

## Race, genes, and racism

Ulrich Kattmann, Department of Biology and Environmental Sciences, University of Oldenburg, Germany

**Summary.** The article provides a review of traditional concepts and recent findings concerning the issue of “race”. Additionally some recommendations for intercultural research und practice are drawn.

*The concept of race has no genetic basis.* This expert conclusion (UNESCO-Workshop 1995) is based on biological facts: genetic differences between individuals within a geographic area are larger than genetic differences between the means of populations in different geographical areas; patterns of DNA and genetic traits are not confined by continental boundaries and do not correlate with any classification of so-called races.

*The classification of human groups is a fundamental source of racism.* The biological concept of race is essentially associated with racial prejudice..

*A fundamental element of racism is generalisation.* If not reflected, generalisations become *pitfalls of simplification*. Simplification may involve types (racial stereotypes), dichotomies (e.g. “blacks and whites”) and median values of groups.

*Keys to overcoming racial thinking* are focusing on the individual and acknowledging the special character of human diversity.

### The scientific “reality” of races

#### Color as a racial stereotype

No other feature is as closely linked to the concept of race as the perception of skin color. To anthropologists however, the pigmentation of the skin for classifying humans is useless. The pigmentation of the human skin varies continuously with the geographical latitude with few discontinuities and exceptions. This distribution is mainly caused by selection due to UV radiation. As a result human populations of the same latitude show generally the same grade of skin pigmentation, e.g. dark skinned people around the equator in Africa, Asia, Australia and in South America. The distribution of pigmentation is the parallel outcome of convergent evolution, not of common descent. Therefore “color” does not say anything about kinship of humans.

Nevertheless racial conceptions are dominated by “colors”, e.g. the opposition of “black” and “white” or “white” and “colored”. Europeans understand themselves as “Whites” in spite of the fact that the pigmentations of southern Europeans and most Asians (which are called “Yellows”) are nearly identical. The discrimination of “Blacks”, “Whites”, “Yellows” and “Reds” is part of the racial doctrine of

color which is used to indicate essential differences that do not exist at all.

#### The idea of isolation

Traditionally in science it is thought that differences between human populations and cultures are caused by evolution through isolation and selection. It was claimed that races originated separately in isolated areas (so called areas of selection: “Züchtungsräume”). This conception was in accord with the concept of evolution in mainstream biology. But the idea of isolation did not only dominate evolutionary biology a long time, but was adopted also in other disciplines which influenced racial thinking and racial interpretations of human cultures (table 1).

In regard to the understanding of cultures as “pseudospecies” (Erikson 1968), it should be pointed out that cultures are not isolated, they are not closed to one another but live through exchange of materials and ideas. The same is true for “races”: Human populations did not evolve in isolation but in frequent und sustained genetic and cultural exchange trough migration (see below).

**Table 1. Isolation as a scientific idea**

Discipline	Conceptions
<i>Philosophy of History</i> Gobineau (1860-1882) and followers	Theory of culture: Cultures are created and carried by pure races.  Degeneration of culture by race mixture
<i>Evolutionary Biology</i>	Origin of races and speciation by geographical separation
<i>Psychology</i> Erik Erikson (1902-1994)	Origin of different cultures by apportionment and alienation in order to achieve “identity”. To stress the diversification of cultures they are defined as isolated entities and – in analogy to the diversity of animal species – called “pseudo-species”.
<i>Biological Anthropology</i>	Origin of human races by natural selection in geographical isolation. Linkage of culture to traits of “higher” races”

## Genetic studies on “race”

“The revolution in our thinking about population genetics and molecular biology has led to an explosion of knowledge about living organisms. Among the ideas that have been profoundly altered are concepts of human variation. The concept of ‘race’ carried over from the past into the 20th century has become entirely obsolete. ... There is no scientific reason to continue using the term ‘race’” (UNESCO, Workshop 1995).

