Philosophy and Phenomenological Research
Vol. LIX, No. 4, December 1999

Resemblance Nominalism and the Imperfect Community[1]

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The object of this paper is to provide a solution to Nelson Goodman's *Imperfect Community difficulty* as it arises for *Resemblance Nominalism*, the view that properties are classes of resembling particulars. The Imperfect Community difficulty consists in that every two members of a class resembling each other is not sufficient for it to be a class such that there is some property common to all their members, even if '*x* resembles *y*' is understood as '*x* and *y* share some property'. In the paper I explain and criticise several solutions to the difficulty. Then I develop my own solution, which is not subject to the objections I make to the other solutions, and which accords completely with the basic tenets of Resemblance Nominalism.

Introduction

The object of this paper is to give a new solution to what Nelson Goodman called, in the *Structure of Appearance*, *the imperfect community difficulty* (ICD hereafter),[2] as it arises for *Resemblance Nominalism*. The paper is divided into three parts: in the first part I explain what Resemblance Nominalism and the ICD are, in the second I discuss three possible solutions to the ICD and show that they are all unsatisfactory and, finally, in the third, I develop and discuss my own solution.

I

§1.1 Resemblance Nominalism

According to Resemblance Nominalism the only entities in the world, apart from classes, are *particulars*: there are no universals. Furthermore, these particulars are *concrete* particulars: they are not the so-called *tropes*. For my purposes I need not give a definition of 'concrete particular', it will suffice to give familiar examples, like tables, horses, planets, atoms etc. By 'particulars' I shall hereafter mean *concrete* particulars.

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[1] This essay is dedicated to the memory of my brother, Diego.

[2] N. Goodman, *The Structure of Appearance*, 2nd edition, The Bobbs-Merrill Company, Inc., 1966, page 162.

I should emphasise, to avoid confusion, that Resemblance Nominalism is nominalistic only in the sense popularised by Armstrong's writings, i.e. in that it rejects both universals and tropes, *not* in Goodman's sense of rejecting classes. Classes belong indeed to the ontology of Resemblance Nominalism and so those used to Goodman's (or Quine's) sense of the word might see this as a contradiction. But there is no such contradiction: just a different, and perhaps less strained, use of the word 'Nominalism'.

Properties, according to Resemblance Nominalism, are just resemblance classes: classes of particulars which *resemble* each other. This resemblance is a primitive notion, for the Resemblance Nominalist cannot explain the resemblance of two particulars *a* and *b* on the basis of some entity shared by them: that would be to invoke universals. Nor can the Resemblance Nominalist explain it by appealing to tropes, for there are no such entities in the ontology of Resemblance Nominalism. An important function of the primitive notion of resemblance is to avoid the promiscuity to which otherwise any Nominalism identifying properties with classes of concrete particulars (e.g. what Armstrong call 'Class Nominalism') would be committed. In short, there are many such classes, and if your properties are sparse, as those of the Resemblance Nominalist are, you cannot identify every class with a property.[3]

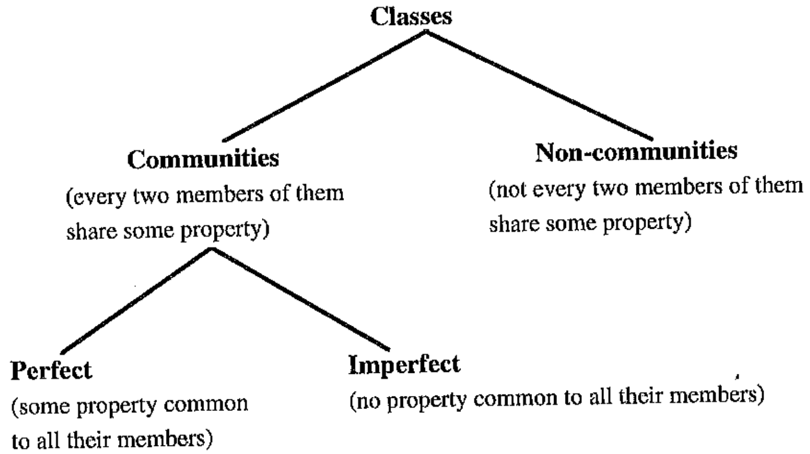
But particulars cannot be the only resembling entities, or Resemblance Nominalism could not accommodate *relations*. Relations, according to Resemblance Nominalism, are classes of resembling ordered *n*-tuples. Just as the property of *being red* is the class of red particulars, so the relation of *being to the north of* is the class of ordered pairs in which the first members are to the north of the second ones, such as (Edinburgh, London) and (Milan, Rome). Thus just as two apples resemble each other, so two pairs like (Edinburgh, London) and (Milan, Rome) resemble each other. This is, of course, no departure from the basic ontology of Resemblance Nominalism, since ordered *n*-tuples are just classes. Nothing other than particulars and classes is required to cope with relations.

