Module subject code: py291 module subject title: no of words: introduction to psy...

Science, Biology

Module/Subject Code: PY291 Module/Subject Title: No of Words: Introduction to Psychology 2, 320 [DARWIN'S THEORY OF EVOLUTION] Describe Darwin's theory of evolution and evaluate the important contribution it has made to Psychology as a discipline. In 2007, Scientists from the Smithsonian Institute inducted the skulls of a prehistoric snake, found in tact in a Colombian coal mine, into the fossil record1. These giant snakes, cold-blooded reptiles, alongside two other ancestors of animals still living today: the giant crocodile and the giant tortoise; pre-date the evolutionary progeny of Darwin's observations in the Galapagos Islands yet exemplify his theory of natural selection. Long before Darwin published his evolutionary observations in On the Origin of Species, the snake, Titanoboa, was the dominant carnivorous predator. Biologically superior in its ability to hunt, constrict, and swallow prey whole, the higher temperatures of this tropical climate produced optimal conditions for Titanoboa and other such reptiles to grow to gigantic proportions (Head, J. J., Bloch, 2009). Today's snakes, limited only by environmental conditions (Huey, R. B., 1991), have inherited similar physiological and reproductive traits. In 1836, Darwin reached the archipelago of the Galapagos Islands: 16 volcanic masses off the coast of South America, individual habitats at self-determining stages of their own evolutionary process (Geist, 1996) supporting ecosystems of unique diversity. On each Island, Darwin observed, across plants and animals - insects, birds and reptiles — similarities among species albeit with subtle adaptations best suited to their environments. Plants of yellow and white flowers dominated: as they successfully attracted bees for pollination, other variations receded. In the absence of mammals, he noted, individual species

had adapted to environmental conditions without predatory limitation and only after hunting by man did behavioural changes manifest, in fear for their survival, and impact response to human interaction (Angell, 1909 para. 10). Darwin, in the Abstract of ‘ On the Origin of Species’ Darwin, C (1859) theorised that: In considering the Origin of Species, it is quite conceivable that a naturalist, reflecting on the mutual affinities of organic beings, on their embryological relations, their geographical distribution, geological succession, and other such facts, might come to the conclusion that each species had not been independently created, but had descended, like varieties, from other species. Nevertheless, such a conclusion, even if well founded, would be unsatisfactory, until it could be shown how the in numerable species in habiting this world have been modified so as to acquire that perfection of structure and co-adaptation which most justly excites our admiration. Iguanas were by virtue of their inability to swim, an anomaly of the Galapagos and yet, Darwin observed large populations across the islands. Iguanas, cold-blooded reptiles like snakes, can endure long periods without food or water. This was critical to the survival of the many that floated, swept away on driftwood from the South American shores where they originated, to individual islands where they settled and reproduced. Darwin deduced through his studies that variations in each of these highly-populated colonies were the product of adaptation to environmental conditions present in each unique ecosystem: coastal; volcanic rock; grasslands. The marine iguana, unlike its relatives can swim. A vegetarian, it feeds on algae and seaweed and exhibits physiological characteristics suited to underwater scavenging: strengthened claws to cling to the seabed and

nasal glands which facilitate the modified behaviour of ‘ spitting’ out saltwater to circumvent dehydration (Dunson, W. A., & Mazzotti, F. J., 1989). The climatic phenomenon of El Nino, which decimates algal food sources, prompted scientists to observe closely the physiology of the marina iguana, which were now only 80% of previously recorded body sizes. This physiological variation is now scientifically attributed to a direct response to the environmental hostilities which challenged the survival of this species: smaller skeletons and body mass allows marine iguanas to regulate body temperature and consume less. Larger marina iguanas die off until favourable environmental conditions return (Wikelski, M., 2005). This biological adaptation illustrates that which Darwin so sensitively described as he brought to bear a newer way of thinking to the earlier schools of philosophical and physiological study. Philosophy sought to explain the mind-body relationship as the spiritual entity separate to the physical laws governing bodily behaviour. Physiology, the study of bodily function, and medical understanding were advancing from the early schools of thinking through the school of British Empiricism (Passer & Smith, 2011, p. 11). John Locke (1632-1704), an empiricist, had established observation over subjective reasoning as a qualified approach to acquiring knowledge and avoiding what is now termed consideration bias (Passer & Smith, 2011, p. 5). Observation was grounded in fact and as Darwin later relied on when he published On the Origin of Species (1859), the basis on which theories could be founded and justified. In the decades prior to and immediately after the publication of On the Origin of Species, philosophers like T. H. Huxley (1825-1885) and Herbert Spencer (1820-1902) were promulgating contentious

