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In conversation with J. Philippe Rushton

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ABSTRACT

The interview covers Rushton's background in England, South Africa, and Canada, his education at the University of London (B.Sc., 1970; Ph.D., 1973), and his early research (1970–1980) on the social learning of generosity in 7- to 11-year olds. In his first book, Altruism, socialization, and society (1980), Rushton solved two "anomalies" for his social learning perspective—altruism in animals and traits in people—causing a "paradigm shift" for him toward sociobiology. He spent January to June 1981 at the University of California, Berkeley, to study the longitudinal stability of personality traits like altruism. There, he was influenced by Jensen's work on *g* and race differences in rate of maturation and two-egg twinning. Subsequently, Rushton found that across 60 variables, Europeans fall between East Asians and Africans, closer to East Asians. He extrapolated Wilson's (fast–slow) *r-K* life history theory to explain the pattern. Also covered is Rushton's research on the heritability of altruism, and Genetic Similarity Theory explaining assortative mating and ethnic nepotism. Spouses and best friends are as similar as half-siblings and people randomly chosen from the same ethnic group are as related as first cousins. Altruism follows lines of similarity to replicate genes effectively. Rushton's research on creativity is described.

HN: Tell us about your background

JPR: I had one famous ancestor, Samuel Crompton (1753–1827) of Bolton, Lancashire, who invented the spinning mule which helped revolutionize the cotton-textile industry. It spun almost every type of yarn and was more versatile than the spinning jenny it replaced. Crompton lived in fear of the Luddites, bands of English workers (1811–1816) who went around the countryside smashing up new machines (and their inventors) lest they threaten jobs and the existing order of life. In the end, he was hailed as a benefactor and his threads and yarns became much sought after.

HN: Are all your roots in England?

JPR: Other than old Crompton, my ancestors were plain English working class folk, dissenters from the Established Church of England, and often anti-establishment in politics as well. The Rushton family name, along with their collaterals, the Ashcrofts and Cromptons, go back to the Saxon Chronicles (10th century), perhaps entering England from Germany as early as the 4th century. My father's family had lived in Lancashire for generations as small farmers or local artisans. Crompton himself was the son of a tenant farmer near Bolton, which was the town my parents grew up in. My mother's family, the Adamsons, originated in Scotland, but the family had lived in Lancashire for at least three generations. In World War I (1914–1918) my maternal grandfather served in the 10th Hussars, a Cavalry regiment, and was stationed in Northern France where he met my maternal grandmother, a Catholic farmer's daughter. So my mother contributed my middle name, spelt the French way.

HN: Tell us about your formative years

JPR: I was born on December 3rd 1943 in the middle of World War II (1939–1945) in Bournemouth, a middle-class seaside resort in southern England. My father joined the Royal Air Force as ground crew, repairing battle-damaged Spitfires, and seeing action on airfields east of London during the 1940 Battle of Britain. My mother worked for the Fire Service in London; and an uncle served in the 8th Army under General Montgomery at the Battle of El Alamein. In 1943, my mother relocated to the family's pre-war house in Bournemouth and my father volunteered to work in a nearby armaments factory to be closer to her. I was the first result. My brother Peter soon followed in June 1945 as the war came to a close.

In 1945, a Labor Party (socialist) government was elected in Britain. It nationalized important industries and rationed the building supplies my father needed as a private contractor and disadvantaged him in competing with the massive state-run housing projects. With the future in Britain looking bleak for my small-business-oriented family, they decided to seek more fertile fields. In 1948 they emigrated to South Africa.

In 1952 we returned to the UK. I passed the 11+ examinations and began grammar school (high-schools offering advanced level courses). In 1956 my father landed a job he really wanted as a scenic artist and designer in the new Canadian Broadcasting

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Corporation (CBC) television stations in Toronto. My parents emigrated anew, moving the family to Canada.

HN: What drew you to psychology?