§1.2 *The Imperfect Community Difficulty*

The classes with which Resemblance Nominalism identifies properties are classes of *all* the particulars having a certain property, that is, maximal

3 For 'Class Nominalism' see D. M. Armstrong, *Nominalism and Realism*, vol. I, Cambridge University Press, 1978, pages 28–43. I call the doctrine I am discussing 'Resemblance Nominalism' inspired by Armstrong *op. cit.*, pages 44–57, but it differs from what he discusses under that label in that I put no privileged elements, i.e. the so-called *paradigms*, in the resemblance classes. In the absence of paradigms my Resemblance Nominalism is more like Carnap's ontology in *The Logical Structure of the World* (Routledge & Kegan Paul, 1967; translated by Rolf George). But this difference in the two versions of Resemblance Nominalism need not be discussed here, as both versions face the ICD.

classes of particulars sharing a certain property. But if we can define these classes, sometimes called *property classes*, in terms of resemblances among their members, then we can also define, in terms of resemblances, non-maximal classes of particulars sharing a certain property. Let us forget about maximality and divide classes, of particulars for the moment, as follows:



Tables 1, 2 and 3, where capital letters stand for properties and lower case letters for particulars, represent a Perfect, an Imperfect and a Non-community respectively:[4]

T.1: Perfect Community

	F	G	H
a	1	1	1
b	1	0	1
c	1	1	0

T.2: Imperfect Community

	F	G	H
d	0	1	1
e	1	0	1
f	1	1	0

T.3: Non-community

	F	G	H
g	0	1	0
h	1	0	1
i	1	1	0

Can we define classes whose members have some property in common, i.e. Perfect Communities, in terms of resemblances? Consider the following definition, which is basically the one proposed by Carnap, using a dyadic resemblance predicate 'S' applying between particulars sharing a property:

$$(D_{PC})\ \alpha \text{ is a Perfect Community } =_{def.} (x)(y)(x \in \alpha \ \&\ y \in \alpha \supset Sxy)$$

Although it defines classes of particulars with a property in common by using a predicate explained as applying between particulars sharing some

4 I borrow the expression 'Perfect Community' from the title of Alan Hausman's paper, 'Goodman's Perfect Communities', *Synthese* **41**, 1979, but the expression appears *only* in the title and so it is not clear what Hausman meant by it. The labels 'Community' and 'Non-community' have not, I believe, been used in this way before.

property, the definition is not circular. For the definition belongs to a system in which the predicate is a *primitive*. The fact that this primitive is *explained* does not affect its primitiveness, because the explanation is given *outside* the system. *Within* the system the predicate remains undefined.[5] More importantly, there is no need to mention the word 'property' in our explanation of the primitive: this is just a matter of convenience. For, strictly speaking, the interpretation is purely extensional and so it is a matter of making correspond to the predicate 'S' a certain set of pairs. Of course, the members of these pairs would *extra*systematically be said to have some property in common. But this plays no rôle in the interpretation of our predicate.

Is (D_{PC}) correct? Clearly, Perfect Communities satisfy its definiens, for if there is some property common to their members, every two of them must resemble. But not only Perfect Communities satisfy it, as Table 2 shows. For *d* and *e* share **H** and therefore they resemble each other, *d* and *f* share **G** and therefore they resemble each other and, finally, *e* and *f* share **F** and therefore they resemble each other. But {*d,e,f*} is an Imperfect Community. Thus (D_{PC}) is inadequate, for it fails to distinguish between Perfect and Imperfect Communities. To solve the ICD one needs to find a necessary and sufficient condition for being a Perfect Community in terms of resemblances, which is what I shall do in this paper. Solving the problem is important, for if Resemblance Nominalism cannot distinguish Imperfect from Perfect Communities its identification of properties with resemblance classes is extensionally inadequate. True, distinguishing Perfect from Imperfect Communities would only remove half of the extensional problems of Resemblance Nominalism, for there are well-known difficulties with its maximality condition, namely the so-called *Companionship Difficulty*. This, I think, can also be successfully dealt with, but I cannot touch upon it in this paper.

