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YEW-KWANG NG THE UTILITARIAN: AN APPRECIATION[*]

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The most important insight of Yew-Kwang Ng as a scholar is the single idea that welfare dictates humanity and the other sentient beings as well. This idea serves as the unifying principle that runs through the lion's share of significant contributions by Ng, as an outstanding defender and an innovative modern theorist of utilitarianism, to a good number of literatures in economics and beyond.

Keywords: Utilitarianism; social welfare; welfare biology; evolution; happiness.

1. Introduction

Professor Yew-Kwang Ng has been consistently prolific over an extraordinary career, contributing to a stupendous range of topics in economics and a number of other disciplines. This paper is not intended to be comprehensive in its coverage of the scientific contribution Ng has made thus far.[1] It is not even intended to be a review, or a summary, of the carefully selected part of his scholarship. Instead, it is an appreciation, inevitably limited in the range of what is to be referred to, and biased due to my own preference and taste.

The most important insight of Ng as a scholar, in my opinion, is the single idea that welfare dictates the life and behavior of humanity and the other sentient beings as well. This idea, as far as I can see, serves as the *unifying principle* that runs through the lion's share of the significant contributions made by Ng, as a passionate and formidable defender and an innovative modern theorist of utilitarianism, to a substantial number of literatures in economics and beyond.

I will start with one major breakthrough Ng (1975) made in axiomatic treatment of Bentham's utilitarian principle in the next section. To adequately appreciate the position

[1]That is, I skip many of his contributions to economics, including those on impossibilities in social choice, the third-best theory, group-level Pareto improvement and increasing returns to specialization and economic organization.

he has long held as a leading welfare economist, it is useful to briefly outline some important background in the history of ideas, especially some central principles in utilitarianism developed by the classical utilitarian scholars (Section 3). I then turn to the revival of Benthamism in modern economics and the part Ng played in it (Section 4), and his original contributions in a number of research fields, ranging from the study of happiness and population ethics to the welfare of wild animals (Section 5). The paper concludes with a speculative remark on the style of Ng as a rarely found explorer in the social sciences (Section 6).

2. Ng's (1975): An Edgeworthian Axiomatization of the Benthamite Social Welfare Function

Ng's major field of scholarship is welfare economics. In this field, his first major contribution is his analysis (Ng, 1975) of why social welfare equals the simple sum of utilities of all members of society under the following two assumptions (and some other conventional and technical/minor ones). The first assumption concerns humanity's limited capability of perceiving the nuances of the world around us, a notion of the "minimum sensible" that dates back at least to Francis Edgeworth (1881), as Ng (op. cit., p. 545) points out. Stated more formally, all members in society have equatable finite sensibilities (subject to appropriate scaling of all the individual utility functions), viz. everyone is indifferent to any state A and an alternative B that is sufficiently close to A. Based on finite sensibility, and some other more conventional postulates imposed on the preference, Ng re-establishes the representation theorem that there exists a well-behaved mathematical function representing the intrinsic preference. He then proposes to adopt such a function that assumes a value at any state A exceeding that at an alternative state B at least by a constant margin if and only if A is preferred to B. The second assumption is about how to aggregate individuals' preferences across populations into, so to speak, a single societal preference. Simply put, if half of the population prefers A to B and none prefers B to A, then society is strictly better off in state A than in state B. Apparently, this so-called weak majority preference (WMP) criterion is so weak that nobody could reasonably reject it. Assuming continuity of the social welfare with respect to the utility of each and every individual based on his/her underlying preference, and the WMP criterion, Ng then establishes a summation theorem, the central result of the paper, which holds that that the social welfare, defined as a single number resulting from aggregation of the values of such utility functions across population, equals the unweighted sum of the values of those utility functions. That is, should everyone's welfare be appropriately formulated, there exists perfect substitution of utilities across individuals in society as far as the social welfare is concerned. To rigorously establish this statement, some technically useful and conceptually innocuous condition of quasi-concavity of the social welfare function (SWF) W would suffice (ibid, pp. 553–555). It is worth stressing that the very assumption of the aggregation of individuals' well-beings into social welfare is the starting point of utilitarianism, an assumption that Ng refers to as "general utilitarianism." Ng (1975), therefore, essentially makes a strong case for the idea that general utilitarianism, under the Edgeworthian finite sensibility, necessarily implies a