The most important elements of understanding human diversity are the

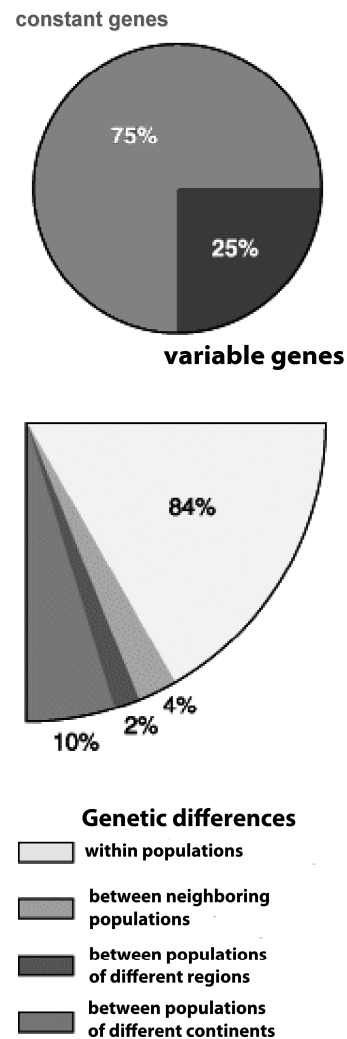
- greater amount of diversity within, not between human populations,
- continuous variation of gene frequencies all over the globe, and
- striking genetic similarity of all humans.

If populations of different geographical regions are analysed the most striking result is the fact that most differences are found within not among populations. Molecular analysis of gene (allele-) frequencies have shown that *within* any group of humans the differences between individuals are large, in comparison with those differences *between* groups, which are comparatively small. The differences between populations of different continents (traditionally equalized with “geographical races”) contribute at most 10 % of the overall variation of humans (fig. 1).

As a consequence the significance of racial classification fade away: For any “white” European you can find a “black” African who is genetically more similar to him than his light skinned neighbor.

Nevertheless series of studies in genetic variation seem to support the traditional classification into geographical “races”. They find clusters of genetic similarity, which corresponds to the geographical distribution of the populations. The most voluminous study with this result (Jorde e. al. 1997) was reanalyzed, questioning the sampling (Serre & Pääbo 2004). The participants of the study had their origin from regions which are located at the edges of the continents. The US-researchers gathered the data just from those people who frequently immigrated to the US. If the sampling comprehends the whole continents –by using the same statistics – the continental clusters vanish. They are artefacts of convenient US-sampling. The authors of the reanalysis conclude: “There is a great tendency in the literature to use a few populations from the extremes of continental landmasses ... to make worldwide inferences about substructures in the human gene pool. In fact, because human genetic diversity tends to be distributed clinally [continuously], it is especially problematic to sample the extremes of continents because this will create the impression of sharp discontinuities in the distribution of genetic

variants. In this regard, it is worth noting that the colonization history of the United States has resulted in a ‘sampling’ of the human population made up largely of people from western Europe, western Africa, and Southeast Asia. Thus, studies in which individuals from Europe, sub-Saharan Africa, and Southeast Asia are used (e.g., Jorde et al. 1997) might be an adequate description of the major components of the U.S. population ... However, it would be incorrect to conclude that such studies necessarily generalize to subdivisions of the human gene pool on a worldwide scale” (Serre & Pääbo 2004, p. 1683).

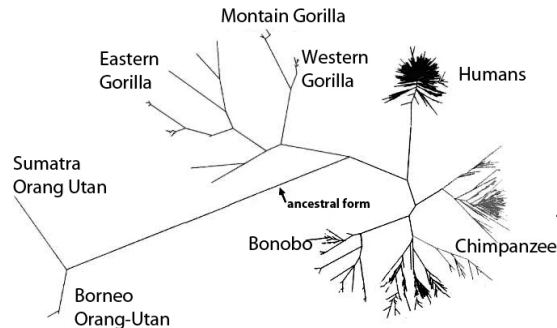


**Figure 1.** Genetic differences within and between groups of different geographical origin (after Lewontin 1972, cf. Excoffier, & Hamilton 2003)

Due to the extreme migrations of humans for nearly 100 000 years the continents do not form barriers for gene flow between human populations. In accord with this, genetic patterns are not restricted to but distributed over the continents, thus documenting the migration history of humans.