Communities and Non-communities have the important feature that they can always be distinguished by means of a dyadic resemblance predicate, for only Communities are such that every two of their members satisfy the predicate in question. This plays a fundamental rôle in my solution to the ICD. But let us first examine the other proposed solutions to the ICD and see why they fail.

II

§2.1 Goodman's solution

Goodman's solution to the ICD, which I shall call 'GS', is a mereological one, i.e. it uses the calculus of individuals instead of the calculus of classes. Let us see how Goodman describes his own solution:

5 See Goodman, *op. cit.*, page 147.

> Now application of the general method of the preceding section will involve broadening our primitive relation so that not only [particulars] but also certain sums of [particulars] are included among our basic units. Let us, therefore, drop the calculus of classes in favor of the calculus of individuals. A [property] for this system, then, will not be a class, but a whole—the sum of all the individuals that, in ordinary language, have the [property] in common. The term '[property] stretch' may be used for any sum of one or more [particulars] all of which have a [property] in common. (...) Let us now take as our new primitive the similarity relation L that obtains between every two discrete parts of a [property] whole. A [property] stretch may now be defined as any individual of which every two discrete parts form an L-pair. A [property] whole is then any [property] stretch that is a proper part of no other. This method of definition meets the difficulty of imperfect community here as well (...).[6]

Note that GS makes properties resemblance wholes rather than resemblance classes. Thus GS, strictly speaking, is not available to Resemblance Nominalism as described in §1.1 but to a mereological version of it. But GS should nonetheless be discussed here, for if it succeeds then this might constitute good reasons for adopting a mereological version of Resemblance Nominalism.

If GS's definition of property wholes meets the ICD, it is because of its definition of property stretches, which, following our terminology, might be called *mereological* Perfect Communities. GS would say, then, that the sum *d+e+f*, in Table 2 above, is not a *property stretch* because, although L(*d,e*), L(*d,f*) and L(*e,f*), it is not the case that L(*d,e+f*).

Now, the mereological GS can be copied using the calculus of classes. Let us call this classial analogue to GS, 'classial-GS'. Classial-GS would introduce a predicate 'L*' obtaining between every two disjoint subclasses of a property class, a class of all the particulars having a certain property in common.[7] Thus a Perfect Community is now a class every two disjoint subclasses of which form an L*-pair. On this solution we should say that {*d,e,f*}, in Table 2, is not a Perfect Community because although L*({*d*},{*e*}), L*({*d*},{*f*}) and L*({*e*},{*f*}), it is not the case that L*({*d*},{*e,f*}). Do GS or classial-GS solve our problem?

Let us start with GS. GS is correct, in the sense that it singles out all and only property stretches (mereological Perfect Communities). For take any property stretch PS. PS is then part of some property whole PW (which may be identical to PS), every two discrete parts of which satisfy 'L'. But every two discrete parts of PS are discrete parts of PW and so every two discrete parts of PS satisfy 'L'. So if an individual is a property stretch, every two of its discrete parts satisfy 'L'. Suppose, now, that every two discrete parts of

6 Goodman, *op. cit.*, pages 211–12. Since Goodman was thinking of phenomenalist systems like Carnap's in *The Logical Structure of the World*, i.e. those with *erlebs* as basic elements, he speaks of qualities rather than properties. I have adapted Goodman's passage to my terminology by replacing occurrences of 'quality' by bracketed occurrences of 'property' and occurrences of 'erlebs' by bracketed occurrences of 'particulars'.

7 Compare Goodman, *op. cit.*, page 214.

some individual Z satisfy 'L'. Then there is some property whole PW (which may be identical to Z) such that every two discrete parts of Z are discrete parts of PW. But if so, Z is a part of PW, and therefore Z is a property stretch, since every part of a property whole is a property stretch. Thus an individual is a property stretch (mereological Perfect Community) if and only if every two of its discrete parts form an L-pair.

But GS will not satisfy any one who wants to construct properties from resemblance relations. Goodman calls 'L' a *similarity* relation: but what does it mean to say that *a* is similar to *b+c*? Goodman never says. But he needs to. For if 'L' is to express a similarity relation then presumably any two entities to which it applies must have some property in common. But since GS requires that some particulars stand in L to some *sums* of such particulars, sums must be given some properties to share with such particulars, and Goodman gives no indication of what those properties might be.