Benthamite SWF. It is evident that such a SWF substantially differs from both John Nash's product of (maximized) utilities and John Rawls' focus on the most miserable individual's well-being, with rich ethical implications for public policy. Regrettably, the influence of this work has largely been confined to the field of social choice theory, and its significance has been underappreciated in welfare economics, especially in the literature on the microeconomic foundation of public policy, presumably due to a widely held reluctance to accept the measurability and interpersonal comparability of utility.[2]

It is to be noted that the Edgeworthian finite sensibility approach advanced by Ng (1975) is not the only means of axiomatization of the Benthamite SWF. An alternative way of doing so, represented by d'Aspremont and Gevers (1977) and Maskin (1978), is the informational-basis approach that exploits the concept of social welfare functional (Sen, 1970), a concept that is defined on the basis of the possible individual utility functions known to a social planner who is concerned with social welfare under ethical considerations. It is worth emphasizing, however, the Bentham–Sidgwick classical utilitarianism that Ng drew upon and expounded in a number of studies in addition to the aforementioned axiomatization (Ng, 1979, 1981, 1990) differs markedly from the other strands in ethics and, especially, what emerged from the ordinalist revolution (which, as is well known, took place in economics over the 1930–1940s) and then came to be predominant in modern welfare economics. It also diverges substantially from non-utility (non-hedonistic) preference utilitarianism. Classical utilitarianism, and its modern reincarnation, is firmly grounded on a psychological foundation, the hedonistic foundation by nature, whether this be conceptualized on the basis of pleasures, happiness, felicity, enjoyment, or, on the negative side, pains and sufferings. Not surprisingly, the harshest critiques of utilitarianism that have been raised since the 1950s focus to a far greater extent on hedonistic utilitarianism than on preference utilitarianism. To appreciate Ng's unique contribution to utilitarianism, it is therefore useful to digress briefly into the works of a few classical utilitarians who established the foundation of *quantitative* hedonistic utilitarianism.

3. Classical Utilitarianism and Its Decline in Economics After the Ordinalist Revolution

We may start with Jeremy Bentham as usual, "the Newton of (utilitarian) legislation," an ambitious role Bentham assumed for himself. For our purpose, two points figure most prominently in his influential volume (1789). First and foremost, of course, he articulated the fundamental axiom in utilitarianism of "the greatest happiness of the greatest number," the so-called greatest happiness principle, which he regarded as the organizing principle

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[2] An encouraging revival of this line of inquiry, however, recently emerged. Interested readers may refer to, especially, Argenziano and Gilboa (2019), wherein finite sensibility in the social preference is likewise assumed as that in the individual preference, based on which the authors argue that monotonicity of the societal preference implies existence of a Benthamite SWF. An analysis of qualified equivalence between Ng (1975) and this work is found in Ng (2024), while the tension between them is investigated in Alexandrie (2023).

of his new science or ethics of legislation. Basing moral philosophy on hedonism (psychology), he famously wrote,

> "Nature has placed mankind under the governance of two sovereign masters, pain and pleasure. It is for them alone to point out what we ought to do, as well as to determine what we shall do. On the one hand, the standard of right and wrong, on the other, the chain of causes and effects, are fastened to their throne. They govern us in all we do, in all we say, in all we think …. The principle of utility recognizes this subjection, and assumes it for the foundation of that system, the object of which is to rear the fabric of felicity by the hands of reason and of law. … By the principle of utility is meant that principle which approves or disapproves of every action whatever, according to the tendency which it appears to have to augment or diminish the happiness of the party whose interest is in question." (ibid, the opening sentences of Chapter One, the "principle" chapter.)

