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PARFIT, RISK ASSESSMENT, AND IMPERCEPTIBLE EFFECTS

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ACCORDING to the U.S. Office of Technology Assessment, 25 to 30 percent of us will die from cancers, 90 percent of which are environmentally induced and hence theoretically preventable. All of us, however, are subjected to a multitude of different carcinogens, each in doses alleged to be harmless.[1] How is that each infinitesimal, individual exposure (with imperceptible effects) is alleged to be acceptable, but that together these doses (with perceptible effects, like cancer) are unacceptable?

I. INTRODUCTION AND OVERVIEW

In *Reasons and Persons* ("Mistakes in Moral Mathematics") Parfit argues, correctly I think, that one ought not follow "commonsense morality" and ignore acts causing such imperceptible effects on large numbers of persons.[2] Although his conclusion is correct, Parfit's four main arguments (used to justify his account of imperceptible effects) are highly questionable. I call these the "Mistaken-Pain Defense," the "Total-Effect Defense," the "Paradox Defense," and the "Simplicity Defense":

> *Mistaken-Pain Defense:* if we admit that "someone's pain can become less painful, or less bad, by an amount too small to be noticed," then there can be imperceptible harms and benefits.[3]
>
> *Paradox Defense:* unless we admit that "someone's pain can become less painful or less bad, by an amount too small to be noticed," then "we face a wider problem, variously called the

Sorites Problem, Wang's Paradox, or the *Paradox of the Heap.*[4]

Total-Effect Defense: we can appeal to the "total effect" of what each action (with allegedly imperceptible effects) accomplishes.[5]

Simplicity Defense: if we hold that there are imperceptible harms and benefits, then our account of why it is wrong to cause imperceptible suffering "could be simple."[6]

These four arguments are problematic because they rely on (i) taking pain as a paradigm instance of harm; (ii) assuming that pain predicates, such as "at least as bad as," are transitive; (iii) attempting to show that acts with allegedly imperceptible effects are members of a set of acts together causing perceptible harm; (iv) presupposing that there is an easy, practical way of ascribing responsibility for *individual acts* when one deals only with the total effects of *sets of acts;* (v) assuming that it is easy to determine causal chains of harm; (vi) using a questionable notion of collective responsibility; (vii) presupposing that allowing ourselves to be mistaken about pain lets us preserve transitivity (and therefore collective responsibility for sets of acts); (viii) employing unrealistic examples to support key points; (ix) using deductive arguments with vague predicates to establish his claims; and (x) ignoring the privacy problem.

Although Parfit is correct in claiming that we ought not ignore imperceptible effects on large numbers of persons, his reasons for this conclusion err. Since I have argued elsewhere that the Simplicity Defense fails,[7] in this essay I show why the Mistaken-Pain Defense, the Paradox Defense, and the Total-Effect Defense are equally problematic. I also argue that an alternative framework, probabilistic risk assessment, is superior to Parfit's for taking account of allegedly imperceptible effects on large numbers of persons.

II. Parfit's View

Acts with imperceptible effects on other people pose difficulties, especially for consequentialists, since such acts apparently cannot be wrong *because* of their effects. To resolve these difficulties, claims Parfit, persons often make a fifth "mistake in moral mathematics" and appeal to a false tenet: "an act cannot be right or wrong because of its effects, if the effects of this particular act are imperceptible."[8] Instead, says Parfit, such acts can be shown to be wrong because each such act may be one of a *set* of acts causing perceptible

harms or benefits. To substantiate his point, Parfit uses the sample of 1000 wounded men in the desert; each of the 1000 remaining soldiers, all altruists, must decide whether to contribute his pint of water to the common water cart where it will be distributed equally to the wounded. Parfit stipulates that Outcome (1) is that in which 1 man contributes his pint of water to the 100 pints (already collected) to be distributed to the 1000 wounded men, that Outcome (2) is the case in which 2 persons contribute their pints, that Outcome (3) is the case in which 3 persons contribute. . . . and that Outcome (900) is the case in which all of the remaining 900 persons contribute. Because the contribution of one pint would add only one one-thousandth of a pint of water to the ration of each of the thousand men, says Parfit, the benefit to each thirsty person from the contribution of one pint would be imperceptible.[9] But suppose a thirsty person says, continues Parfit, that his pain in Outcome (2) is at least as bad as it was in Outcome (1), that his pain in Outcome (3) is at least as bad as it was in Outcome (2). . . . and that his pain in Outcome (900) is at least as bad as it was in Outcome (899). Therefore he also ought to be able to say that his pain in Outcome (900) is at least as bad as it was in Outcome (1). But it would be absurd to say that the individual's pain in Outcome (900), where he has one pint to drink, is at least as bad as it was in Outcome (1), where he had only one-tenth of one pint to drink. Parfit's reasoning is as follows: If one assumes both (A) that "someone's pain cannot become *imperceptibly* better or worse," and (B) that "*at least as bad as*, applied to pains, is a transitive relation," then one reaches absurd conclusions.[10] Hence Parfit argues: "Since this conclusion is absurd, we must reject either (A) or (B). Which should go? I reject (A)."[11]

Parfit's reasoning in rejecting (A) is that, if one admits that one's pain can become imperceptibly better or worse, then the pain predicate ("at least as bad as") can be said to be *transitive;* any apparent instance of *intransitivity* arises only because of mistaken perceptions about one's pain (mistaken perceptions about one's harms or benefits).

As grounds for choosing the latter course, rejecting (A), the claim that one is always correct about changes in the degree of one's pains (and therefore, correct about changes in the degree of one's harms or benefits), Parfit provides four related arguments, all of which are deficient. Let's examine these in order.

III. Problems with Transitivity

Before considering these four arguments, however, it is important to point out that there are difficulties with Parfit's appeal to

transitivity. His claims about transitivity are essential, *both* to all Parfit's defenses of his theory of imperceptible harms and benefits *and* to the success of his account of the total effects of sets of actions.