Yet it is clear what those properties of sums must be: the properties shared by the particulars which are their parts. Thus if *a*, *b* and *c* have **F** and so are parts of the **F**-whole, *a+b* must have **F** too in order for it to resemble *c*, i.e. bear L to *c*. But this assumes that every relevant predicate of the form '*x* is **F**' is, to follow Goodman's terminology, *collective*, which is not true. A predicate is collective, according to Goodman, if it is satisfied by any sum of entities that satisfy it severally, i.e. if '*a* is **F**', '*b* is **F**' and '*c* is **F**' are true then '*a+b+c* is **F**' is true.[8] But suppose **F** is a certain *size*, *mass* or *shape*. Whatever it might mean to assign a *shape* to a sum, it is surely false that if *a* and *b* are spherical then so is *a+b*. And similarly for *size*, *mass* and many other so-called 'extension' properties. GS is therefore not a satisfactory solution to the ICD.[9]

One might reply that, whatever Goodman himself meant by 'similarity' in the quoted passage, 'L' need not apply only to pairs of entities sharing some property. For 'L', whether a similarity predicate or not, by allowing us to pick out all and only property stretches (mereological Perfect Communities) avoids the ICD, which is what matters. But this is not good enough. For while 'L' need not be taken as a similarity or resemblance predicate to provide an extensionally correct definition of (mereological) Perfect Communities, it must be so taken by any sort of Resemblance Nominalism, which aims to give an extensionally correct definition of Perfect Communities in terms of *resemblance* relations. It is because GS does not succeed in defining (mereological) Perfect Communities in those terms that I reject it as a solution to the ICD for the mereological version of Resemblance Nominalism.

8 Goodman, *op. cit.*, page 54.
9 Compare the discussion of *Mereological Nominalism* in Armstrong, *op. cit.*, page 35.

§2.2 The classial analogue to Goodman's solution

So much for GS; let us now consider classial-GS. This also gives an extensionally correct definition of Perfect Communities. 'L*' is here explained as applying to every two disjoint subclasses of a property class and a Perfect Community is defined as a class every two disjoint subclasses of which form an L*-pair. This singles out all and only Perfect Communities. For suppose α is a Perfect Community. Then α is a subclass of some property class β (which may be identical to α). Then every two disjoint subclasses of β satisfy 'L*'. But every two disjoint subclasses of α are disjoint subclasses of β and so every two disjoint subclasses of α satisfy 'L*'. So if α is a Perfect Community, every two of its disjoint subclasses satisfy 'L*'. Suppose, now, that every two disjoint subclasses of some class α satisfy 'L*'. Then there is some property class β (which may be identical to α) such that every two disjoint subclasses of α are disjoint subclasses of β. α is then a subclass of β, and so α is a Perfect Community, since every subclass of a property class is a Perfect Community. Thus a class is a Perfect Community if and only if every two of its disjoint subclasses form an L*-pair.[10]

Classial-GS, unlike GS, does not require classes to have the properties shared by their members, which is just as well: for while sums and their parts belong to the same logical type, i.e. are *individuals*, this is not true of classes and particulars. Classial-GS does not require classes to have their members' properties because it says that a Perfect Community is a class every two disjoint subclasses of which form an L*-pair, so that L* relates no class to any particular.

Although classial-GS is extensionally correct, it too cannot satisfy a Resemblance Nominalist. For it does not show how being a class of particulars all of which share some property depends on those particulars resembling each other. Classial-GS does not define Perfect Communities in terms of resembling particulars, but in terms of classes bearing L* to each other: it says that for a class α to be a Perfect Community every two disjoint subclasses of α must stand in the relation L*. This would not matter if we knew how L*'s relating any two disjoint subclasses of α depended on α's members resembling each other. But this has not been shown. In §3.5 I shall consider

10 Note, however, that since the empty set has no two subclasses, it vacuously satisfies the definition of Perfect Communities and thus becomes a Perfect Community, a result to be avoided if possible, e.g. by making Perfect Communities *non-empty* classes every two disjoint subclasses of which form an L*-pair. Now, since classial-GS is the classial analogue of the mereological GS and there is no null element in the calculus of individuals, we must decide whether by 'disjoint subclasses' we understand 'disjoint *non-empty* subclasses'. This gives us two possible ways of defining Perfect Communities: as (non-empty) classes every two disjoint *non-empty* subclasses of which form an L*-pair, or simply as (non-empty) classes every two disjoint subclasses of which form an L*-pair. But these two definitions are subject to the same objection, to be made in this section, which makes them unacceptable to Resemblance Nominalists.

an attempt to make L*'s relating α's subclasses depend on α's members resembling each other and show why it fails.