Great Apes of the same species, but with different geographic origin, cannot easily be distinguished by a layperson, while this is hardly a problem of humans.

Nevertheless the genetic distances between humans are astonishingly low: While the pattern of branching in populations of the chimpanzee resembles a wide ranging bush, in the case humans the short branches are narrowly jointed together. One can speak of a *bottlebrush pattern* (fig. 2).



**Figure 2.** Genetic distances (next neighborhood) of mitochondrial DNA (Control Region 1) between individuals of populations of the Great Apes and Homo sapiens (after Gagneux et al. 1999)

The frequency of genes (alleles) of each population of humans is statistically different from others. But most of these differences are unimportantly small and do not justify racial classification. Otherwise one can put Austrians and Germans or even the inhabitants of two neighbouring cities into distinct races: The genetic distances between these populations are indeed quite in the same range as between those populations which were traditionally classified as races.

The migrations of Homo sapiens started from Africa about 90 000 years ago and went through several bottlenecks which reduced the diversity decisively. This development was followed by a rapid population growth. Now we are a global population with the genetic diversity of a group of 10 000 Africans who migrated and settled on the whole globe and became a number of nearly seven billion: *We are all Africans.*

In short: The concept of race has no genetic basis: The patterns of DNA and genetic traits are not distributed along the assumed barriers of the continents and do not correlate with any classification of so called races (Cavalli-Sforza, Menozzi & Piazza 1996, Cavalli-Sforza 1997, Templeton 1999, Pääbo 2001, Royal & Dunston 2004, Serre & Pääbo 2004, Stix 2008).

## Classification of humans and racism

### Steps to racism

In spite of the results of genetic studies, racists create their races, motivated by their own interests. Explicitly or implicitly, the concept of race is nearly inevitably

associated with racial prejudice. The image of the “stranger” is based on one’s self-image: The positive self-image of one’s own group creates the negative image of the out-group, i.e. the hetero-stereotype (Nolting 1987; Kattmann 1997).

The classification of races in biology (including historical approaches) and racial discrimination can be characterized through very similar processes (table 1). The parallels between the mechanisms of group discrimination as described by social psychology and the process of the classification of races are striking and demonstrate that biologically defined “races” are social constructs. This is also shown by the fact that racial classifications differ extremely between cultures and social groups due to strong influences of social interests from the classifying groups

**Table 1. Parallels between the formation of racial prejudices and the biological classification of races**

Formation of racial prejudices (described by social psychology)	Racial doctrines (in science)
Awareness of group membership	Sampling of typical racial traits
Culturally determined forming of groups	Divergent racial classifications
Apportionment and alienation of groups	Concepts and definitions of “race”, Essentialist ideas of “race” as persisting units of evolution
Evaluation of groups	Linking of “race” to mental und cultural abilities
The self-image determines the image of the out-group	Inferiority of foreign races
Group ideology caused by social conflicts and interests	Social construction of race Dichotomies of “Blacks and Whites”, “Aryan an Jews”

The classification of humans into races is by itself a fundamental source of racism which promotes social discrimination and culminates in the crime of genocide (table 2).

If connected with social valuation, the classification give birth to dangerous consequences. This is true for the ideologies of superiority of “Whites” over “Blacks” or “cultural” over “primitive races”. The image of the strangers emerges from the image of one’s self: The positive self-image of one’s own group creates the negative image of the out-group (hetero-stereotype). This is why stranger images (racial or sexual stereotypes and prejudices) do not fit to reality, i. e. they do not tell us anything about the features of the out-group (and naturally also of the in-group) (cf. Kattmann 1980).