The main difficulty is that Parfit conceives the set of actions (each of which has imperceptible effects) as a set precisely because he alleges that the predicates describing their effects (e.g., "at least as bad as," when applied to pains) are transitive. Were the predicates not transitive, then on Parfit's terms a person (whose act caused no increased pain) could not be said to be responsible for the perceptible harm caused by a set of acts, of which his act is one. Parfit maintains that such predicates are nontransitive precisely because the speaker is mistaken about his pain. He appears to believe that, were someone not mistaken about his pain, his pain predicates would be transitive; because of this transitivity, the agent of act X is in part responsible for the total effects of the set of acts which include X.[12] In other words, Parfit seems to believe that our allowing ourselves to be mistaken about pain lets us preserve transitivity and therefore a sense of collective responsibility for acts for which we otherwise might not be said to be responsible. This seems well and good, until one tries to determine what sort of responsibility is at issue.

What would it *mean* to ascribe responsibility on the basis of Parfit's particular notion of transitivity? Suppose I say: "Pain predicates are transitive." What sense would this assertion have if the item said to be transitive describes a state (pain) about which the subject could be mistaken? How could a predicate which was able to be misused, because of one's making mistakes about his pain, be said to be transitive? How would one *know* that it were transitive, apart from the way it was used? Presumably one must have a "fix" on the item said to be transitive, or else one could never know that it was used consistently and hence never know that it were transitive. Without such a "fix," one would never know *what* it was that was said to be transitive. Yet the fact that Parfit says that one could be mistaken about his pain and therefore mistaken in ascription of pain predicates means that one does not have a definite "fix" on these predicates. And if one does not have a fix on them, then one does not know *what* is being said to be transitive. And if one does not know what is being said to be transitive, then it is unclear how this notion of transitivity is robust enough to undergird claims about total effects, imperceptible effects, and collective responsibility.

IV. The Mistaken-Pain Defense

Perhaps part of the reason why Parfit appeals to such a questionable notion of transitivity, as his basis for rejecting (A) and accepting (B) is that he believes that he is then able to provide an account of responsibility for sets of actions, each member of which has imperceptible effects. If Parfit can establish the mistaken-pain defense, then he can explain how and why we are responsible for actions having imperceptible effects.

Consider the mistaken-pain defense: We ought to reject (A) because "someone's pain can become less painful or less bad, by an amount too small to be noticed."[13] As Parfit argues, "people have been shown to make very small mistakes when they report the nature of their experiences. Why should we assume that they cannot make such mistakes about the badness of their pain and the strength of their desire that some pain cease?"[14]

Parfit's reasoning here is persuasive. Indeed, we are all familiar with cases in which we have been mistaken about the nature of our experiences. For example, we may claim to have seen a white wall atop the distant sea, when it was really the famous *Fata Morgana* mirage.[15]

The pain case, however, is radically different from certain other first-person experiences.[16] If I believe that I have seen the *Fata Morgana*, for example, then my first-person report is corrigible; it is possible to determine whether, at the time and place I "saw" the image, there was really a white wall there. Likewise, if I "see" a bent stick in water, I can lift the stick from the water and learn that I saw a stick which only appeared to be, but was not really, bent. In cases such as these, I can correct or substantiate my claims about my experiences. I can do so because there is some sort of "court of appeal" (usually based on varying or manipulating the conditions of observation) beyond my single, alleged experience. When I report my pain experience, however, there is no such court of appeal. There is no point of privileged access from which to affirm or deny my first-person pain utterances. Admittedly, a particular individual might claim to have made a mistake when she said she was in pain; perhaps she experienced intense cold and claimed to have felt pain. If someone pointed out to her later that her pain receptors were not affected by the cold, then she might claim to have mistaken feelings of cold for feelings of pain.[17] It is not clear, however, that the mistake would be in feeling, rather than in remembering, pain. Moreover, even if it could be established as a mistake about pain feeling, about

being in pain or not, it would not provide the kind of example needed by Parfit. Such an example does not entail either that one can determine degrees of pain or that one can be said to be mistaken about the degree of one's pain, as Parfit alleges.

If one could make a mistake about the degree of one's pains, presumably this would mean that there were some gauge of "real pain," a gauge capable of distinguishing pains which were closely similar in type and intensity. This in turn would mean that when any two pains were compared, via this gauge, one might be shown to be wrong, e.g., in believing that the pain in Outcome (2) is at least as bad as the pain in Outcome (1) in Parfit's water-cart example. But what could this gauge of "real pain" be? Surely not some physico-chemical or behavioral criterion, since (in any given case) one could always deny, incontrovertibly, that a particular scientific criterion provided an accurate pain indicator. For example, one's symptoms or physical state could improve slightly, while one's pain statements indicated a worsening condition. The physical state need not count against the correctness of the first-person utterance about the pain state, however, both because some pain states (e.g., psychosomatic ones) may not be merely functions of physical states and because one could always allege that there were some hidden variables responsible for the pain.

Suppose I say, "I now have such and such a pain." Suppose, five minutes later, I say, "The pain I now have is at least as bad as that which I had five minutes before." According to Parfit, I could be mistaken in my claim that the later pain was at least as bad as the earlier one. But what would it *mean* to say that I am mistaken in believing that my later pain was at least as bad as the earlier one?

How could I know that I was mistaken about the degree of some pain if, of necessity: (1) I cannot again experience that same pain and (2) I cannot experience two pains (an earlier and a later one) at the same time and cannot compare them, phenomenally, without the use of memory? If I am wrong in asserting, "My later pain was at least as bad as the earlier one," then presumably the allegedly correct assertion would be something like the following. "I felt at least as much pain in the later case as I remembered feeling in the earlier one, but I really felt less pain in the later case than I remembered feeling in the earlier case." In other words, short of contradiction, how could I say that I was mistaken about my pain, if I am the only authority on my pain and if I cannot have "that" pain again and know it was "that" one? How could one say, "I have less pain, but I feel it more"? If one feels it more, then one has more pain. If one has

less pain, then one feels it less. In other words, there appears to be nothing, not even the later claim of the speaker herself, which could demonstrate that she was mistaken about her own earlier pain feelings. This is because, even in the case of the later claim, the error could be one of *remembering* and not a mistake in *feeling* or *reporting* one's pain. For example, to use M. Bayles' example, suppose a person says, "My pain yesterday was not as bad as it is today." Suppose her friend responds, "But yesterday you were screaming and writhing and you claimed that the pain was awful. Today your behavior is far less extreme and you appear to be in much less pain." Suppose, as a result of this reminder, the person then admitted, "Oh, I suppose you are right; yesterday's pain was at least as bad as today's." In such a case, it would probably be more reasonable to argue that the person was not mistaken in her pain *feelings* about the degree of yesterday's pain but that she was mistaken in her *remembering* the pain.