§2.3 Collective resemblance

Finally, there is a solution, which was briefly suggested by David Lewis, that proceeds by making the primitive resemblance predicate *multigrade*: it applies between any number of particulars sharing some property.[11] Since resemblance is here multigrade, if n particulars resemble, then their resembling is something over and above the resemblance of every two of them. A Perfect Community would here be defined as a class all of whose members collectively satisfy the resemblance predicate.

But we need not make the resemblance predicate *multigrade* to obtain the desired result, as Alan Hausman has shown.[12] For we can give it a fixed number n of places, provided n satisfies certain conditions. In particular, we can follow Hausman and make n one less than the number of particulars in the domain. This depends on an argument which I do not find convincing, but making n the number of particulars in the domain would do equally well. The resemblance predicate would then be explained as applying to $x_1,\ldots,x_n$ if and only if $x_1,\ldots,x_n$ share some property. (Note that we can indeed use such a predicate to express the resemblance, if any, among less than n particulars. Thus suppose that $n = 5$ and of these five three particulars, a, b and c, share some property. Then since the resemblance predicate—call it 'H', for Hausman—must be reflexive, this fact is expressed, for instance, by 'H*abccc*').[13] Again, on Hausman's approach, a Perfect Community is defined as a class all of whose members collectively satisfy the resemblance predicate in question, a definition which no imperfect community can satisfy.

Both Lewis' and Hausman's approaches neutralise the ICD. But, I think, they are subject to a problem that shows the philosophical superiority of a solution to the ICD proceeding in terms of a *dyadic* resemblance predicate. For consider the basic fact about resemblance that, if the members of certain class resemble, then so do the members of any subclass of it. That is, if $\alpha = \{a,b,c\}$ and $\beta = \{a,b\}$, then if α's members resemble, β's members must also resemble. This is in the nature of resemblance.

But why? The Realists about universals have no problem in explaining this. For they will say that if the members of α resemble, this is in virtue of some universal being present in each of them, and therefore any members of α resemble. Again, if you are a Resemblance Nominalist and your primitive notion of resemblance is *dyadic*, an easy explanation can be given. For then α's members resemble because a resembles b, a resembles c and b resembles c. And this entails that the members of β also resemble. In short, the *pairwise* resemblance of a, b and c is a conjunctive fact, the resemblance of a and b being one of its conjuncts.

But if resemblance is collective then the fact that a, b and c resemble is entirely independent of the resemblance facts of any two of them. The *collective* resemblance of a, b and c is an atomic fact which does not entail the resemblance of a and b. The 'collectivist' about resemblance cannot then explain why if a certain number of particulars resemble, then so do any two of them. True, we could stipulate that if our multigrade resemblance predicate applies to the members of a certain class then it applies to the members of any of its subclasses. But this would hardly constitute a progress in explanation and the advantage would then be for the Realists.

III

§3.1 Resembling pairs

My solution to the ICD will use a dyadic resemblance predicate. But the crucial difference between my resemblance predicate and others, which enables me to escape the ICD, is that my resemblance predicate applies not only to particulars but also to certain pairs or two-membered classes. Now I want to draw attention to the simple idea that motivates what follows. Consider two groups of three particulars each: a, b and c, which are all red, and d, e and f, which are all green, as shown in Table 4, and consider also some pairs of them or pairs of pairs of them, as shown below Table 4.

Table 4

	a	*b*	*c*	*d*	*e*	*f*
Red	1	1	1	0	0	0
Green	0	0	0	1	1	1

$\{a,b\} = \mathbf{1}$ $\{a,c\} = \mathbf{2}$ $\{d,e\} = \mathbf{3}$

$\{\{a,b\},\{b,c\}\} = \mathbf{4}$ $\{\{a,b\},\{a,c\}\} = \mathbf{5}$ $\{\{a,b\},\{d,e\}\} = \mathbf{6}$

There is a sense in which the pairs **1** and **2** resemble each other, but they do not resemble the pair **3**. For both **1** and **2** are such that they are pairs of red particulars, while this is not true of **3**. In short, **1** and **2** have the property of *being a pair of red particulars*, but **3** does not have it. The same idea can then be applied a step further: the pairs **4** and **5** resemble each other, but they do not resemble the pair **6**. **4** and **5** have the property of *being a pair of pairs of*

[11] D. Lewis, 'New Work for a Theory of Universals', *Australasian Journal of Philosophy*, LXI/4, 1983, pages 347–48. He does not mention in that passage the ICD, but it is obvious that it is one of the things he has in mind and so he said it to me. He also makes the resemblance predicate *contrastive*. But I think he added this feature into the picture to avoid also the Companionship Difficulty, with which I am not concerned here.