assertions which contradicted religious doctrine, as Spencer stated ‘ I hold in common with most men who have studied the matter to the bottom, that the existence of Deity can neither be proved nor disproved’. Spencer a scholarly advocate of the notion of evolution lacked the plausible mechanism but ‘ postulated a universal tendency towards progressive development, ... , from simpler into increasingly complex and more highly organised forms’ Duncan, 2004). Darwin’s proposition that ‘ mind was not a spiritual entity but a product of biological continuity between humans and other species’ (Passer & Smith, 2011, p. 12) also contradicted the acceptable philosophies to society of that time and implied that insight into human behaviour could be deduced by studying other species. As Darwin defined a mechanism of evolution through natural selection so too did Alfred Russel Wallace (1823-1913) during his parallel voyage in the Pacific Ocean, though not in absolute terms of man’s evolution from animal (Angell, 1909, para. 25). Darwin (and Wallace), within years of Spencer’s assertions, provided the scientific foundation which underpinned the theory of evolution: ‘ As many more individuals of each species are born than can possibly survive; and as, consequently, there is a frequently recurring struggle for existence, it follows that any being, if it vary however slightly in any manner profitable to itself, under the complex and sometimes varying conditions of life, will have a better chance of surviving, and thus be naturally selected. From the strong principle of inheritance, any selected variety will tend to propagate its new and modified form.’ –Charles Darwin, Introduction, On the Origin of Species (1859) Spencer who coined the phrase ‘ survival of the fittest’ acknowledged in his writing of Principles of Biology (1864) Darwin’s findings ‘ This survival

of the fittest, which I have here sought to express in mechanical terms, is that which Mr. Darwin has called 'natural selection'' (Paul D. B., 1988, p. 411-424). Darwin, now associated with this term, presented the scientific evidence through animal observation to bear out his theory of evolution and ‘ the preservation of favoured races in the struggle for life’. Though the empiricists validated observation as an objective method of evaluating mind-body relationships it is Darwin to whom we can attribute the incorporation of growth, development and the influence of environment, both social and physical, in the systematic and scientific process of Psychology research (Angell, 1909, para. 5). Bolstered by the support, from even those who so vehemently opposed his earlier declarations, Darwin published his revolutionary ideas on human biological and mental evolution in The Descent of Man, in 1871 (Angell, 1909, para. 3). Darwin applied his naturalist studies of animals to the biological evolution of man: from a single ancestor which, through reproduction over generations, and inherited, advantageous, favourable variations resulted in the highest evolutionary form: the human species. The human brainstem is today proven to have evolved over 500 million years ago. Termed ‘ the reptilian brain’ as it is practically identical to the complete brain of a reptile, it is responsible for alertness and unconscious bodily functions critical to survival such as breathing, heart rate. This biological similarity accords with Darwin’s theory, though he could not have known this at the time, and explicates the biological conclusions he presented to the world some 200 years ago (Ornstein & Thompson, 1986, p. 4). In The Descent of Man (1871), Darwin presented numerous examples supporting his contention that humans and nonhuman animals share

cognitive attributes like wonder, curiosity, long-term memory, the ability to pay attention, imitate the behaviour of others, and to reason (Darwin, 1871/1896, p. 65-113). From these observations he theorised that instinct and the influence of intelligence in the process over mere reflex muscular action should be attributed to ‘ natural selectionoperating on chance variations in conduct’ over, though only to a lesser extent, ‘ inherited, useful habits consciously acquired’ (Angell, 1909, para. 8). Many instincts cannot be inherited and natural selection provided for similar processes in the evolutionary structures to better fit Darwin’s theory. In 1850, before Darwin published his pioneering work on natural selection, E. H. Weber and G. T. Fechner were studying, with great success, how physical stimulus relates to the magnitude of sensation: Psychophysics. This research, combined with advances in Germany in psychophysiology led to the establishment of the first how physical stimulus relates to the magnitude of sensation: experimental laboratory in 1879 by William Wundt (Shapiro, 1994, p. 48). Structuralism, the analysis of the mind in terms of its basic elements as hypothesised by Wundt, was demonstrated through his replication of responses within controlled environments: he contended that the mind could be studied, and understood, by scientifically evaluating its components (Passer & Smith, 2011, p. 12). At the same time in America William James (1842-1910) was evaluating functions of consciousness rather than its elements. James looked beyond the scientific approach to contemplate various biological and mental processes and manifested behaviours. He studied human ability and memory for example, and his beliefs were firmly rooted in memory’s associations with the past and ‘ self’ rather than