Since Parfit wants to make a case for the claim that (A) should be rejected, and that our pains can increase or decrease "by an amount too small to be noticed," then one of his strongest arguments would be a counterexample to (A). To be believable, this counterexample would need to be a real-life instance in which two pains are said by a subject to be the same, even though they are really distinct. But Parfit has not provided such an example; he has only postulated hypothetical cases in which he assumes what he wishes to prove, that two pains said to be the same by their subject are really distinct. Moreover there are strong grounds for saying that, in principle, he could not provide a real case. This is because, as Goodman recognized: "since qualia are phenomenal individuals, we can hardly say that apparently identical qualia [qualia which appear identical] can be objectively distinct."[18] True, people make small mistakes when they report " the nature of their experiences."[19] But because one can be wrong about experiences of one kind, e.g., seeing a mirage, does not mean that one can be wrong about experiences of a quite different kind, e.g., feeling pain, since (1) there is no point of privileged access from which to affirm or to deny a first-person pain utterance; (2) there is no gauge of "real pain," no certain basis on which to affirm or to deny a first-person pain utterance; and (3) it is possible neither to experience again an earlier pain, and know it was the same one, nor to experience earlier and later pains at the same time, so as to compare them phenomenally, without the use of memory. In giving us extremely hypothetical examples, such as torturer's actions causing no increased pain, Parfit has assumed/stipulated, not argued, that persons were wrong about their pain.

Moreover, in discussing the topic of "imperceptible harms and benefits,"[20] why does Parfit focus only on pain or its relief as a harm or a benefit? Surely pain is a problematic or misleading paradigm of harm, at least for the reasons (1)-(3) just summarized in the earlier paragraph. Pain is also a misleading paradigm of harm, if one follows Feinberg's account. On his view, harm is a setback of interests, and such a setback can occur even if one is not aware of it or of pain and even if one cannot measure the setback.

Parfit's hypothetical examples about acts of torture or deprivation which cause no pain are likewise problematic both because such acts could cause later pain or complications and because, even when pain is present in a given case, it is often difficult to ascertain its precise cause. For all these reasons, using pain as a prototypical example (of an action's harmful effects) is problematic. But if pain is a problematic instance of harm, then it is questionable whether it can do the work assigned to it by Parfit. That is, it is clear neither that alleged "mistakes about pain" can alone provide evidence for imperceptible harms, nor that "someone's pain can become less painful, or less bad, by an amount too small to be noticed."[21] For both these reasons, it is doubtful whether (C) the Mistaken-Pain Defense provides sufficient grounds for rejecting (A).

V. The Paradox Defense

But what about Parfit's second defense of his account? Does it provide an adequate framework for showing why actions with imperceptible effects can be wrong?

In the Paradox Defense, Parfit claims that, if one does not reject (A), the thesis that someone's pain cannot become imperceptibly better or worse, then one faces the wider problem of Wang's Paradox or the Paradox of the Heap.[22] Wang's Paradox is usually formulated as follows:

> 0 is small;
> If n is small, $n + 1$ is small;
> Therefore, every number is small.

To generate Wang's Paradox, one need only consider a finite number of the statements of the form of the second premise above. If all these were true, then the conclusion above would be false. A similar "false" conclusion is alleged to follow from the Paradox of the Heap, of which Wang's Paradox is the contraposition:

0 grains of sand are too few to make a heap;
If n grains of sand are too few to make a heap, then $n + 1$ are too few.
Therefore every number of grains of sand are too few to make a heap.[23]

Parfit claims that, if we assume there cannot be imperceptible benefits, then we fall victim to this paradox.[24] Hence he apparently believes that, if we avoid the paradox, then we must assume that there can be imperceptible benefits. *This means that Parfit would be wrong if we were to avoid both the paradox and the assumption that there can be imperceptible benefits.*

Could we avoid the paradox and yet assume that all benefits must be perceptible? Clearly we can avoid the paradox, in the sense that there are some interpretations of "small" for which the premises and the conclusion of the "paradox" are both true. However, on any interpretation under which the argument constitutes a paradox, the predicate "small" (or the word "heap") will be vague. I shall argue that the paradox is evidently due to this vagueness.[25] Why should Parfit claim to be facing a paradox, if indeed it is generated by vagueness? I would deny that, in the presence of vague predicates, an argument each step of which appears valid is necessarily itself valid.

One reason why an argument, each step of which is apparently valid, is not itself necessarily valid in the presence of vague predicates is that contradictory assumptions often underlie the definition of the predicate in question. Take the case of the Paradox of the Heap, for example. Here Parfit likely assumes both that the predicate "too small to make a heap" is ostensively defined and that it is not the case that this predicate is ostensively defined.

Recall that, to master the sense of any predicate is to learn (at least) to distinguish cases in which it may be correctly applied from those in which it may not be. In the case of the Paradox of the Heap, the underlying assumption appears to be (0) that the sense of the predicate, "too small to make a heap," is mastered ostensively, since grains of sand may be observed, and since there is no non-ostensive rule specifying how many such grains constitute a heap. However, if mastery of this predicate can be accomplished ostensively, then a comparison of two relevant cases must always reveal a difference perceptible through sense experience. The claim that the whole range of application of a predicate can be made intelligible by "ostensive means" therefore presupposes that it is never the case that only one of a pair of objects, which the senses cannot tell apart, is

characterized by it.[26] Yet, the denial of this presupposition central to ostensive definition is exactly what underlies the Paradox of the Heap. This means that someone (like Parfit) who accepts the paradoxical nature of this paradox either has to deny that such predicates (e.g., "too small to make a heap") can be fixed by ostensive definition or he has to admit that one cannot be mistaken about them. Parfit presumably would deny that one cannot be mistaken about these predicates, since he argues that, in a similar case, one can be mistaken about the application of pain predicates.[27] But if one admits that he could be mistaken about predicates such as "too small to make a heap," then he must deny that such predicates can be fixed by ostensive definition. And if he denies that such predicates can be fixed by ostensive definition, then he contradicts the underlying assumption (0) noted above, that the predicate, "too small to make a heap," is defined ostensively. If this reasoning is correct, and if Parfit's interpretation of this paradox involves his making contradictory assumptions about how the central predicate in the "paradox" is defined, then one cannot claim that the paradox exhibits a valid argument. If the same (vague) predicates are not used consistently in an argument, then it makes sense to deny that, in the presence of vague predicates (such as "too small to make a heap"), an argument, each step of which appears valid, is necessarily valid.