[12] Hausman, *op. cit.*, pages 199–206.

[13] This example is adapted from Hausman, *op. cit.*, page 200.

red particulars, but **6** does not have it. It is obvious that we can apply the same idea to pairs of pairs of pairs and so on.

This is a sense in which the properties of pairs depend on the shared properties of their members, and, ultimately, on the shared properties of the particulars that are at the bottom of the hierarchy. To make the idea clearer, let us call pairs of particulars, *first order* pairs; pairs of first order pairs, *second order* pairs, and so on. This hierarchy consists of particulars, which are entities of order 0, pairs of them, pairs of pairs of them, and so on. I shall call the pairs in this hierarchy *hereditary pairs*. Then we might assign the property $\mathbf{F}^1$ to a first order pair if and only if its members share the property **F**; and the property $\mathbf{F}^2$ to a second order pair if and only if its members, which are first order pairs, share the property $\mathbf{F}^1$, and so on. Clearly, the properties of an *n*th-order pair, thus understood, depend in a precise way on the properties of their members and on those of the particulars that are at the bottom of the hierarchy.

§3.2 *Pairs and their properties*

To be precise, let us systematise this assignment of properties to pairs by introducing the following function $f(x)$, whose value is the set of properties of x when x is either a particular or a hereditary pair. As introduced below the capital X's (where $n \geq 0$ and $i \geq 1$) range over properties, and the lower case 'x', 'y' and 'z' over particulars and pairs:

$$f(x) = \begin{cases} \{X_1^{\mathbf{0}},\ldots,X_i^{\mathbf{0}}\} \text{ if and only if } x \text{ is a } \textit{particular} \text{ and the members of } \{X_1^{\mathbf{0}},\ldots,X_i^{\mathbf{0}}\} \text{ are all and only the properties of } x. \\ \{X_1^{n+1},\ldots,X_i^{n+1}\} \text{ if and only if } x = \{y,z\}, \text{ where } y \neq z, \text{ and } f(y) \cap f(z) = \{X_1^{n},\ldots,X_i^{n}\}. \\ \varnothing \text{ otherwise.} \end{cases}$$

(Since '$X_1^{\mathbf{0}}$',…,'$X_i^{\mathbf{0}}$' range over properties of particulars, properties like those of *being red*, *being round* and *being hot* are among their values. So when representing an arbitrary property of particulars, I shall now replace '**F**', '**G**', '**H**' etc. by '$\mathbf{F}^0$', '$\mathbf{G}^0$', '$\mathbf{H}^0$' etc.). Just for the sake of illustration consider some of the values of $f(x)$ for Table 5:

Table 5

	$\mathbf{F}^0$	$\mathbf{G}^0$	$\mathbf{H}^0$	$\mathbf{I}^0$
a	0	0	1	1
b	1	1	0	0
c	1	0	0	1
d	1	0	1	0

$f(a) = \{\mathbf{H}^0, \mathbf{I}^0\}$ $\quad f(b) = \{\mathbf{F}^0, \mathbf{G}^0\}$ $\quad f(c) = \{\mathbf{F}^0, \mathbf{I}^0\}$ $\quad f(d) = \{\mathbf{F}^0, \mathbf{H}^0\}$

$f(\{a,b\}) = \varnothing$ $\quad f(\{b,c\}) = \{\mathbf{F}^1\}$ $\quad f(\{b,d\}) = \{\mathbf{F}^1\}$ $\quad f(\{c,d\}) = \{\mathbf{F}^1\}$

$f(\{\{b,c\},\{c,d\}\}) = \{\mathbf{F}^2\}$ $\quad f(\{\{c,d\},\{d,a\}\}) = \varnothing$ $\quad f(\{\{\{b,c\},\{c,d\}\},\{\{b,c\},\{b,d\}\}\}) = \{\mathbf{F}^3\}$

In general, then, x has a property if and only if $f(x) \neq \varnothing$. And x and y share some property if and only if $f(x) \cap f(y) \neq \varnothing$: the properties shared by x and y are those in $f(x) \cap f(y)$. The function makes the properties of pairs depend on the properties of their members: a pair has a property if and only if its members share the corresponding lower order property. Let us single out this result in the following way, which will be useful later:

(1) If certain properties are common to certain entities then their pairs have the corresponding higher order properties. Thus if $\mathbf{F}^n$ is common to x, y and z, $\{x,y\}$, $\{x,z\}$ and $\{y,z\}$ have all $\mathbf{F}^{n+1}$.