Bentham, therefore, suggests ascertaining the morality of any action by hedonistic/felicific calculus. He even offers a category of fourteen kinds of pleasures and twelve kinds of pains as the so-called happiness factors (ibid., Chapter V). According to Bentham's hedonistic utilitarianism, simply put, pleasure or happiness matters and it is the only thing of intrinsic value. As is widely known, he claimed that he had founded what he called "the sect of the utilitarians." Another interesting, and closely related, point worth stressing is Bentham's standing as one of the earliest advocates of animal rights. His argument is remarkably hedonistic, in that, for him, what governs mankind, viz. suffering and pleasure, governs sentient beings in general for the same reason.[3]

John Stuart Mill's (1861) enlargement of Bentham's narrow-focused notion of happiness is well known. A systematic exposition of the hedonistic ethics, however, is developed in Henry Sidgwick's (1874) new methods of ethics, which Derek Parfit describes as "the best book on ethics ever written" and John Rawls regards as "the outstanding achievement in modern moral theory … the first truly academic work in moral theory, modern in both method and spirit."[4] To Sidgwick ethics is about what/which actions are objectively right, and for that matter, he developed ethical hedonism, which Griffin and Parfit (2018, p. 5769) describe as, "(e)thical hedonism refers to the claim that only pleasure is intrinsically valuable, that all other things that are valuable are so only instrumentally as means to pleasure." But advocating for quantitative hedonistic utilitarianism, to the extent that Sidgwick was able to, raised a key problem, the so-called "dualism of practical reason" regarding egoism, or egoistic hedonism (pursuit of one's own greatest happiness) and utilitarianism, or universal hedonism (pursuit of the greatest happiness of all), pointing to the difficult problem of the interpersonal comparison of utility.

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[3] "But a full-grown horse or dog is beyond comparison a more rational, as well as a more conversable animal, than an infant of a day or a week or even a month old. But suppose the case were otherwise, what would it avail? The question is not, Can they reason? Nor, Can they talk? But, Can they suffer?" (ibid., excerpted from the long footnote on the interests of inferior animals in Chapter 17, Section 1, Part IV).

[4] Parfit (2011, p. xxxiii); Rawls (1980, pp. 554–555).

Edgeworth therefore attempted to establish a scientific foundation for his friend Sidgwick's hedonistic utilitarianism, by drawing upon experimental psychology, preliminarily in Edgeworth (1877) and then more systematically in Edgeworth (1881). He proposed what he calls utilitarian calculus (hedonimetry) to compute the greatest possible happiness, based on recent findings by experimental psychologists of the equatable just-perceivable increments of pleasures by individuals.[5] In other words, he believed in the measurability of happiness and seriously attempted a practical estimation. Unlike Sidgwick who viewed utilitarianism through the lens of moral intuitions, Edgeworth reoriented the theoretical basis of utilitarianism to psychology. Believing in not merely the existence but also the measurability of physical units of pleasure, Edgeworth invokes the notion of "just perceivable increments of pleasure" to lay the objectively observable foundation for Bentham and Sidgwick's *quantitative hedonistic utilitarianism.* For Edgeworth, the measurability and interpersonal comparison of utility is almost self-evident. "Utility, as Professor Jevons says, has two dimensions, intensity and time. The unit of each dimension is the just perceivable increment. The implied equation to each other of each *minimum sensible* is a first principle incapable of proof" (1881, p. 7). This would be echoed about one hundred years later, in both economics and psychology, e.g., by Ng's (1975) axiomatic treatment in welfare economics and Kahneman's (1999) discussion and improvement of the bottom-up approach to the measurement of happiness, one of the central subjects in hedonic psychology.

Apart from his seminal observation of the just perceivable increments of pleasure, more often referred to as "just noticeable differences" (JND) in modern literature, another insightful point made by Edgeworth (1881) is his justification of utilitarianism by invoking choice under a veil of uncertainty. He wrote,

> "it may seem to each that as he cannot have his own way, in the absence of any definite principle of selection (of his position), he has about as good a chance of one of the arrangements as another. But, rather than resort to some process which may virtually amount to tossing up, both parties may agree to commute their chance of any of the arrangements for the certainty of one of them, which has certain distinguishing features and peculiar attractions as above described — the utilitarian arrangement" (Edgeworth, 1881, p. 55).