Dummett claims that such a denial "violates the concept of valid argument itself."[28] Presumably Parfit would agree with him on this point, since he employs the Paradox Defense of his claim that (A) ought to be rejected. Yet, if a term *B* is vague, for example, in "*A* entails *B; B* entails *C;* therefore *A* entails *C,*" then one has no way of knowing whether the *B* in "*A* entails *B*" is the *same B* as the one in "*B* entails *C.*" If one does not know how either the first *B* or the second one is defined or interpreted, despite the fact that they share common symbols, and if one does not know whether they are defined or interpreted in the same way, then why should denying the validity of this argument constitute violating "the concept of valid argument itself"? Rather, this denial appears to constitute recognition that the alleged paradox may represent a fallacy of equivocation, an argument with no univocal middle term. Since the alleged middle term, "too small to make a heap," for example, may have two assumed definitions (one ostensive and one not ostensive), denying the validity of arguments with vague predicates actually preserves the concept of valid argument. It amounts to denying the validity of an invalid argument.

Admittedly, a denial of the validity of arguments with vague

predicates might be advanced by a "strict finitist" (a person who insists that the meanings of our terms must be given by reference to constructions which we can in practice carry out, and to criteria of correct proof on which we are in practice prepared to rely) in mathematics.[29] In denying the validity of vague arguments, one is committing oneself neither to the necessity of providing constructions which can in practice be carried out, nor to the strict finitist claim that a proof is valid just in case it can in practice be *recognized* by us as valid. Rather, one is committing oneself simply to the necessity of employing precise, rather than vague, terms in arguments. Whether the argument is *recognized* as valid is another, and later, point. Apart from whether it is *recognized* as such, a valid argument does not *exist* unless one meets the precondition of employing rules of inference correctly. But one does not employ rules of inference correctly unless one is able to ascertain that repeated instances of the same term have the same meaning. Frege had a similar (but more extreme and hence more problematic) insight, that the use of vague predicates and phrases, like "looks to be the same color as," or "feels as if it is the same pain as," is fundamentally incoherent.[30] I do not wish to argue for such an extreme (and unpopular) position, since we do appear to understand (in some sense) vague terms, e.g., "reasonable person" in the law, which suggests that vague terms may not be incoherent. Rather, my claim is merely that one ought not claim to draw valid conclusions from an allegedly deductive argument employing vague predicates.

The use of vague predicates in allegedly deductive arguments about pain is questionable, however, not only because arguments containing them may have neither a genuine middle term nor consistent interpretations of the same predicate, but also because we lack a notion standing to pain, for example, as that of real position stands to phenomenal (observed) position. Likewise we lack a notion standing to real color, as that of real length stands to phenomenal length. Because of the absence of what Goodman would call a "pain chart" or a "color chart,"[31] it is impossible to assert that we were wrong about our experiences of things such as degrees of colors or pains. And, if we cannot assert that we were wrong in using such predicates, then they are vague and their interpretations could be inconsistent. But if so, then one is not forced, via the Paradox Defense, to affirm the existence of imperceptible benefits (e.g. increased amounts of water which are so small as not to lessen one's painful thirst), in order to avoid paradox. Indeed one is not forced to do *anything* to avoid alleged paradox, because the paradox exists only if one illicitly insists on using a deductive inference scheme containing a vague word or phrase.

People like Goodman and Russell avoided the paradox and related problems associated with this incoherence by arguing that certain concepts like color require narrower criteria of reapplication than mere observational or experiential indistinguishability. Goodman's solution was to claim that "we need only recognise that two qualia are identical if and only if they match all the same qualia."[32] Hence, rather than following Parfit and alleging that persons can be mistaken about changes in degrees of their pains and that pain predicates are transitive, one might follow Goodman and make another move. One might say that, in cases where pain predicates appear not to be transitive (like Parfit's 1000 thirsty men in the desert), the persons are not *mistaken* about their *pains;* rather they are *misusing* pain *language.* Continuing this same line of thought, one might say that persons using vague predicates need to employ narrower criteria of reapplicability. Once these narrower criteria were used, there would be no problem with the paradox or transitivity.

Admittedly, Goodman's and Russell's moves here are controversial. In proposing narrow criteria for reapplicability of vague concepts, Goodman and Russell are open to the charges that they have removed these concepts from being truly phenomenal, and that they have driven a wedge between ordinary language and experience. Dummett's complaint is that such a new sense of "phenomenal quality" or "phenomenal concept" is radically at odds with our traditional notions of both terms.[33] However, the fact that Goodman's and Russell's moves here are counterintuitive does not necessarily damage their account. This is both because all intuitions are not sacrosanct,[34] and because progress in knowledge frequently consists in delivering us from false intuitive notions, e.g., that space is not relativistic or that particles always have mass. Apart from whether they are correct or not, Goodman's and Russell's moves are significant at least in illustrating yet another reason why acceptance of (A) need not involve one in a paradox. And if not, then one need not reject (A), the claim that someone's pain cannot become imperceptibly worse.

VI The Total-Effect Defense

Parfit's third argument for rejecting (A) is that, if we do so, then we can appeal to the "total effect" of what each action (with allegedly imperceptible effects) accomplishes. Here Parfit cites the example of 1000 torturers. Although by each turn of the pain switch, each torturer affects each of his 1000 victims' pain imperceptibly, after

1000 turns of the switch, by all 1000 torturers, they have inflicted severe pain. In the Total-Effect Defense, Parfit maintains that, if we reject (A), then we can claim that an individual (torturer) who causes no perceptible pain to a great number of persons nevertheless "causes each victim to suffer slightly more," and thereby imposes a "great total sum of suffering."[35]

The primary problem with the Total-Effect Defense is not that it presupposes the existence of some "real pain," like "real color," as did the Mistaken-Pain Defense. Rather, the problem is that Parfit's sole basis, in his defense of the distinction (between *being* in the same pain and *seeming* to be in the same pain), appears to be that the predicate, "at least as bad as," when applied to pains, is behaving nontransitively. In other words, Parfit appears to sanction the claim that people can be mistaken about their pains purely because, if he does not do so, then it is impossible to claim that the pain predicate is transitive. And if it is impossible to claim that the pain predicate is transitive, then Parfit is unable to refer to the total effects of acts which are harmful but each of which allegedly causes no increase in pain.