Our function not only makes the properties of a pair depend on those of its members. It also makes them depend on those of what I call its *bases*, i.e. the particulars bearing the ancestral of membership to the pair in question. For example, the bases of $\{a,b\}$ are the particulars a and b, and the bases of $\{\{a,b\},\{a,c\}\}$ are the particulars a, b and c. Notice that if x and y are pairs then the class of bases of $\{x,y\}$ is identical to the union of the class of bases of x and the class of bases of y.

It is clear that the function makes the properties of a pair depend on those of its bases. For if an *n*th-order pair has a property $\mathbf{F}^n$ then its members, entities of order $n-1$, share the property $\mathbf{F}^{n-1}$, and if its members are pairs then *their* members, entities of order $n-2$, share the property $\mathbf{F}^{n-2}$, and so on, until we arrive at entities of order $n-n$ sharing the property $\mathbf{F}^{n-n}$, i.e. particulars sharing the property $\mathbf{F}^0$. This result will be very important in what follows. So let us call it (2) and formulate it as follows:

(2) If an *n*th-order pair has a property $\mathbf{F}^n$ then its bases share the property $\mathbf{F}^0$.

§3.3 Perfect Communities entail Communities, Imperfect Communities entail Non-Communities

From now on, 'α^0' represents an arbitrary finite class of *particulars*, 'α^1' the class of first order pairs whose bases are members of α^0, 'α^2' the class of second order pairs whose bases are members of α^0, and so on. In general, then, 'α^n' represents the class of *n*th-order pairs whose bases are members of a given α^0. Similarly for 'β^0', 'χ^0' etc.

Now, since pairs have been given properties which they either share or not, they form classes having the same structure as classes of particulars. Consider the following four tables:

Table 6

	$\mathbf{F}^0$	$\mathbf{G}^0$	$\mathbf{H}^0$
a	1	1	1
b	1	0	1
c	1	1	0

Table 7

	$\mathbf{F}^0$	$\mathbf{G}^0$	$\mathbf{H}^0$
d	0	1	1
e	1	0	1
f	1	1	0

Table 8

	$\mathbf{F}^1$	$\mathbf{G}^1$	$\mathbf{H}^1$
{*a*,*b*}	1	0	1
{*a*,*c*}	1	1	0
{*b*,*c*}	1	0	0

Table 9

	$\mathbf{F}^1$	$\mathbf{G}^1$	$\mathbf{H}^1$
{*d*,*e*}	0	0	1
{*d*,*f*}	0	1	0
{*e*,*f*}	1	0	0

Tables 8 and 9 show the properties of the first order pairs corresponding to Tables 6 and 7 respectively. Table 6 represents a Perfect Community, and Table 7 an Imperfect Community. But there is a further difference between them, made apparent by Tables 8 and 9: the first order pairs corresponding to the Perfect Community form a Community, while the first order pairs corresponding to the Imperfect Community form a Non-community. This, however, is not always the case. For there are some Imperfect Communities such that their first order pairs do form a Community.

But what is important is that the first order pairs of the Perfect Community of Table 6 must form a Community, and that some class of *n*th-order pairs corresponding to the Imperfect Community of Table 7 had to form a Non-Community. This is because if α^0 is a Perfect Community then, for every *n*, α^n is a Community, while if α^0 is an Imperfect Community then there is some *n* such that α^n is a Non-community (in particular, one such *n* is the least *n* such that the bases of two pairs in α^n jointly exhaust the members of α^0). This general fact is very important, since it allows us to solve ICD. So let us be clear about it.

If α^0 is a Perfect Community then, for every *n*, α^n is a Community. For if α^0 is a Perfect Community then there is some property $\mathbf{F}^0$ common to its members. But if so, it follows from (1) above that every pair of them will have $\mathbf{F}^1$. Thus α^1 is a Perfect Community. And since $\mathbf{F}^1$ is common to the members of α^1, it follows again from (1), that every pair of them will have $\mathbf{F}^2$, i.e. α^2 is a Perfect Community, and so on. Thus if α^0 is a Perfect Community then, for every *n*, α^n is a Perfect Community, and therefore a Community.