JPR: As a teenager I read Hans Eysenck's three popular paperbacks: *Uses and Abuses of Psychology* (1953), *Sense and Nonsense in Psychology* (1956), and *Fact and Fiction in Psychology* (1964). They brought a hard-nosed philosophy of science to real life topics like IQ testing, vocational interests, personality, politics, and psychotherapy. I used one of his questionnaires and mapped the political attitudes of my family and friends on his two axes of radical *versus* conservative, and tough- *versus* tender-minded. It was a revelation to find that people could be classified in such a straightforward manner. I turned out to be tough-minded, but neither conservative nor radical. At university, I was disappointed to find individual differences constituted only a tiny part of the syllabus, and were often considered "passé."

I returned to England to go to university and in 1970 earned a B.Sc. in psychology from Birkbeck College at the University of London with First Class Honors, and then in 1973 a Ph.D. in social psychology at the London School of Economics and Political Science. I was determined to get to grips with a substantial problem and make a contribution to knowledge. I chose "altruism" as my dissertation topic because it posed a fundamental problem for theories of human nature. "Why *do* people help others?" At the time I was enamored with social learning theory and thought if it explained altruism, it could explain other parts of human nature and have implications for improving the human condition.

I gained access to the local schools and examined generosity in 7- to 11-year olds. Mine was an experimental study in which I varied whether children observed models behaving generously or selfishly. My supervisor, Hilde T. Himmelweit, Chair of the Department, herself an Hans Eysenck Ph.D. was best-known for her 1958 book, *Television and the child*. Although she would have preferred me to conduct surveys rather than "laboratory-type" experimental studies, she fully allowed me to go my own way.

I spent 1973–74 at the University of Oxford on a post-doc with Jeffrey Gray, another Eysenck Ph.D., and continued my research on personality development in children. Having published four articles from my Ph.D. augured well for gaining the academic post to which I aspired. I returned to Canada in 1974 and taught at York University (1974–1976) and the University of Toronto (1976–1977). I then moved to the University of Western Ontario and became a full professor in 1985. In 1989 I was made a Fellow of the John Simon Guggenheim Memorial Foundation and in 1992 I received a D.Sc. from the University of London (an earned degree).

HN: You continued to publish social learning studies of prosocial behavior while at York University and the University of Toronto, including how children learn to resist temptation. So when and how did you become a sociobiologist or 'evolutionary psychologist' to use the gentler and now accepted term?

JPR: Altruism has always been *the* central issue for me. However, in the first ten years of my research career (1970–1980) I studied it from a social learning perspective. When I began at Western, my first priority was to complete a book I had started at Oxford, *Altruism, socialization, and society* (1980), in which I describe the influence of the educational system, the mass media, and the family. I identified: empathy and internalized "norms of social responsibility" as primary motivations. So, I wasn't always a controversial race-researcher—or even an evolutionary psychologist.

Then, around 1979 I joined a group of colleagues from my department working our way through Wilson's (1975), *Sociobiology: The new synthesis*. Wilson defined altruism as the "central theoretical problem of sociobiology" (p. 3) and provided the answer (following Darwin) in family structure and kinship. Reading Wilson's tome with my colleagues (we met one evening a week at the Faculty Club) led me to the over-arching structure of evolutionary *r-K* life history theory. I adopted this perspective for my research from then on.

HN: But how did you develop that interest in sociobiology in the first place?

JPR: I underwent a "paradigm shift" by solving two anomalies from my social learning perspective with which I wrestled while writing the *Altruism* book. The first was whether altruism existed in animals. Wilson (1975) showed altruism in non-human animals was pervasive. For me, this implied an evolutionary and genetic basis in people. The evidence that prosocial parents produce prosocial offspring (and abusive parents, abusive offspring), might just as easily be explained genetically as culturally. When reviewing the literature on family influences, I was struck by how few studies controlled for genetic influences. It wasn't until the 1980s that genetic designs began to be incorporated more routinely into social developmental research.