Partially due to the celebrated work by Pareto (1906) who developed his market equilibrium analysis by using the ordinal notion of preference alone, as a contrast to Edgeworth's treatment of cardinal-utility-based indifference curves, the marginalist

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[5] In his innovative commentary on Henry Sidgwick's *Methods of Ethics*, Edgeworth (1877, Section II) borrowed heavily from the studies by experimental psychologists, especially Gustav Fechner and Wilhelm Wundt, of the limited sensibility to stimulus, but proposed to use a new term of "capability for pleasure" for his own purpose of formulating and improving Sidgwick's hedonic ethics. Interested readers may refer to Chapter VIII of Section II in Edgeworth (1877), especially pp. 40–43. The same idea was then refined and better expounded in the name of "just perceivable increments of pleasure" in his (1881) work, which, of course, came to be much more influential for many good reasons. The latter contains, in particular, a few pages that are exclusively devoted to the axiom of just perceivable increments of pleasure (pp. 59–60) and one chapter entitled "On hedonimetry", that was initially published as a journal article in 1879, as an appendix (pp. 98–102).

economists, in general, cast serious doubt on the cardinal measurability and interpersonal comparability of utility, and thereby gradually abandoned both the notion of cardinal utility and classical utilitarianism.[6] In the 1930s and 1940s, under the strong influence of the leading ordinalist figures in welfare economics, such as Lionel Robbins, John Hicks, Abram Bergson and Paul Samuelson, the Edgeworthian cardinalist utilitarianism faded into insignificance. The utility function came to be widely treated merely as a useful immaterial device to represent the underlying preference that is revealed by the consumers' observed choice.

4. The Revival of Benthamism in Economics and Ng's Defense for and Elucidation of Welfare Utilitarianism

A revival of the classical utilitarian ideas was nonetheless underway, in the form of rigorous axiomatization, in the hands of modern theorists in the 1950s. Among them, two outstanding studies are Fleming (1952) and Harsanyi (1953, 1955). The former, under some quite acceptable postulates, proves that social welfare is additively separable in terms of individuals' utilities. The latter argues that collective choice for the general good of all is made under a veil of uncertainty as to which role any particular individual will assume, and a reasonable SWF is, therefore, equivalent to individual choice under uncertainty à la the von-Neumann — Morgenstern expected utility maximizer. The optimal social welfare, accordingly, should be formulated as the highest possible value of the average of utilities of all the members of society. It is interesting to note that Harsanyi (op. cit.), perhaps unconsciously, echoed to some extent Edgeworth's pioneering insight into justifiable utilitarianism in terms of choice under uncertainty as quoted above. It is further to be noted, at the conceptual level, that Harsanyi's uncertainty-neutralizing formulation of social welfare lends certain support to a kind of rule utilitarianism and that, relatedly, the key underlying notion of Harsanyi's theory is the existence and function of the impersonal (impartial) observer, very much like the impartial spectator in Adam Smith's (1859) ethics. Interestingly, some key aspects in both Harsanyi (op. cit.) and Ng (1975) may well date back to Edgeworth (1881), arriving at a formally similar SWF, while differing in a rather subtle manner from each other in so doing. Hedonism is rejected by Harsanyi as naive. But happiness, or welfare (broadly defined happiness), as is rooted in the Bentham–Sidgwickian pleasure, is endorsed by Ng, who indeed forcibly defends what he refers to as welfare utilitarianism as a contrast to preference utilitarianism (as I discuss further below).

It is worth stressing that Ng *firmly* belongs to the pre-ordinalist-revolution Benthamism that holds, simply put, not only that pleasure or happiness matters but that it is the only thing of intrinsic value and therefore the only thing that intrinsically matters. Many would readily accept the first part of this proposition. It is the second part that distinguishes the Benthamist (and their modern counterpart, the welfarist) from others, including sympathetic critics: the idea that it is the *only* thing that matters. One interesting case in point is Ng's (1981) defense for welfarism when rebuking some criticisms raised by Sen (1979) on

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[6] Although Pareto himself did not entirely reject cardinality of utility *per se* or its usefulness in some cases.

the predominant utilitarianism and welfarism in welfare economics. To my mind, the central and also the most forcible point Ng (1981) made for welfarism, is Ng's utilitarian accounting for the origin and evolution of some morals that non-welfarists may have (mis) understood as more basic than welfarism *per se*.[7] For Ng, many moral principles, including liberalism that many critics use to attack utilitarianism and welfarism, are adopted simply because they "generally contribute to the promotion of social welfare as defined by the welfarist SWF" (ibid., p. 529). In other words, from a welfarism point of view, some critics seem to put the cart before the horse, and risk giving priority to effects such as some moral principles and overlooking their welfarist origins, thereby undermining their criticism against welfarism or utilitarianism.