To present a more plausible rejection of (A), the thesis that someone's pain cannot become imperceptibly better or worse, Parfit might need to determine *independently* the circumstances distinguishing *being* in pain from *seeming* to be in pain. Were that accomplished, his move to fix blame for individual acts by "saving" transitivity, and therefore "saving" actions' "total effects" would appear less *ad hoc*.

Even were there independent, rather than *ad hoc*, grounds for using transitivity to ascribe responsibility for acts via their "total effects," there would be strong *theoretical, practical* and *linguistic* reasons for not doing so. On the theoretical side, ascribing responsibility for acts to a group of people (such as the 1000 torturers), all of whom are collectively responsible for the "total effects" of the acts, gets one into a number of philosophical difficulties associated with collective responsibility. One of these problems is determining the level of each one's "share" of the responsibility.

Another difficulty is knowing precisely how to define the set whose member acts are performed by agents who are responsible for the "total effects." For example, Virginia Held argues that, "from our attribution of an action, and moral responsibility, to a collectivity [group of persons], it does not follow that the collectivity's members are morally responsible for the action of the collectivity."[36] Likewise, Stanley Bates argues that, if moral responsibility can be distributed to every member of a "random collection," then it is

because of the criterion by which we pick out the members as being members of *that* random collection (to which we attribute the action for which we are assigning moral responsibility); moreover, argues Bates, spatial and temporal contiguity is an insufficient basis to determine group membership.[37] *Although there is no space here to analyze either Held's and Bates' arguments or those of other philosophers on this topic,* the existence of such arguments indicates that it could be very difficult to establish a notion of collective responsibility, such as that presupposed by Parfit.

On the practical side, there are at least two obvious difficulties with ascribing responsibility to a person for an act which, only together with other acts, results in perceptible benefits or harms. These are that (1) one often does not know if the other acts have occurred or are likely to occur, and (2) one can avoid responsibility for his act by alleging that the other acts have not occurred or are unlikely to occur. Numerous governmental and industrial agents, in exactly these sorts of cases (single acts whose effects are allegedly imperceptible but which together with other acts have perceptible effects) make claim (2). They maintain that the necessary conditions for harm (the occurrence of the other acts in the set) have not been met. Because of their making this claim, and thereby focusing on *sets* of acts whose members (they say) have a low probability of occurrence,[38] it is difficult to hold them accountable for harms allegedly resulting only as a consequence of the occurrence of all the members of the set. Hence, it is not clear that Parfit's strategy of dealing with total effects of *sets of acts* provides a practical way of ascribing responsibility for *individual acts* with allegedly imperceptible effects.

Not knowing whether other acts in the set have occurred is just as troublesome to Parfit's strategy of collective responsibility. One often does not know because epidemiological studies and various forms of monitoring low-effect hazards simply do not take place. For example, in pesticide monitoring in the U.S., food chain and synergistic effects, both important pathways for human risks, are ignored because determining all these effects would be both difficult and costly. With 60,000 different chemicals annually used commercially in the U.S., and approximately 1000 new ones added each year, only a small fraction are ever monitored. Because they are not fully monitored, it is extremely difficult to infer the complex sets of causes of obvious harms, even when one knows the statistical risks associated with various causal agents. Cancers do not wear tags saying who caused them and how they occurred. We know the probability of contracting liver cancer, for example, given a particular level of

exposure to vinyl chloride, just as we know the probability of contracting lung cancer, given a particular level of exposure to asbestos. However, we cannot infer with certainty either that a given liver cancer was caused by exposure to vinyl chloride, or that a particular lung cancer was caused by exposure to asbestos, simply because the causal chain is complex and rarely fully known. This is why it took a year of costly and difficult research by many persons before polybrominated biphenyls (PBB's), for example, were identified as the source of a serious and well known contamination problem.[39] The difficulty of establishing the causal sequence of events is also why, in a recent liability case in Michigan, all the manufacturers of DES sold in that state were assessed liable as a consequence of damage claims. The court lumped all damage claims together and assessed liability to manufacturers on the basis of their share of the DES market in Michigan. Although there was a causal chain from a particular DES manufacturer to each victim, it could not be established.

Given the difficulty of discovering causal chains of harms, it is easy to see why various industrial and governmental groups repeatedly avoid responsibility for their actions by claiming that low-level exposures to certain substances are alone insufficient to cause certain harm.[40] Phenomena associated with small, allegedly imperceptible effects of acts are rarely determinate enough to enable one to settle the question of the morality of those acts by appeal to the causal chain in which the acts are imbedded. The causal chain is often unknown.[41] But appealing to the total effects of a set of acts assumes that one can easily determine etiology. Since we cannot easily do so, it is questionable whether Parfit's consideration of "total effects" has much applicability to real-world problems of ascribing responsibility for individual acts allegedly having imperceptible effects.

VII. An Alternative Approach to Allegedly Imperceptible Effects

If an alternative theory were capable of answering some important questions about allegedly imperceptible effects, what might it be like? First, addressing Parfit's problems with transitivity and simplicity, an alternative account might be built on (A), acceptance of the claim that there are no imperceptible changes in the degree of pain and no imperceptible (i.e., nonmeasurable) harms and benefits.

Second, it would be an account in which one were able to talk about increased and decreased *risk,* or increased and decreased probability of harm. Scientists and risk assessors long ago began talking about certain harm, no harm, and risk or probability of

harm. Economists, for example, talk about the "compensating wage differential," the wage which is higher because the occupational *risk* of harm, not *certain* harm, is greater than that for a similar job.[42] Epidemiologists also talk in terms of risks and probabilities, not in question-begging, either/or terms of harm/no harm.[43] Engineers computing risks from energy technologies, for example, typically use the BEIR dose-response curve to relate radiation exposure to cancer risk; they know that one rad of radiation is responsible for approximately .0002 cancers.[44]

Were we to think of all types of harms and benefits in terms of probabilistic dose-response or act-consequence curves, as scientists and risk assessors do, then we could avoid talk about imperceptible differences in pain. A philosophical analysis of allegedly imperceptible effects could then be expected to focus, not so much on linguistically peculiar pain statements and a priori assertions of causality, in order to establish moral responsibility, but on measurement difficulties associated with various probabilistic and dose-response criteria for harm.