The other anomaly was whether altruism was an enduring trait of personality. If people were as consistent in their prosocial behavior as they were in intelligence and temperament then it would be correct to describe them as having traits of character. Though it might seem commonsense to ascribe traits to individuals, a major debate during the 1960s and 1970s arose over the "consistency *versus* specificity" of behavior. As a social learning theorist I typically sided with the specificity position, although I always accepted the three super-traits of Intelligence, Extraversion, and Anxiety. It was a major intellectual reversal (indeed an epiphany) when I concluded that people did indeed have enduring traits of character. To examine them one had to use the *principle of aggregation* and form composite measures (Rushton, Brainerd & Presley, 1983).

Solving these two anomalies to my own satisfaction—altruism in animals and traits in people—led me from social learning to sociobiology.

HN: So, to "retool," you took a semester away from your home university and spent January to June 1981 as a Visiting Scholar at the University of California, Berkeley?

JPR: Yes. I had been invited to the Institute of Human Development at Berkeley by fellow altruism researcher Paul Mussen. Specifically, I hoped to examine how stable individual differences in altruism were over the life-span. However, I found that although many of the Institute's members had international reputations documenting the early emergence of personality traits in children and their power to predict adjustment, no one was interested in discussing genetic causation. At Berkeley, discussion of behavior genetics was a hop, skip, and a jump away from Arthur Jensen's politically incorrect research on Black–White IQ differences.

HN: One question I am asked about you is why you picked such a controversial topic to study as race differences, and then stayed with it for so long? Is it that you enjoy being in the limelight? Marvin Zuckerman once called you an "intellectual sensation seeker."

JPR: Well I do enjoy intellectual excitement, but I never expected my work on generosity in children to lead to a firestorm over race differences. In the end I felt it couldn't be avoided if there was to be a full evolutionary analysis of human life histories.

HN: But surely it *could* have been avoided? Most behavior geneticists and evolutionary psychologists study human behavior without getting embroiled in race differences in brain size and intelligence? Why didn't you steer clear of the minefields?

JPR: Perhaps it might have gone differently if I hadn't been as strongly influenced by Arthur Jensen. Since he occupied an office in the School of Education, one floor up from my office in the psychology department, I decided to visit him and we hit it off. I had been interested in his work on race and intelligence since graduate school, though I remained agnostic as to any genetic basis. Jensen was highly informative, sketching out his views and providing detailed answers to my questions along with copies of his reprints.

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Under his tutelage, I learned about general intelligence (Spearman's *g*), behavior genetics, and race differences.

Jensen's (1969,1973) work went beyond IQ. He documented that, on average, Black babies are born a week earlier than White babies yet are more mature on measures of amniotic fluid in the placenta, bone development by X-rays, and muscular strength and motor co-ordination. East Asian infants are less precocious and motorically reactive than Europeans. He also described differences in two-egg twinning rates (16, 8, and 4 per 1000 live births for Africans, Europeans, and East Asians, respectively). In a long footnote, Jensen (1973) suggested that "the three racial groups lie on a developmental continuum on which the Caucasian group is more or less intermediate (p. 289)."

Jensen's note struck a responsive chord for I had been reading about *scala naturae* and behavioral scaling in the sociobiological literature and wondered about their application to human differences. Wilson (1975) explained the origins of parental care, which had enormously increased in complexity over evolutionary time (Fig. 1). He described two ends of a reproductive continuum. At one end, a "fast" life history (the *r*-strategy), eggs and sperm are produced and simply discharged into the water (for example, in oysters). Further to the opposite end, a "slow" life history (the *K*-strategy), an egg is not only laid in the ground but pollen and honey provided for future needs (as with wasps). Other steps in the *K* direction include bringing food and caring for the offspring. In mammals, the combined demands of gestation, delivery, production of milk, and protecting and physically caring for the young reach a peak.

K-strategists provide a lot of parental care. They have complex social systems and work together in getting food and shelter. *K*-strategists have more developed nervous systems and bigger brains but produce fewer eggs and sperm. The bigger an animal's brain, the longer it takes to reach sexual maturity and the fewer offspring it produces. Number of offspring, time between births, parental care, infant mortality, speed of maturity, life span, even social organization and altruism all fit together like pieces of a puzzle.