Such a Darwinian defense for utilitarian principles is also found in Ng's other writings. It is clear that such a line of inquiry goes far beyond, and does not fit into, the revealed-preference literature in ascertaining social welfare. It is probably not much of an exaggeration to say that this position alone makes Ng one of the very rare economists who over the past half a century have consistently advocated Benthamite utilitarianism. Doing so has enabled him to make original contributions to many fields, including, in particular, the study of happiness, population ethics and animals' welfare. We shall turn to each of these in turn in the next section.

5. Happiness, Future Generations and Welfare Biology

It can hardly come as a surprise, as may have been made clear above, that the utilitarian position naturally leads Ng to take happiness as an object of study in his research in welfare economics. What is unusual is that he did so as early as the 1970s (Ng, 1978), second perhaps only to Easterlin's (1974) famous study of economic growth and welfare and long before the economics profession, as a latecomer compared to some other disciplines, became sufficiently aware of the importance of the topic to take it on. Like Easterlin (1974), Ng (1978) confronted the non-monotonic relationship between, on the one hand, economic growth (often measured by *per capita* national income) and, on the other, the subjective happiness of the individuals experiencing such growth in wealth, calling for better-designed surveys and a more complete multidisciplinary study of happiness. For a long time, very few responded to this call. The situation began to change significantly only some 20 years later, largely due to the publication of three symposium papers in *Economic Journal* in 1997, of which one was authored by Ng (Robert Frank and Andrew Oswald each single-authored another). In that paper, Ng (1997) called on fellow economists to explore happiness, not only based on the Benthamite utilitarian principle that "happiness is the ultimate objective of most, if not all people" (p. 1848). No less impressively, Ng highlighted and indeed strengthened the case he had long made for the measurability and interpersonal comparability of cardinal utility (Ng, 1979, 1990, 1992; a refined analysis is found in Ng 2022, Chapters 5 and 6).

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[7] This is also the point Sen describes in his Reply as "the most persuasive" (Sen, 1981, p. 533).

Further pursuing the same line of welfarism inquiry led Ng to a territory that seems to be distant from the usual purview of economists: future generations and population ethics. Universal utilitarianism appears not to provide any good reason, when gauging the overall welfare of all human beings, to treat the currently living generation more favorably than future generations yet to be born, apart from certain discounting factors that come into play due to uncertainties. This fundamental welfarism principle results in a real and deep concern for catastrophic or even existential risks due to environmental degradation and climate change, nuclear war, or/and sometimes entirely unexpected breakthroughs in genetic engineering. Ng (1991) contributed a pioneering analysis of this increasingly important issue, which poses a pressing challenge to humanity as a whole. The same utilitarian position directed Ng's attention to some basic, and compelling, principles in population ethics as well. Shortly after the appearance of Parfit's (1984) justly celebrated volume, Ng (1989) offered a penetrating analysis of Parfit's (op. cit., Chapter 17) well-known repugnant conclusion,[8] thereby clarifying and defending utilitarianism when such ethical consideration involves the fundamental tradeoff between the size of population and the level of well-being of each individual member.

The most important achievement in Ng's fruitful enlargement of the scope of utilitarianism may well be his original analysis of the welfare of wild animals. Ng (1995) explicitly set a very ambitious goal for himself: to help found a new sub-discipline of welfare biology, in parallel to welfare economics, comprising "the study of living things and their environments with respect to their welfare (happiness net of sufferings)" (p. 255). He identified and then made a preliminary analysis of what he calls three basic questions in welfare biology: What species have meaningful welfare? Is the overall welfare, assumed to be unidimensional and measurable, positive or negative? What can be done to improve sentient animals' wellbeing? His most intriguing analysis and preliminary conclusion based on purely theoretical and sometimes speculative but persuasive reasoning, in my view, centers on the second question, viz. do wild animals, in general, suffer or not? Based on some plausible axioms conceptually drawing upon evolutionary biology and technically postulating convexity of the energy consumed (the cost function) for perceiving enjoyment or suffering, Ng (1995) arrives at his Buddhist Premise proposition: wild sentient animals' overall welfare, in general, is negative. That's both interesting and bad. Comfortingly, Groff and Ng (2019) recently identified and corrected some technical flaws in Ng's (1995) proof of the Buddhist premise, delivering a less pessimistic message: wild animals' welfare is possibly negative, but it depends. Intuitively, it is difficult to imagine that nature directs the evolution of sentient beings in a manner to allow suffering to predominate, as Buddhism teaches us to believe. Of course, we cannot go very far in answering this empirical question by trading intuitions and speculations alone. What's encouraging is that the past decade has witnessed a boom not only in TV and online programs, but also in scientific journal papers and books on the welfare of wild animals (see, e.g., Budolfson *et al.*, 2023; Dawkins, 2023; Singer, 2023; Nussbaum, 2024). It will almost surely take a