Historically, the connection of biological classification of races and racism is rather strong. The most awesome example is the collaboration of German physical anthropologists with the National Socialists in conducting the “race laws”. In the Nuremberg Laws of 1935 Jews lost their rights as German citizens and marriages between Jews and persons of „German or kindred blood“ were forbidden. In cases of uncertainty of fatherhood, for the consecution of these laws there was the task of identifying whether a person was a Jew, a Hybrid or of “German or kindred blood”. Members of the Institutes of Anthropology of the universities claimed that they were the only experts who were able to decide on “race” of a person. In general these “experts” decided unscrupulously that the persons under study were Jewish – irrespective of their murderers waiting in the extermination camps (cf. Seidler & Rett 1982).

It should be stressed that the division of groups, and not their evaluation, is the first step of racism. The cohesion of the levels and the consequences should be acknowledged and reflected in interculturality research and practice.

**Table 2. Different kinds of racism and their consequences for human life**

Approaches to racism	Strategies of racists
<i>Purity</i> Races differ in their essence; races must be kept pure.	Segregation, apartheid, ghettos
<i>Superiority</i> races differ in value “my race is the best”	Social discrimination, political suppression
<i>Selection</i> Races must constantly be improved or they will degenerate. My race must be improved by positive selection and protected from other races by negative selection.	Sterilisation programs, eugenics
<i>Cleansing</i> Strangers are a threat. They must be eliminated from my territory.	Expulsion (“ethnic cleansing”), murder, genocide

**Pitfalls of simplicity**

*Generalisation* and the schemata fundamentally serve as tools of orientation in a complex and diversified world. But generalisations are dangerous too. Unavoidably generalisations are connected with a loss of information: Individuality is lost in average.

If this circumstance is not reflected, the instruments of generalisations will become pitfalls of simplification. Simplicity then evokes the reification of abstract types, such as “human races”, “levels of culture”, “role of sexes”, and may be linked with racial stereotypes. Explicitly or implicitly valuation is nearly unavoidably connected with this process and runs into ideologies like racism, sexism or “clash of civilisations”. The means of simplification are: types, linear curves, dichotomies and mean values.

- *Types* are ideal images or statistical derived kinds (classes), which displace the diversity of individuals. The forming of types is based on putting individuals with similar features together into one unifying class concept. A weaker form is the orientation towards prototypes (Rosch et al. 1976). Whether they are type of races, students, teachers or sexes: types exist in our brains only. In biology the forming of types is especially inadequate, because variability, spread and continuity of features in groups and between groups are neglected. Furthermore, typology should be fundamentally abolished by evolution, for evolutionary change will alter any type and push it out of existence. In biology types are only instruments which help to describe taxa and to reconstruct the history of phylogenetic groups. But regularities, laws or at least so called principle of conservation (conservation of the species or “race”) cannot be deduced from types.

The forming of types is also the basis of other pitfalls of simplicity:

- *Dichotomies* divide the diversity of processes and modes of living into seemingly incompatible alternatives. Then, intermediate forms and evolutionary continuity are often neglected or treated as marginal. This is true for the dichotomy of sexes, where the overlapping of features and ,even more serious, intersexes are excluded. This also applies to the politically motivated racist dichotomies of “Blacks” and “Whites” or “Coloureds” and “Whites”.
- *Forming median values* is often an instrument to reduce diversity to simple-mindedness in order to get homogeneous types. Thereby the spread of features is ignored. Once formed and statistically saved by significance, the loss of information is often not reflected, but is usually followed by far reaching scientific assumptions, e.g. the deduction of the ability of groups from IQ-values.

Pitfalls of simplicity are not the causes of such social valuations, but they tend to strengthen them. Consequently the starting point of educational measures is not the valuation itself, but the formation and usage of adequate categories of knowledge.