I'd also read an article on the "Origin of Man" by Lovejoy (*Science*, January 31, 1981) which documented the trend in hominids toward larger brains, prolonged gestation, single births, a longer period of infant dependency, successively greater periods between pregnancies, greater predator recognition and territorial defense, and prolonged life-spans. Lovejoy attributed this pattern to an increasingly *K*-type demographic strategy. With each step in the scale, populations require a greater proportion of their reproductive energy to be devoted to sub-adult care, with greater investment in the survival of fewer offspring. I couldn't help but wonder whether the well-documented racial differences in family structure might have their roots in just such an origin?

I reviewed the international literature on differences among the three major races on 60 different variables (Table 1). Some were well-established, such as family structure, crime, and educational achievement. East Asian Americans, often labeled a "model minority," averaged more tightly knit and complexly organized families than European Americans. Other data had only recently become available such as Richard Lynn's (1977) finding that East Asians averaged a higher IQ than Europeans. Some data were sketchy. Were there *really* race differences in sexual behavior—as the stereotypes implied? I later found race differences did exist in age of sexual maturation (Blacks earlier than Whites and Whites earlier than East Asians), frequency of intercourse and masturbation, as well as in sexual anatomy.

I considered data on brain size to be especially important. In 1981 there was an almost empty cell in Table 1 for East Asians, although *r-K* theory predicted they should average higher. Then data showing an East Asian advantage were provided by Beals, Smith, and Dodd (1984). In the 1990s I corroborated this advantage by calculating cranial capacities for international samples of air-force pilots collated by NASA, a stratified random sample of 6325 US Army personnel, thousands of 25- to 45-year olds grouped into 40 regional samples by the International Labor Office, and 35,000 children followed from birth to 7 years by the US National Collaborative Perinatal Project (see Rushton, 1995; Rushton & Ankney, 2009).

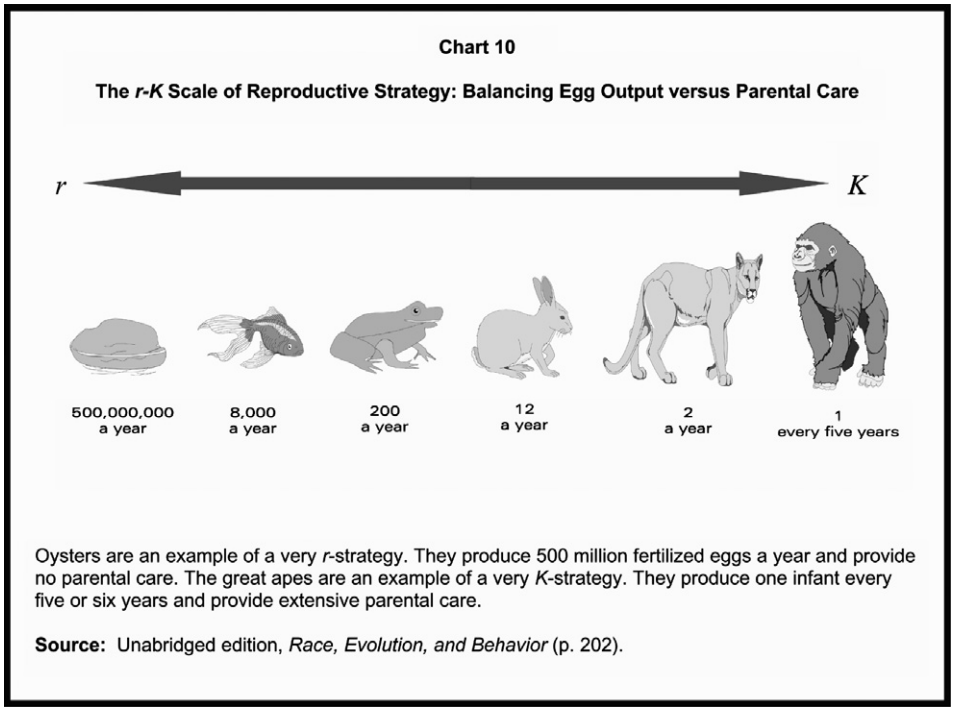

Fig. 1. The *r-K* scale of reproductive strategy.