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[8] It is justifiable to satisfice a large population of quality life for a much larger population who have lives scarcely worth living, by the impersonal total-utility principle.

long time for the mission that Ng (1995) presciently outlined to be accomplished. Ng's evolutionary insights into the wild animals' welfare will claim many credits over the course.[9]

6. A Concluding Remark

To summarize, the quantitative Benthamite hedonistic utilitarianism underlies and indeed unifies much of Ng's remarkable contribution to a number of important topics across a few disciplines. For this reason, I see Ng as a Dysonian bird. It is perhaps worth recalling here Freeman Dyson's metaphor of mathematicians and physicists that he thoughtfully made in his AMS Einstein Lecture delivered in October 2008,

> "Some mathematicians are birds, others are frogs. Birds fly high in the air and survey broad vistas of mathematics out to the far horizon. They delight in concepts that *unify our thinking and bring together diverse problems from different parts of the landscape*. Frogs live in the mud below and see only the flowers that grow nearby. They delight in the details of particular objects, and they solve problems one at a time." (Dyson, 2009, the opening sentences; emphasis added)

Dyson immediately qualified his typology by warning that "(i)t is stupid to claim that birds are better than frogs because they see farther, or that frogs are better than birds because they see deeper." (ibid, p. 212). His typology certainly applies to scholars beyond mathematicians and physicists. The economics profession, in particular, has become exceedingly specialized especially since the mid-twentieth century (Hayek, 1956), and is therefore more urgently in need of birds than perhaps ever before. We are fortunate to have a figure such as Ng, whose scholarship surveys so wide a domain of fields, providing precisely the kind of integrative vision excessive specialization renders increasingly difficult. Quite a few disciplines are richer for his contribution.

References

Alexandrie, G (2023). Two impossibility results for social choice under individual indifference intransitivity. *Social Choice and Welfare*, 61, 919–936.

Argenziano, R and I Gilboa (2019). Perception-theoretic foundations of weighted utilitarianism. *The Economic Journal*, 129, 1511–1528.

Bentham, J (1789). *An Introduction to the Principles of Morals and Legislation*, London: T. Payne and Son. Open access now.

Budolfson, M, B Fischer and N Scovronick (2023). Animal welfare: Methods to improve policy and practice. *Science*, 381, 32–34.

Dawkins, MS (2023). Farm animal welfare: Beyond "natural" behavior. *Science*, 379, 326328.

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[9] It is worth remarking, in passing, that the notion of evolution figures prominently in Ng's thinking, even in his works explicitly and almost exclusively on utilitarianism (refer to, e.g., Ng, 1981 on the utilitarian origin of moral principles, as is discussed in detail in the above, and Ng (1990, pp. 178–179), on the survival-enhancing function of knowledge). Indeed, I believe that it is primarily this brilliant combination of utilitarianism and Darwinian evolution that enables Ng so successfully to cast his net as wide as he does.

d'Aspremont, C and L Gevers (1977). Equity and the informational basis of collective choice. *Review of Economic Studies*, 44, 199–209.

Dyson, F (2009). Birds and frogs. *Notices of the AMS*, 56(2), 212–223.

Easterlin, R (1974). Does economic growth improve the human lot? Some empirical Evidence. In *Nations and Households in Economic Growth: Essays in Honor of Moses Abramovitz*, PA David and MW Reder (eds.), pp. 89–125. New York: Elsevier.

Edgeworth, F (1877). *New and Old Methods of Ethics*, London: James Parker & Co.

Edgeworth, F (1881). *Mathematical Psychics*, London: C. Kegan Paul & Co.

Fleming, M (1952). A cardinal concept of welfare. *The Quarterly Journal of Economics*, 66, 366–384.