To engage in such probabilistic and scientific talk, however, one would have to define increased risk as a harmful effect of an individual act, and decreased risk as a beneficial effect. To make this transition from speaking of *sets* of acts causing *certain* harm to *individual* acts causing increased *risk* of harm, however, one likely would have to make two further admissions. One is that (3) the effects of every non-mental act are capable of being known in some way, at least at the molecular level through sophisticated instrumentation. Another admission is that (4) the absence of perceptible change in *pain* is not a sufficient basis for affirming that an *effect* is imperceptible. Admission (3) seems to me to be at least in principle plausible,[45] and I defended admission (4) earlier in this section.

With all this talk of evaluating *perceptible* harm at the physiological or molecular level, e.g., in terms of increased risk, it is important to note that Parfit is not clear as to what he means by "imperceptible." He apparently means by it, "effects on other people, if none of these people could ever notice any difference."[46] Yet surely Parfit must mean more than this, since it is obvious that agents are responsible for harmful effects which are "not noticed" by their victims.

VIII. Parfit's Response

What would Parfit say about the preceding "alternative account" of allegedly imperceptible harms? His main objection would

likely be that any theory which accepts (A), the thesis that pain cannot become imperceptibly worse, is therefore bound to reject (B), to reject the thesis that predicates about pain are transitive.[47] Parfit appears to believe that giving up transitivity is untenable, so he argues that pain can become imperceptibly worse.

It is less than obvious, however, why accepting (A) entails rejecting the thesis that predicates about pain are transitive. This is because, even were Parfit really able to "save" transitivity by rejecting (A), it is not clear that much would be gained by his doing so. This is because transitivity has never been in question, as Dummett has pointed out,[48] in any except a very few cases. Transitivity has never been in question in cases in which the application of predicates is taken to be established by observational comparison of some object with a prototype. For example, if we say "*X* is circular," then it is because we can compare *X* with prototypical circles. Further, if we say "*X* is circular, and all circular things are *Y*," then we can also say "*X* is *Y*," because the "difference " in question is discriminable with respect to a prototype. In other words, because of the existence of this prototype, being circular is a discriminable difference, and because it is a discriminable difference, it is transitive. (If we say "*X* is painful," or "*X* is red," however, the transitivity is in question because the application of the predicates, "red," and "painful," is not taken to be established by observational comparison of some object with a prototype. We cannot compare *X* to some prototype for "painful" or for "red," because there is none. These differences are non-discriminable, and because they are non-discriminable, their transitivity is in question.)

If I am correct in accepting (A), and in believing that all benefits and harms must be perceptible or measurable in some sense, then the class of discriminable differences, once one extends discrimination to the microphysical level, is very large. And if it is very large, then a great many problems associated with allegedly imperceptible differences can be understood in terms of finer microphysical discriminations, e.g., among cell abnormalities having a propensity to develop into cancer. These discriminations, in turn, are likely to play a role in the risk to which one is subjected, e.g., to one's probability of contracting a disease such as cancer. The point is that, if one looks at allegedly imperceptible harms with fine enough medical and scientific know-how and instrumentation, then it is questionable whether there are any genuine effects of non-mental acts which are imperceptible. And if there are not, then the class of cases for which Parfit wishes to "save" transitivity is very small—as well as problematic—and it includes only predicates like "red" and "pain-

ful." But if so, then little is to be lost by adopting an alternative, risk-based account of allegedly imperceptible effects.

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NOTES

1. J.C. Lashof, *et al., Assessment of Technologies for Determining Cancer Risks from the Environment* (Washington, D.C.: US Office of Technology Assessment, June 1981), p. 3, gives the cancer statistics and the data on the percentage of cancers which are environmentally induced. See B. Fischhoff, *et al., Acceptable Risk: A Critical Guide* (New Rochelle, New York: Cambridge University Press, 1981), and C. Woteki, *Environmental Contaminants in Food,* OTA-F-103 (Washington, D.C.: US Office of Technology Assessment, December, 1979), pp. 59-60, 154-165; hereafter cited as; Woteki, ECF. See also, for example, D.H. Fine, "N-Nitroso Derivatives of Pesticides . . . ," in *Coping with Man-Made and Natural Hazards* (Washington, D.C.: National Science Foundation, 1977), pp. 97-98; hereafter cited as; Fine, CMMNH. Finally, see D.J. Epp, *et al., Identification and Specification of Inputs for Benefit-Cost Modeling of Pesticide Use,* EPA-600/5-77-012 (Washington, D.C.: US Environmental Protection Agency, August, 1977), pp. 51-56; hereafter cited as; Epp, IS.

2. Derek Parfit, *Reasons and Persons* (Oxford: Clarendon Press, 1984), pp. 67-86; hereafter cited as: Parfit, RP. The author is grateful to R.M. Hare, M. Bayles, R. Baum, and R. Paden for constructive criticisms of an earlier draft of this essay, and to H. Lehman, J. Leslie, J. Newman, D. Odegard, and T. Settle for constructive criticisms of an oral presentation of an earlier draft.

3. Parfit, RP, p. 78.

4. Parfit, RP, pp. 79-80.

5. Parfit, RP, p. 79.

6. Parfit, RP, p. 31.

7. See my essay, "Parfit and Mistakes in Moral Mathematics," *Ethics,* vol. 97 (1987), pp. 50-60. Parfit has admitted that his mistaken-pain defense is less important and more problematic than his total-effect defense. See Parfit, "Comments," *Ethics,* vol. 98 (1986), p. 847; hereafter cited as: Comments. Gruzalski has pointed out some problems with the total-effect defense. See Bart Gruzalski, "Parfit's Impact on Utilitarianism," *Ethics,* vol. 98 (1986): pp. 780-782; hereafter cited as: Impact.

8. Parfit, Comments, p. 847; this is a slight restatement of his earlier views found in RP, pp. 75 ff.

9. Parfit, RP, pp. 75 ff.

10. Parfit, RP, p. 79.

11. Or, one could simply multiply the number of thirsty persons until one arrived at a number, X, for which it could be agreed that one pint of

water, divided by X, would produce an imperceptible benefit to each of X persons.