## Beyond race

### One human culture

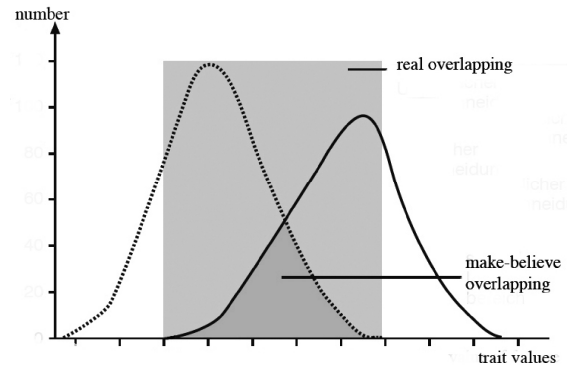
To prevent racism it is not enough to deny the existence of races. One has to explain the overt differences between cultures, which were formerly linked to different mental abilities of the populations or “races”. It is therefore of highest importance that an alternative explanation is offered to the learners. After Jared Diamond (1997) the different biographical conditions made the difference: Agriculture, and as a consequence complex civilization, emerged primarily only in areas inhabited by plants and animals appropriate for domestication. These data should be used to paint a correct picture of the development of human populations and cultures (Kattmann 2009).

Furthermore different cultures should not be treated as excluding alternatives but it should be stressed that they are complimentary components of *the* (i. e. one) human culture. In the including biological view, culture is a species specific trait of humans (*Homo sapiens*). Therefore the concept of “culture” should mainly be understood as a unity and consequently the term should be used predominantly in singular. *Including thinking* should be promoted which seeks to combine opposites to one whole (Schaefer 1984) and shows that the plurality of cultures are only facets of this unique human feature. Differences are not denied or overseen but the commonalities are not longer seen as accidental but as essential if human cultures are understood adequately. This inclusive view can be an effective instrument against racial thinking in dichotomies and disruptive group characteristics.

### Interpretation of bell curves

The *overlapping of normal distributions* (bell curves) can help to understand human diversity (fig. 2). The overlapping zone is spontaneously seen by nearly everyone in the roughly triangular area between the two curves (make-believe overlapping).

This perception of overlapping places emphasis on group differences and makes believe that the groups have only few values in common. But the real zone of overlapping is the area where both curves have the same values on the x-axis in common. This zone of overlapping includes the median values of both groups. Consequently, the median values do not tell us anything about the individuals of the two groups (i. e. “races” or any other division with a similar distribution pattern).



**Figure 3.** Overlapping bell curves of two groups or populations

### Focus on the individual

In the US sickle cell anemia is often called “black disease”, because cases of illness are frequent among Afro-Americans. The misleading and dangerous consequences of such reification of race can be demonstrated by the case of a poor little boy, who was nearly mistreated by his doctors due to his light skin.

“As the following example illustrates labelling of this disease on the basis of the phenotype (skin color) resulted in serious health consequences to individuals who are not phenotypically ‘black’ but have the relevant genetic variants. An 8-year-old boy, phenotypically European, was presented with acute abdominal pain and anemia (hematocrit 0.21). Although his body temperature was only 37,9 °C surgery was considered. A technician [accidentally] found red corpuscles with hemolytic characteristics in a smear. Surgery was cancelled after the results of a subsequent sickle preparation were found to be positive, and the child was treated for previously undiagnosed sickle cell anemia. His parents were from Grenada and were of Indian, northern European and Mediterranean ancestry. This case highlights the idea that ancestry is better indicator than ‘race’ or ‘ethnicity’ of whether one carries the markers of sickle cell anemia” (Rotimi 2004). Because the samplings are often oriented on “race” a leading scientist proposes the following statement to be included in each study on human populations: “Allelic frequencies vary between any selected human groups – to assume that those variations reflect ‘racial categories’ is unwarranted” (Duster 2005). This can also be a reminder also in cultural studies.

The most important point in avoiding racial thinking is to focus on the individual. The image of the individual should not be obscured by the stereotype of so called typical characteristics of the group the individual belongs to. Such categorizations can always be harmful for individuals not fitting to the racial labelling.