Griffin, J and D Parfit (2018). Hedonism. In *The New Palgrave Dictionary of Economics*, 3rd Edition, pp. 5769–5771. Palgrave Macmillan.

Groff, Z and Y-K Ng (2019). Does suffering dominate enjoyment in the animal kingdom? An update to welfare biology. *Biology & Philosophy*, 34, 1–16.

Harsanyi, JC (1953). Cardinal utility in welfare economics and in the theory of risk-taking. *Journal of Political Economy*, 61, 434–435.

Harsanyi, JC (1955). Cardinal welfare, individual ethics, and interpersonal comparisons of utility. *Journal of Political Economy*, 63, 309–321.

Hayek, FA (1956). The dilemma of specialization. In *The State of Social Sciences*, LD White (ed.), pp. 462–473. Chicago: University of Chicago Press.

Kehneman, D (1999). Objective happiness. In *Well-being: The Foundation of Hedonic Psychology*, D Kahneman, E Diener and N Schwarz (eds.), pp. 3–25. New York: Russell Saga Foundation.

Maskin, E (1978). A theorem on utilitasianism. *Review of Economic Studies*, 45, 93–96.

Mill, JS (1861). Utilitarianism. In *Collected Works*, Volume 10, London: Routledge, open access now.

Ng, Y-K (1975). Bentham or Bergson? Finite sensibility, utility functions and social welfare functions. *Review of Economic Studies*, 42, 545–569.

Ng, Y-K (1978). Economic growth and social welfare: The need for a complete study of happiness. *Kyklos*, 31, 575–587.

Ng, Y-K (1979). *Welfare Economics: Introduction and Development of Basic Concepts*. London: Macmillan, open access now.

Ng, Y-K (1981). Welfarism: A defense against Sen's attack. *The Economic Journal*, 91, 527–530.

Ng, Y-K (1989). What should we do about future generations? Impossibility of Parfit's theory X. *Economics and Philosophy*, 5, 235–253.

Ng, Y-K (1990). Welfarism and utilitarianism: A rehabilitation. *Utilitas*, 2, 171–193.

Ng, Y-K (1991). Should we be very cautious or extremely cautious on measures that may involve our destruction? *Social Choice and Welfare*, 8, 79–88.

Ng, Y-K (1992). Utilitarianism and interpersonal comparison: Some implications of a materialist solution to the world knot. *Social Choice and Welfare*, 9, 1–15.

Ng, Y-K (1995). Towards welfare biology: Evolutionary economics of animal consciousness and suffering. *Biology and Philosophy*, 10, 255–285.

Ng, Y-K (1997). A case for happiness, cardinalism, and interpersonal comparability. *The Economic Journal*, 107, 1848–1858.

Ng, Y-K (2022). *Happiness: Concept, Measurement and Promotion*. Singapore: Springer, open access.

Ng, Y-K (2024). Utilitarianism: Overcoming the difficulty of interpersonal comparison. *Singapore Economic Review*, 69(4), 1525–1536.

Nussbaum, M (2024). *Justice for Animals: Our Collective Responsibility*. New York: Simon & Schuster.

Pareto, V (1906). *Manuale di Economia Politica*. For an English translation, *Manual of Political Economy*, JS Chipman *et al.* (ed.). Oxford University Press.

Parfit, D (1984). *Reasons and Persons*. Oxford: Oxford University Press.

Parfit, D (2011). *On What Matters*, Vol. 1. Oxford: Oxford University Press.

Rawls, J (1980). Kantian constructivism in moral theory. *The Journal of Philosophy*, 77, 515–572.

Sen, A (1970). *Collective Choice and Social Welfare*. Amsterdam: North-Holland.

Sen, A (1979). Personal utilities and public judgements: Or what's wrong with welfare economics? *The Economic Journal*, 89, 537–558.

Sen, A (1981). A reply to Welfarism: A defense against Sen's attack. *The Economic Journal*, 91, 531–535.

Sidgwick, H (1874). *The Method of Ethics*, 1907, 7th Edition, United Kingdom: Hackett Publishing Co, open access now.

Singer, P (2023). *Animal Liberation Now*, London: Penguin Books, Random House.

Smith, A (1859). *Theory of Moral Sentiments*, printed for A. Millar, in the Strand; and A. Kincaid and J. Bell, in Edinburgh, London. Open access now.