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Table 1
Average differences between Africans, Europeans, and East Asians.

	Africans	Europeans	East Asians
Brain size			
Mean across methods (cm^3)	1267	1347	1364
Autopsy data (cm^3 equivalents)	1223	1356	1351
Endocranial volume (cm^3)	1268	1362	1415
External head measures (cm^3)	1294	1329	1356
Cortical neurons (billions)	13,185	13,665	13,767
Intelligence			
IQ scores	70–85	100	105
Decision times	Slower	Intermediate	Faster
Cultural achievements	Lower	Higher	Higher
Muscular-skeletal traits			
Muscle attachment sites on crania	Largest	Intermediate	Smallest
Postorbital constriction and temporalis fossae (indentations in skull for jaw muscles)	Largest	Intermediate	Smallest
Facial prognathism (forward jutting jaw)	Most	Intermediate	Least
Number of teeth	32	30–32	28–30
Size of molars	Largest	Intermediate	Smallest
Bi-condylar breadth of mandible (widening of upper back-of-jaw for attachment to wider skull).	Least	Intermediate	Largest
Mass of nuchal muscles	Largest	Intermediate	Smallest
Femoral head size (where thighbone exits pelvis)	Smallest	Intermediate	Largest
Femoral shaft curvature index (from pelvis to knee)	76.6	97.0	102.2
Size of tibial plateau (knee platform giving balance for curved femur)	Smallest	Intermediate	Largest
Maturation rate			
Gestation time	Shorter	Longer	Longer
Skeletal development	Earlier	Intermediate	Later
Motor development	Earlier	Intermediate	Later
Dental development	Earlier	Intermediate	Later
Age of first intercourse	Earlier	Intermediate	Later
Age of first pregnancy	Earlier	Intermediate	Later
Life-span	Shortest	Intermediate	Longest
Personality			
Activity level	Higher	Intermediate	Lower
Aggressiveness	Higher	Intermediate	Lower
Cautiousness	Lower	Intermediate	Higher
Dominance	Higher	Intermediate	Lower
Impulsivity	Higher	Intermediate	Lower
Self-esteem	Higher	Intermediate	Lower
Sociability	Higher	Intermediate	Lower
Social organization			
Marital stability	Lower	Intermediate	Higher
Law abidingness	Lower	Intermediate	Higher
Mental health	Lower	Intermediate	Higher
Administrative capacity	Lower	Higher	Higher
Reproductive effort			
Two-egg twinning (per 1000 births)	16	8	4
Hormone levels	Higher	Intermediate	Lower
Size of genitalia	Larger	Intermediate	Smaller
Secondary sex characteristics	Larger	Intermediate	Smaller
Intercourse frequencies	Higher	Intermediate	Lower
Permissive attitudes	Higher	Intermediate	Lower
Sexually transmitted diseases	Higher	Intermediate	Lower

The literature on hominid evolution showed that as brain size increased from chimpanzees (380 cm^3) to *Australopithecus* (450 cm^3) to *Homo habilis* (650 cm^3) to *Homo erectus* (1000 cm^3) to *Homo sapiens* (1400 cm^3), it was accompanied by changes from a robust to a more gracile form across 74 musculo-skeletal traits, both cranial and postcranial (r = .90 across the populations). Subsequently, I examined 37 of the 74 traits representing most of the skeleton to determine whether the trend applied across the three sub-species of *H. sapiens* and found that it did (Table 1; Rushton & Rushton, 2003). The initial 74 traits across five species were taken from evolutionary anatomy textbooks; the 37 on race differences from forensic anthropology textbooks. Across the three populations, the 'ecological correlation' between brain size and the 37 traits averaged a remarkable r = .80. If the races did not differ in brain size, this correlation could not have been found.