heredity. The more associations formed with a memory, the more that memory persisted (Green & Teo, 2004, p. 71). Wundt's Structuralism was soon supplanted by William James' Functionalism, as flaws within his scientific approach persevered in the wider consideration of cognitive processes such as memory. Wundt had no effective experimental technique by which to investigate it (Green & Teo, 2004, p. 45). Memory, a psychological category debated by Greek philosophers and everpresent in the continued exploration of the consciousness, presented boundaries for Wundt's approach and in the evolution of scientific study cumulative progress is paramount. The process by which both arrived at these theories however shared definitive similarities: controlled experimental environments in which to reveal response, and evidence their findings (Green & Teo, 2004, p. 45) (Passer & Smith, 2011, p. 12). Darwin in his exploration of the Galapagos was exposed to nature's greatest laboratory and in sharing his observations and methodology influenced the evolvement of these early schools. Many notable scientists, Edward Titchener (1867-1927) and H. K. Wolfe (1858-1918), emerged from Wundt's laboratory to continue their study of mind and behaviour by new, progressive approaches and functionalism evolved into the two related fields of cognitive and evolutionary psychology research. By the late 1800's the assimilation of the fragmented schools of thinking converged to bring about the serious consideration of psychology, and its many subfields, to be the scientific study of behaviour and the mind as it is recognized as today. And so it is the scrutiny of Darwin's theory, that it is nature which plays the pivotal role in cognitive evolution over nurture, which has given rise to the challenging and critical analysis of mind and

behaviour. Through the four main psychological perspectives recognised today: Psychoanalysis; Behaviourism, Humanism and Cognitive Psychology; personality, emotion, learning, environment and experience have been systematically researched in a concerted cumulative effort to understand human nature, independent of evolutionary influence. Psychoanalysis, popularised by Freud (1856-1939), focuses on the role of unconscious processes which have no physiological malfunction and lie repressed so as not to cause negative affectation (Passer & Smith, 2011, p. 176). Pavlov (1849-1936) through controlled experiments and later Watson (1878-1956) emphasised learning as environment influencing behaviour. Behaviourism proffers adaptation by personal experience to ensure survival, not inheritance (Passer & Smith, 2011, p. 215). Humanism considers freewill, personal growth and self-meaning as dominant in the ultimate relationship between mind and behaviour (Passer & Smith, 2011, p. 12) and Maslow (1908-1970) best represented this motivational concept of behaviour in his ‘ Hierarchy of Needs’ (Passer & Smith, 2011, p. 371). The Cognitive Perspective, a diversified field of study, seeks to uncover the nature of the mind, mental processes and resulting behaviour (Passer & Smith, 2011, p. 15). Such perspectives align with Darwin’s earliest contention of nature’s struggle for perfection and agree that the mind, influenced by various mental processes, evolves over generations. However these theorists did not concede to his assertion that such adaptations simply occur by heredity and between species: they demonstrated that mental evolution was also a product of environment, learned responses and past experiences. In the 35 years between Darwin’s revelations during his voyage on the HMS Beagle

and the publication of his controversial tomes, the scientific community had gathered sufficient momentum to contemplate explanations of the natural world, beyond the religious tenets so widely accepted. Darwin’s observational contribution to scientific methodology afforded his counterparts a systematic approach to prove or disprove behavioural response. His own assertions, fiercely dictated by his dogmatic belief in man’s evolution from a single ancestor, often constituted a single-minded view of human response and sometimes he selectively adopted observations to prove his theory. Thus he created opportunity for future scientists to critique his contentions and look beyond the biological mind to environment, for further investigation and evaluation of behaviour. Psychology is, by virtue of the subject matter, an evolving process of continuous revelation and it was always Darwin’s hope that his hypotheses provoke thought and further discovery by future generations. " In the distant future I see open fields for far more important researches. Psychology will be based on a new foundation, that of the necessary acquirement of each mental power and capacity by gradation. Light will be thrown on the origin of man and his history." On the Origin of Species (1859) p. 488 Reference List Books Passer & Smith, 2011. Psychology: The Science of Mind and Behaviour (5th ed). NewYork, NY: McGraw Hill. Green & Teo, 2004. The transformation of Psychology (2nd ed). Washington, DC: American Psychological Association. Duncan, D. (2004). The life and letters of Herbert Spencer. Kessinger Publishing. R. Ornstein, R. Thompson, 1986. The Amazing Brain. Houghton Mifflin Company Darwin, C. 1859. On the Origin of Species. Darwin, C. 1871, The Descent of Man. Journals/ Articles Angell, J. R. (1909). The influence of

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