### **This is Gordon!**

The nurse brought a new child into the kindergarten-group. A little girl pointed to the dark-skinned boy and shouted: "O look, a negro". Aware of the situation the nurse told the group: "This is not a negro, this is Gordon!"

### **Elly is Jewish.**

"I was a good friend of Elly. Suddenly Elly did not appear at school. The teacher told the class that Elly had to leave the school. When I told my mother, that I'm very sad that Elly is absent and that I don't know, why Elly left the school, my mother told me: 'Elly is Jewish, you know'.

The effect of focussing on the individual and the opposite consequences of the orientation on group images can be demonstrated by two little stories.

The story of *Gordon* is a report from a scene which was watched in a kindergarten in Kiel (Germany) several years ago. After the intervention of the nurse, focusing on the individual, the boy was fully accepted by the group.

The story of *Elly* happened in Nazi-Germany. It was told by an old lady, who expressed her feelings: "It is strange: nowadays I can't understand, why I was satisfied by this answer and did not ask again." But her reaction is quite understandable: The fixation to group differences blocked further thinking and questioning.

## **Recommendations to Applied Interculturality Research**

*Biological concepts of race should be considered as entirely obsolete.*

Reflecting the fact that race has no genetic basis, the most important question is not whether races exist or not, but whether biological concepts of race are adequate for capturing the gradual diversity of humans.

While biologists should abandon the race concept: *Psychologists and cultural scientists cannot neglect "race"*.

"Race" is (even in science) a social construct which has atrocious consequences for human life.

After abandoning the biological concept of race: *Be aware of biologically and culturally based racism.*

Racists (and others) create "races" by their beliefs.

If concerned with racial conceptions or even racist beliefs: *Focus on the individual.*

The keys to overcoming racial thinking lie in:

- The perception of individuals as concrete and real objects, while types are simply crude abstracts.
- enduring ambiguity, commonalities and overlapping of seemingly excluding opposites.
- being aware of variation and the reflection the significance of normal distribution.

The connotations of "race" and racism must become an issue in public discussions, education and mediation as well as in cultural research and practice. The central aim is the respect for the "other". Then the "strange" may become a familiar part of our own. The overall method to achieve this goal, to meet the pitfalls of simplicity and to overcome racial thinking is talking together:

*It is much better to speak of race than to be silent about racism.*

## **Literature**

- Cavalli-Sforza, L. L. (1997). Genes, peoples, and languages. *Proceedings of the National Academy of Science*, 94, 7719-7724.
- Cavalli-Sforza, L. L., Menozzi, P. & Piazza, A. (1996). *The history and geography of human genes*. Princeton: University Press.
- Diamond, J. (1997). *Germs, guns and steel. A short history of everybody of the last 13 000 years*. New York: Norton.
- Dole, J. A. & Sinatra, G.M. (1998). Re-conceptualizing change in the cognitive construction of knowledge. *Educational Psychology*, 33 (2/3), 109-28.
- Duster, T. (2005). Race and reification in Science. *Science*, 307, 1050 seq. (URL: <http://raceandgenomics.ssrc.org/Duster/>).
- Erikson, E. H. (1968). *Identity: Youth and Crisis*. New York: Norton.
- Excoffier, L. and Hamilton, G. (2003). Comment on "Genetic structure of human populations." *Science* 300, 1877.
- Janßen, A. (1998). Vorstellungen von Menschenrassen in der Fachwissenschaft und bei Schülerinnen und Schülern [Conceptions of "human races" in science and in the minds of students]. *Oldenburger Vor-Drucke*, 368. Oldenburg: Didaktisches Zentrum.
- Jorde, L.B., Rogers, A.R., Bamshad, M., Watkins, W.S., Krakowiak, P., Sung, S., Kere, J., and Harpending, H.C. (1997). Microsatellite diversity and the demographic history of modern humans. *Proc. Natl. Acad. Sci.*, 94: 3100-3103.
- Kattmann, U. (1980). Education against race prejudices as a topic of biology education. In Kelly, P. J. & Schaefer, G. (Eds.), *Biological education for community development* (pp. 159-170). London: Taylor & Francis.
- Kattmann, U. (1997). No "We" without discriminating "They". *Internationale Schulbuchforschung*, 19 (2), 154-156.