An unexpected finding was that males averaged a larger brain than females even though they did not have a higher IQ. Richard Lynn (1999) dubbed this the "Ankney-Rushton anomaly," after my zoology colleague Dave Ankney discovered the sex difference, even after controlling for body size (see Rushton & Ankney, 2009). Lynn (1994) solved the paradox by showing that men averaged 5 IQ points higher than women. He suggested the sex difference had gone unnoticed because females mature faster than males thereby masking differences prior to late adolescence when most IQ data is collected. Lynn's finding of a higher male IQ after adolescence to go along with the larger brain has been corroborated by others (Nyborg, 2005), including Doug Jackson and myself in an analysis of 100,000 SAT takers (Jackson & Rushton, 2006).

HN: It's still not clear why you made race the center of your research. You titled your 1995 book, *Race, Evolution, and Behavior*.

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JPR: The question of why the *three-way pattern* of racial differences had come about (Table 1) was far too intriguing to walk away from. It offered more opportunity for finding and testing alternative theories than any single dimension. Only a gene-based evolutionary theory could explain the totality of this pattern.

HN: So was the application of *r-K* life history to human differences unique to you? It must have taken a lot of hard thinking to work it all through. How did you make the leap?

JPR: Remarkably, there was no need to think it through. Instead there were a series of ever stronger "clang associations," mostly in 1980 and early 1981, until a light went on in my head and I thought "Hmm, that seems to fit; I wonder how I might prove (or disprove) it." The answer was again immediate–examine whether other *r-K* traits lined up in the same direction. It didn't take more than ten minutes to list enough items to see the approach was viable (Table 1).

HN: Is the General Factor of Personality (GFP) part of the *r-K* life-history approach? If so, how?

JPR: Yes. In my first publication on *r-K* life history theory, I proposed that "one basic dimension—*K*—underlies much of the field of personality" (Rushton, 1985, p. 445). Subsequent research confirmed the interrelatedness of the life history traits identified in the 1985 paper such as altruism, intelligence, sexuality, and delinquency. But, it probably was Sir Francis Galton (1887) who first described a GFP, just as he did the general factor of intelligence (see Rushton & Irwing, 2011).

The GFP as such, however, only became known in 2007 after hierarchical factor analyses were carried out on existing personality inventories assessing both normal and personality disorder scales (Rushton, Bons, & Hur, 2008; see Rushton & Irwing, 2011, for review). Cross-national twin studies find 50% of the variance in the GFP is due to genetic influence and 50% to non-shared environmental influence. A South Korean twin study found the GFP emerged by 2- to 3-years of age (Rushton et al., 2008). As with cognitive ability, an integration of broad and narrow traits can be achieved through combining them hierarchically; with the GFP occupying the apex in the same way that *g* occupies the apex in the organization of cognitive abilities.

High scores on the GFP indicate a "good" personality; low scores a "difficult" personality (someone who is hard to get along with). Individuals high on the GFP are altruistic, agreeable, relaxed, conscientious, sociable, and open, with high levels of well-being and self-esteem. Because the GFP defines clear positive and negative poles, it provides potential for understanding the socially "advantaged" (those with high levels of emotional intelligence) as well as the socially "challenged" (those more likely to suffer a personality disorder). The GFP can be viewed as a dimension of social effectiveness. This follows Darwin's proposal that natural selection acted directionally to endow people with more cooperative and less contentious personalities than their archaic ancestors or nearest living relatives, the chimpanzees. Individuals high on the GFP probably left more progeny since we prefer mates, fellow workers, and leaders who are altruistic, conscientious, and emotionally stable. Those able to cooperate in groups were also more likely to achieve goals and even win wars.

HN: You have also made contributions to altruism, personality, and creativity. For example, you formulated Genetic Similarity Theory by which you mean that people innately prefer those genetically similar to themselves. Can you expand on this and your views on assortative mating?

