental change and its impacts in the future?

RETHINKING ADAPTATION IN MANAGING CHANGE IN BIOCULTURAL DIVERSITY

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we suggest an approach to adaptation that helps to both integrate and expand the impact-risk, vulnerability, and pathway perspectives to more fully capture the dynamics of authocthonous adaptation to environmental change and its relation with human wellbeing. The adaptation processes approach suggests an alternative, beginning with an assessment of existing modes of adaptation and then focusing specifically on how these pathways have operated and evolved in relation to each other in the face of both environmental and social change, regardless of system or scale boundaries

In the last 60,000 y humans have expanded across the globe and now occupy a wider range than any other terrestrial species. Our ability to successfully adapt to such a diverse range of habitats is often explained in terms of our cognitive ability. Humans have relatively bigger brains and more computing power than other animals, and this allows us to figure out how to live in a wide range of environments. Here we argue that humans may be smarter than other creatures, but none of us is nearly smart enough to acquire all of the information necessary to survive in any single habitat. In even the simplest foraging societies, people depend on a vast array of tools, detailed bodies of local knowledge, and complex social arrangements and often do not understand why these tools, beliefs, and behaviors are adaptive. We owe our success to our uniquely developed ability to learn from others. This capacity enables humans to gradually accumulate information across generations and develop well-adapted tools, beliefs, and practices that are too complex for any single individual to invent during their lifetime.

In its brief evolutionary history, *Homo sapiens* has come to occupy a larger range than any other terrestrial vertebrate species. Earlier hominins, such as *Homo heidelbergensis* and Neanderthals, were limited to Africa and the temperate regions of southern Eurasia. Behaviorally modern humans were living in Africa by 70,000 y ago (1). Between 50,000 and 60,000 y ago, people left Africa, crossing into southwest Asia (2). From there they spread rapidly through southern Eurasia, reaching Australia by 45,000 y ago, a feat that only one other terrestrial mammal (a murid rodent) was able to accomplish (3). Soon after this, people penetrated far north, reaching the latitude of Moscow by 40,000 y ago and the Arctic Ocean by 30,000 y ago. People had spread almost as far south as the southern tip of South America 13,000 y ago, and by 5,000 y ago humans occupied virtually every terrestrial habitat except Antarctica and some islands in Oceania (2). Even the most cosmopolitan bird and mammal species have substantially smaller ranges

This global expansion required the rapid development of a vast range of new knowledge, tools, and social arrangements. The people who moved out of Africa were tropical foragers. Northern Eurasia was an immense treeless steppe, relatively poor in plant resources and teeming with unfamiliar prey species. The people that roamed the steppe confronted a hostile climate—temperatures fell to −20 °C for months at a time, and there were often high winds. Surviving in such environments requires a whole new suite of adaptations—tailored clothing well-engineered shelters, local knowledge about game, and techniques for creating light and heat. This is just the northern Eurasian steppe; each of the other environments occupied by modern human foragers presented a different constellation of adaptive problems. Ethnographic and historical accounts of 19th and 20th century foraging peoples make it clear that these problems were solved through a diverse array of habitat-specific adaptations Although these adaptations were complex and functionally integrated, they were mainly cultural, not genetic, adaptations. Much evidence indicates, in fact, that local genetic changes have played only a relatively small part in our ability to inhabit such a diverse range of environments

This hypothesis flows from a nativist, modularist view of cognition. Its central premise is that broad general problems are much more difficult to solve than narrow specialized ones, and therefore the minds of all animals, including humans, are built of many special-purpose mechanisms dedicated to solving specific adaptive problems that face particular species. These mechanisms are modular in that they take inputs and generate outputs relevant to problems in particular domains such as mate choice, foraging, and the management of social relationships. These authors are nativists because they believe that evolved mechanisms depend on a considerable amount of innate information about the relationships between cues and outcomes in particular domains for particular species. For example, mechanisms that regulate decisions about mate choice in human males may be based on the assumption that long-term mating is likely, and thus selection favored a psychology that leads men to be attracted to young women. Analogous mechanisms in chimpanzees, which do not form long-term bonds, have produced a psychology that causes males to prefer older females, perhaps because they are better mothers . Mechanisms regulating social exchange are specialized in other ways. The innate content is built up because learning and decision mechanisms have been shaped by natural selection to solve the important recurrent adaptive problems that confronted the species.

Human Biological Adaptation

- Several examples of human biological diversity that reflect adaptation to environmental stresses such as disease, diet, and climate
- Adaptations that were once bad may lose their disadvantage if environment shifts