- Kattmann, U. (1999). Warum und mit welcher Wirkung klassifizieren Wissenschaftler Menschen? [Why and to which end do scientists classify humans?]. In Kaupen-Haas, H. & Saller C. (Hrsg.), *Wissenschaftlicher Rassismus* (pp. 65-83). Frankfurt/M: Campus, (URL: <http://zukunft-braucht-erinnerung.de/drittes-reich/ideologie-und-weltanschauung/368.html>).
- Kattmann, U. (2009). Überlegene Europäer? Ursachen unterschiedlicher Kulturentwicklung [Superiority of Europeans? Causes of diverse cultural development]. *Unterricht Biologie*, (342), 27-34.
- Nolting, H.-P. (1987). Kein Feindbild ohne Selbstbild. In G. Sommer et al. (Hrsg.), *Feindbilder im Dienste der Aufrüstung*. Marburg: Arbeitskreis Marburger Wissenschaftler für Friedens- und Abrüstungsforschung.
- Pääbo, S. (2001). The human genome and our view of ourselves. *Science*, 291, 1219-1220 [German: (2002). Eine Quelle der Demut. *Mitteilungen Max-Planck Gesellschaft*, (2)].
- Rosch, E. et al. (1976). Basic objects in natural categories. *Cognitive Psychology*, 8, 382-439.
- Rotimi, C. N. (2004). Are medical and nonmedical uses of large-scale genomic markers conflating genetics and 'race'? *Nature Genetics*, Supplement 36, S. 43-47.
- Royal, C. D. M. & Dunston, G. M. (2004). Changing the paradigm from 'race' to human genome variation. *Nature Genetics*, Supplement 36, 5-7.
- Schaefer, G. (1984). Naturwissenschaftlicher Unterricht auf dem Wege vom exklusiven zum inklusiven Denken [Science education: From excluding to including thinking]. *Der mathematische und naturwissenschaftliche Unterricht*, 37, (6), 324-336.
- Seidler, H. & Rett, A. (1982). *Das Reichssippenamt entscheidet. Rassenbiologie im Nationalsozialismus*. Wien-München: Jugend & Volk.
- Serre, D. & Pääbo, S. (2004). Evidence for gradients of human genetic diversity within and among continents. *Genome Research*, 14, 1679-1685.
- Stix, G. (2008). Traces of a distant past. *Scientific American*, (7), 56-63 [German: (2009). Wie hat sich die Menschheit ausgebreitet? *Spektrum der Wissenschaft*, (9), 58-65].
- Templeton, A. R. (1999). Human races: A genetic and evolutionary perspective. *American Anthropologist*, 3, 632-650.
- UNESCO (1995). Statement of the Scientific Workshop of the UNESCO-Conference "Against Racism, Violence, and Discrimination", June 8th and 9th 1995 on "Race" (URL: <http://www.staff.uni-oldenburg.de/ulrich.kattmann/download/Resengl.pdf>).

Dr. Ulrich Kattmann, Professor of Biology Education, University of Oldenburg, Germany. Fields of research: basics of disciplinary education (Fachdidaktik), e.g. the Model of Educational Reconstruction and its application to concepts of evolution and genetics; educational impact of the concept of „race“ and antiracist education. [ulrich.kattmann@uni-oldenburg.de](mailto:ulrich.kattmann@uni-oldenburg.de) <http://www.staff.uni-oldenburg.de/ulrich.kattmann/> [http://de.wikipedia.org/wiki/Ulrich\\_Kattmann](http://de.wikipedia.org/wiki/Ulrich_Kattmann)