JPR: I began to work on what I called Genetic Similarity Theory (GST) in late 1981 after returning to Canada from Berkeley. There I had been struck by how much people associated with those similar to themselves and the amount of 'ethnic nepotism' engaged in by political activists. Seeking an evolutionary explanation, I extended William Hamilton's (1964) inclusive fitness solution to the problem of altruism. It stated that organisms act to benefit kin depending on how closely related they are. However, in human beings, altruism goes well beyond kin (that is, 'blood relatives'). People tend to associate with, befriend, marry, and help others who, although not kin, are genetically similar (see Rushton, 2009, for review).

The evidence I amassed over the next 25 years in favor of GST included finding that: spouses and close friends assort on blood groups and that blood group similarity predicts fertility; twin and adoption studies show that genes, not upbringing, cause people to assort positively; phenotype matching studies show that assortment is more pronounced on the more heritable items within sets of physical and psychological traits; bereavement studies find that grief is greater following the death of a more similar co-twin or child; and studies of face perception find that people prefer and trust those who look like them.

Using Jensen's (1998) Method of Correlated Vectors, my studies found that social assortment was more pronounced on the more heritable components of traits. I found that attitude and personality items from 300 pairs of identical (MZ) and fraternal (DZ) twins, their spouses, and their best friends revealed the spouses and friends were more similar to each other than to first cousins and almost as similar as to brothers and sisters, a degree of similarity not previously recognized (Rushton & Bons, 2005). Further, the twins' preference for similarity in social partners was 34%, heritable, with 12% of the variance being due to family upbringing, and 54% due to chance factors. For unconscious genetic reasons we seek out our 'own kind'—extraverts with extraverts; traditionalists with traditionalists. The reason is that by liking, becoming friends, aiding, and mating with those who are genetically similar, we help ensure that our own segment of the gene pool is maintained and transmitted to future generations.

HN: In the 2005 issue of *Nations and Nationalism* (an academic journal published by the London School of Economics) you described the implications of Genetic Similarity Theory for ethnic relations. Please explain.

JPR: The pull of genetic similarity does not stop at family and friends. Group members move into ethnic neighborhoods and join together in clubs, societies, and religious organizations. DNA analyses demonstrate a startlingly obvious result. Individuals from the *same* ethnic group share many more genes with their co-ethnics than they do with those of other ethnic groups. Based on their DNA, individuals randomly chosen from the same ethnic group are as much like their ethnic group as they are their extended families; they are like half siblings compared to individuals randomly chosen from the rest of humanity. Two random English people are equivalent to 3/8 cousins compared with two random people from the Near East; 1/2 cousins compared to two random people from India; half-sibs by comparison with people from China; and like full-sibs by comparison with people from sub-Saharan Africa. Rather than being a poor relation of family nepotism, ethnic nepotism is an extension of it. The evolutionary reason why altruism follows lines of genetic similarity is to replicate genes more effectively. Xenophobia may represent the dark side of the evolutionary coin. From an evolutionary perspective it can be rational for an individual to sacrifice for the group. In extreme cases such as war, it can be more important than helping immediate kin (see Salter & Harpending, this issue).

HN: You also published twin studies using the University of London Twin Register in the UK. The first of these was in collaboration with Hans Eysenck, with whom you spent a sabbatical in 1982–83 (Rushton, Fulker, Neale, Nias, & Eysenck, 1986). You found that individual differences in altruism, empathy, nurturance, and aggression were 50% heritable. In 1996 you published a paper showing the heritability of violent crime. In 2004, the Royal Society published your paper on the links between genes and altruism

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showing there were genetic reasons for human kindness (Rushton, 2004). Can you summarize your views?

JPR: I was surprised that both altruism and anti-social behavior had such high heritability because I thought they would be subject to much more socialization pressure than neutral traits. The 2004 study analyzed social attitudes in 300 pairs of twins and found people's heritable tendency to act in a socially responsible manner, help others and disapprove of cheaters, covered a broader array of situations than previously examined. I concluded that humans are hardwired with a "goodness gene" that forms a deep part of human nature. Society is not built to fall apart at the seams. A group of strangers on a desert island would soon band together and work toward a common good.