12. See Parfit, RP, pp. 78-81.

13. Parfit, RP, p. 79.

14. Parfit, RP, p. 79.

15. See A.B. Fraser and W.H. Mach, "Mirages," *Scientific American*, vol. 234, no. 1 (January 1976), p. 104.

16. See N. Goodman, *The Structure of Appearance* (New York: Bobbs Merrill, 1951), p. 133; hereafter cited as; Goodman, SOA, who points out that quale recognition is "untestable . . . immediate and indubitable." See also pp. 267 ff. and 297 ff. for discussion of the problem of ordering qualities. Such qualia, for Goodman, are "presented" characteristics rather than properties of things. See also N. Goodman, *Of Mind and Other Matters* (Cambridge: Harvard University Press, 1984), pp. 190-191.

17. Thanks to M. Bayles for this example.

18. Goodman, SOA, p. 271.

19. Parfit, RP, p. 79.

20. Parfit, RP, p. 78.

21. See note 13.

22. Parfit, RP, pp. 78-79.

23. See Michael Dummett, "Wang's Paradox," *Synthese*, vol. 30, nos. 3-4 (April-May, 1975), p. 303; hereafter cited as; Dummett, WP.

24. See note 19. R.M. Hare pointed out to me, in private conversation, that "heap" is not a vague concept and hence that no paradox is involved in the Paradox of the Heap. If he is correct, then Parfit is wrong in rejecting (A) on the grounds that he must do so to avoid the paradox. If Hare is incorrect, then there is no need to consider his point, and my analysis in sections 4 and following may be sufficient to show where Parfit goes wrong.

25. Dummett, WP, p. 303, notes that the paradox is not a paradox in the sense that, "On the ordinary understanding of small, the conclusion is true. A small elephant is an elephant that is smaller than most elephants; and, since every natural number is larger than only finitely many natural numbers, and smaller than infinitely many, every natural number is small, i.e., smaller than most natural numbers." See also p. 304. Russell explains what is meant by this sort of vagueness in his classic essay, "Vagueness," *The Australasian Journal of Psychology and Philosophy*, vol. 1, (1923), pp. 89-90; hereafter cited as; Russell, V. He says that "a representation is *vague* when the relation of the representing system to the represented system is not one-one, but one-many. . . . In an accurate language, meaning would be a one-one relation. . . . In actual languages . . . meaning is one-many."

26. A similar point is made by C. Wright, "On the Incoherence of Vague Predicates," *Synthese*, vol. 30, nos. 3-4 (April-May 1975), 342; hereafter cited as: Wright, IVP.

27. See Parfit, RP, p. 79.

28. See Dummett, WP, p. 306.

29. See S.F. Barker, *Philosophy of Mathematics* (Englewood Cliffs, New Jersey: Prentice Hall, 1964), pp. 72-77; R.J. Baum, *Philosophy and Mathematics* (San Francisco: Freeman, Cooper, and Co., 1973), pp. 227-

234; R.L. Wilder, *The Foundations of Mathematics* (New York: Wiley, 1965), pp. 246-263; and Dummett, WP, pp. 301 ff. for a discussion of strict finitism.

30. G. Frege, *Conceptual Notation,* ed. and trans. by T.E. Bynum (Oxford: Clarendon Press, 1972), pp. 83-89; G. Frege, "Begriffsschrift," in *From Frege to Godel,* ed. and trans. by J. van Heijenoort (Cambridge: Harvard University Press, 1967), esp. pp. 5-6; see also pp. 84-92. For related views, see B. Russell, "Introduction," in Ludwig Wittgenstein, *Tractatus Logico-Philosophicus,* trans. by D.F. Pears and B.F. McGuinness (New York: Routledge and Kegan Paul, 1961), pp. ix-xii; and Russell, V, pp. 85, 88-89, where he says that " the law of excluded middle is true when precise symbols are employed, but it is not true when symbols are vague.... All traditional logic habitually assumes that precise symbols are being employed. It is therefore not applicable to this terrestrial life." Admittedly it is not popular nowadays to accept the Frege-Russell view that the vagueness of ordinary language is a defect. Nevertheless the dominant alternative to this view also has problems because the semantic rules for using an expression do not always provide a precise account of its use; on the dominant view, agreement in the application of vague predicates is not possible merely by appeal to the rules for their use. See Wright, IVP, pp. 325-365.

31. Goodman, SOA, pp. 133, 211-313. See also pp. 132, 197 ff. R.M. Hare pointed out, in conversation, that color is a less clear case than pain, in that we do distinguish between looking red and being red. However, in all cases in which we do speak of something looking red, we use the term "looking red" to suggest that we are uncertain about the color. And if we are uncertain, then such a case hardly constitutes an example of use of a color predicate which was mistaken. One is only mistaken about x if one denies what one genuinely affirmed about x. In this case, the affirmation is in question.

32. See note 30.

33. See Dummett, WP, pp. 322-323.

34. See R.M. Hare, *Moral Thinking* (Oxford: Clarendon Press, 1981), pp. 10-14, for an account of the dangers of relying merely on intuitive, rather than also on critical, thinking in moral philosophy. Although Hare does not discuss intuitions in science, his remarks seem to be equally true of empirical intuitions.

35. See note 19.

36. Virginia Held, "Can a Random Collection of Individuals be Morally Responsible?" *Journal of Philosophy,* vol. 67 (1970), pp. 474-475, also pp. 471-481.

37. Stanley Bates, "The Responsibility of Random Collections," *Ethics,* vol. 81 (1971), p. 348, also pp. 343-349. See also M. Benjamin, "Can Moral Responsibility Be Collective and Non-Distributive?" *Social Theory and Practice,* vol. 4 (1976), pp. 93-106; D. Cooper, "Collective Responsibility," *Philosophy,* vol.43 (1968) pp. 258-268, and "Collective Responsibility—Again," *Philosophy,* vol. 44 (1969) p. 153-155; R. Downie, "Collective Responsibility," *Philosophy,* vol. 44 (1969) pp. 67-69, and *Roles and Values* (London: Methuen, 1971); J. Feinberg, "Collective