HN: In other research you found support for Eysenck's (1995) theory that creativity is linked to Psychoticism. Does this contradict the tendency for good traits to go together, as in the General Factor of Personality?

JPR: Creativity remains a conundrum for me and I still don't really know what to make of it in terms of the GFP. Jensen (1998) thought the Big Five traits would predict productivity, especially Conscientiousness and Openness, but also Agreeableness, Sociability, and Emotional Stability when getting on well with people mattered. He also argued that much "zeal and industry" were necessary for very high creativity. The ordinary term "motivation," he pointed out, seemed too intentional and self-willed to fit the behavior of individuals whose biographies showed them to be obsessed by the subject of their work. Jensen suggested that this obsessive–compulsive mental activity in a particular sphere was beyond conscious control. Instead, he likened the "mental energy" of a genius to the kind of cortical arousal seen under the influence of stimulant drugs.

Although Jensen's traits can be fitted into the GFP, there is much evidence that, in addition to being obsessive–compulsive, highly creative individuals have a greater percentage of other psychological disorders. Eysenck's theory is that Psychoticism inclines people to generate quirky ideas, which predispose them on the one hand, to a personality disorder, and on the other, to greater creativity. Eysenck further postulated that *intelligence* enhanced creativity primarily through the *speed* with which new associations were formed, while *psychoticism* did so by expanding the *width* of the associations it could bring together, which he termed over-inclusive thinking. Thus, intelligence and psychoticism act as independent contributors to creativity.

In the 1970s while at York University I became interested in *scientometrics* and using citation counts to measure eminence. Part of my motivation was to see how I was doing personally, compared to colleagues, and how far I would have to go to excel. These are hardly the noblest of motives, but in defense I can say I was also very interested in scientific biography and what kind of people made great discoveries.

My first study in 1977, with Norman Endler and Roddy Roediger in the *American Psychologist*, confirmed what others had found, that very few scientists are responsible for producing the great majority of creative works. 52% of our sample did not publish a single article in any journal in 1975. The picture was similar for citations—53% of psychologists had 5 or fewer citations, while only 25% had 15 or more, and only 1% had 100 or more.

Subsequently, using both self- and other-ratings made by university professors (*Ns* = 52, 69) we found several personality traits consistently correlated with publication and citation counts: ambition, endurance, seeking definiteness, dominance, showing leadership, aggressiveness, intelligence, independence, non-meekness, and non-supportiveness. I asked Eysenck to estimate the loading of each of the 29 traits on his Psychoticism (*P*) scale, which he argued predicted schizophrenia and other psychotic disorders, and which he identified with traits such as high in aggressiveness, coldness, egocentricity, impersonality, impulsivity, and tough-mindedness. I used Eysenck's estimates to calculate an overall *P* score for each professor and correlated this with a composite of publications and citations. For the study of 52 professors, the correlation between *P* and the composite was $r = .26$ ($p < .05$; for intelligence it was $r = .40$, $p < .01$). For the study of 69 professors, the correlation was $r = .43$ ($p < .01$; for intelligence it was $r = .05$).

I carried another study with 200 university students using the *P* scale from the Eysenck Personality Questionnaire along with a measure of general intelligence and a creativity test based on Divergent Thinking (Rushton, 1990). Both *P* and IQ correlated positively with the total number of ideas generated on the measure of divergent thinking ($r = 17$, $p < .05$; $r = .24$, $p < .05$, respectively). In all three studies, Psychoticism was unrelated to Intelligence and thus made an independent contribution to creativity. This evidence, too, confirmed Eysenck's hypothesis.

HN: Any last thoughts?

JPR: Charles Darwin and Wilson were correct. Human social behavior is best understood as part of a life history—a suite of traits genetically organized to meet the trials of life—survival, growth, and reproduction.

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