Responsibility," in *Doing and Deserving* (Princeton: Princeton University Press, 1970); A. Flores and D. Johnson, "Collective Responsibility and Professional Roles," *Ethics*, vol. 93 (1983) pp. 537-545; P. French, *Individual and Collective Responsibility* (Cambridge, Massachusetts: Schenkman, 1972), and "Types of Collectivities and Blame," *Personalist*, vol. 56 (1975) pp. 160-169; and "The Corporation as a Moral Person," in *Ethical Issues in Business*, T. Donaldson and P. Werhane, eds., (Englewood Cliffs: Prentice-Hall, 1983); K. Goodpaster, "Morality and Organizations," in Donaldson and Werhane, *op. cit.;* R. Hardin *Collective Action* (Baltimore: Johns Hopkins University Press, 1982); M. Keeley, "Organizations as Non Persons," in Donaldson and Werhane, *op. cit.;* J. Ladd, "Morality and the Ideal of Rationality in Formal Organizations," *Monist*, vol. 54 (1970) pp. 488-516; H. Lewis, "Collective Responsibility," *Philosophy*, vol. 23 (1948) pp. 3-18; Eric Mack, "Bad Samaritanism and the Causation of Harm," *Philosophy and Public Affairs*, vol. 9 (1980) p. 230-259; Mancur Olson, *The Logic of Collective Actions* (Cambridge: Harvard University Press, 1971); Dennis Thompson, "Ascribing Responsibility to Advisors in Government," *Ethics*, vol. 93 (1983) pp. 546-560; and W. Walsh, "Pride, Shame and Responsibility," *Philosophical Quarterly*, vol. 20 (1970) pp. 1-13. One of the main problems raised by a notion of collective responsibility is that performance of a single act, by person *A*, is not alone sufficient to guarantee the accomplishment of actions for which person *A* (together with other persons) is allegedly collectively responsible.

38. Risk assessors who claim that the probability of certain events is low, and therefore that one need not worry about the occurrence of a set of events which together can cause great harm include D. Okrent, "Comment on Societal Risk," *Science* 208 (1980): 372-375; C. Starr, "Benefit-Cost Studies in Sociotechnical Systems," in *Perspectives on Benefit-Risk Decision Making*, ed. Committee on Public Engineering Policy, National Academy of Engineering (Washington, D.C.: National Academy of Engineering, 1972); and D. Okrent and C. Whipple, *Approach to Societal Risk Acceptance Criteria*, PB271 264 (Washington, D.C.: US Department of Commerce, 1977).

39. This claim about the difficulty of determining the risk pathways is made by numerous risk assessors; see, for example, L. Lave, "Methods of Risk Assessment," in *Quantitative Risk Assessment in Regulation*, ed. L. Lave (Washington, D.C.: Brookings Institution, 1982), pp. 39ff.; Frank Press, *Risk Assessment in the Federal Government* (Washington, D.C.: National Academy Press, 1983), pp. 24-25; and E. Lawless, M. Jones, and R. Jones, *Comparative Risk Assessment*, Grant PRA8018868 (Washington, D.C.: National Science Foundation, 1983), pp. 121-124; hereafter cited as; Lawless and Jones, CRA. See also K.S. Shrader-Frechette, *Risk Analysis and Scientific Method* (Boston: Reidel, 1985), pp. 16-48. For information on chemicals and monitoring, see Fine, CMMNH, p. 98; Woteki, ECF, pp. 44-46, 60-61.

40. One famous case in which the U.S. government has disclaimed responsibility for harms it was alleged to have caused concerns effects of nuclear weapons' testing in the forties and fifties. Between 1951-1962, for example, approximately 400,000 U.S. servicement were exposed to fallout

from U.S. tests of nuclear weapons. Some soldiers were marched to within 300 yards of ground zero immediately after the detonations. Others in the Pacific were within 5 miles of ground zero, likewise unprotected, for 20 to 30 above-ground nuclear tests. Although thousands of servicement or their survivors have claimed that their injuries and deaths "were the result of radiation exposure received during the U.S. nuclear weapons' tests," courts have awarded benefits to only ten men because of the difficulty of proving a causal link between the injuries and their radiation exposure. (M. Korchmar, "Radiation Hearings Uncover Dust," *Critical Mass Journal* 3 (March 1978): 5; See also R. Kraus, "Environmental Carcinogenesis: Regulation on the Frontiers of Science," *Environmental Law* 8 (Fall 1976): 83-135.

41. Professor Hare made this point in discussion following presentation of Professor Parfit's paper, "Mistakes in Moral Mathematics," at the University of Florida Philosophy Department Colloquium, April 2, 1985.

42. See, for example, W.K. Viscusi, *Risk by Choice* (Cambridge: Harvard University Press, 1983), pp. 37ff., 56ff.

43. See, for example, Lawless and Jones, CRA, pp. 118-119.

44. Using the Natiional Research Council's study, *Biological Effects of Ionizing Radiation*, the USS Atomic Energy Commission drew this conclusion. See US Atomic Energy Commission, *Comparative Risk-Cost-Benefit Study of Alternative Sources of Electrical Energy*, WASH-1224 (Washington, D.C.: US Government Printing Office, December, 1974), pp. 3-5 (ch. 3, p. 5). Numerous effects of single acts (rather than sets of acts) which increase the probability of harm are measurable. See, for example, Woteki, ECF. pp. 154-165; and G.M. Karny, *The Role of Genetic Testing in the Prevention of Occupational Disease*, (Washington, D.C.: US Office of Technology Assessment, 1983), pp. 55-85.

45. Admission (3) can be seen to be plausible once one realizes what is meant by a non-mental act. Even if such an act were directed at a victim, but did not cause pain, it might cause various physiological effects associated with a higher or lower incidence of risk in the victim. Consider the act of using a particular insecticide in such a way that other persons would ingest it into their lungs. Even if such an act caused no pain, it would have some physiological effects, e.g., chromosomal abnormalities, or decreased cell respiration, and some of these effects could place the victim in a higher risk category, e.g., one associated with precancerous states. If effects such as these are measurable, and they are in most cases (see note 23), then they may be said to increase or decrease one's probability of being harmed. But if so, then one's talk about pain might be replaced with talk of physiological effects and probabilities of harm. This might be a good move, since Parfit's only alleged instance of a case involving imperceptible harms and benefits is that of pain.

46. Parfit, RP. p. 51.

47. This is the response Parfit made to my proposal (mentioned in discussion on April 2, 1985) that one reject (B) and develop a theory of risk based on small, physicalistic effects of actions. He also makes this response in RP, p. 82, and in Comments, p. 847.

48. Dummett, WP, p. 320.