Now let us see that if α^0 is an Imperfect Community then there is some *n* such that α^n is a Non-community. For given a class α^0 there are some pairs *x* and *y* of some order *n* such that their bases jointly exhaust the members of α^0. Suppose α^0 is an Imperfect Community. If so, *x* and *y* share no property at all. For suppose they shared some property $\mathbf{F}^n$: it follows from (1) that $\{x,y\}$ has $\mathbf{F}^{n+1}$. But then, it follows from (2), $\mathbf{F}^0$ is common to the bases of $\{x,y\}$. But the bases of $\{x,y\}$ are the members of the union of the class of bases of *x* and the class of bases of *y*, i.e. the bases of $\{x,y\}$ are the members of α^0. But then $\mathbf{F}^0$ is common to the members of α^0, which contradicts our initial supposition that α^0 is an Imperfect Community. Thus, *x* and *y* share no property at all. But since *x* and *y* are *n*th-order pairs whose bases belong to α^0, they belong to α^n, and since they share no property at all, α^n is a Non-community. This explains why for the Imperfect Community of Table 7 α^1 is a Non-community: some first order pairs are such that their bases jointly exhaust the members of the class of Table 7. This has to do, of course, with the cardinality of the Imperfect Community of Table 7. But let me emphasise once again the important point: if α^0 is an Imperfect Community then there is some *n* such that α^n is a Non-community.

§3.4 A Definition of Perfect Communities

What we have found is that Perfect Communities are those Communities that, for every *n*, the class of their *n*th-order pairs is a Community. We showed this by assigning properties to pairs by means of our function $f(x)$. This is interesting in itself, but how does it help us in our purpose of defining Perfect Communities in terms of a resemblance predicate? Well, our function tried to capture systematically a sense in which some pairs resemble and others do not: *x* and *y* share some property, and thereby resemble each other, if and only if $f(x) \cap f(y) \neq \varnothing$. And so we can now introduce a new dyadic resemblance predicate 'S*' in the following way:

$$S^*xy \text{ if and only if } f(x) \cap f(y) \neq \varnothing$$

Thus 'S*' applies to any two entities, whether individuals or pairs, if and only if these entities share some property. We can now give the following definition of Perfect Communities, which is not subject to the ICD, in terms of the resemblance predicate 'S*':

$$(D_{PC1})\ \alpha^0 \text{ is a Perfect Community} =_{\text{def.}} (n)(x)(y)(x \in \alpha^n \ \&\ y \in \alpha^n \supset S^*xy)$$

In words, what (D_{PC1}) says is that a class α^0 is a Perfect Community if and only if, for every n, 'S*' applies to every two members of α^n, i.e. if and only if every two members of α^n share some property. (D_{PC1}) is extensionally correct: all and only Perfect Communities satisfy its definiens. For, as we saw before, if α^0 is a Perfect Community then for all n, α^n is a Community, i.e. there is some property common to all its members and therefore every two members of it resemble each other. And if α^0 is not a Perfect Community then there is some n such that α^n is a Non-community, i.e. there are at least two members of it sharing no property at all and thereby not resembling to each other.

Not only is (D_{PC1}) extensionally correct, it proceeds in terms of a dyadic resemblance predicate and fits the kind of Resemblance Nominalism sketched in §1.1. (D_{PC1}) is based on a development of the idea explained in §3.1 that what makes two pairs resemble is that their members resemble in sharing a certain property. In this sense the resemblance of two pairs depends on and is determined by the resemblance of their members. In general, then, the resemblance of two pairs depends on and is determined by the resemblance of their bases. And so (D_{PC1}) shows how being a Perfect Community, i.e. a class all of whose members share some property, depends on the resemblance relations among its members. Furthermore we cannot object to (D_{PC1}) in a manner similar to that in which we objected to GS, that it gives pairs the properties of particulars. For if $n \neq m$, then $X_i^n \neq X_i^m$ and 'S*', given the definition of $f(x)$, never applies between a particular and a pair or between two pairs of different order. So with (D_{PC1}) we have a satisfactory solution to the ICD, and have thereby removed one of the great obstacles faced by Resemblance Nominalism. The task of solving ICD for Resemblance Nominalism has then been accomplished.[14]

Notice that the solution to the ICD proposed here cannot be implemented using mereology or the calculus of individuals and so mereological Resemblance Nominalism cannot benefit from it. For there is nothing in mereology corresponding to the hierarchy of hereditary pairs which is essential to the solution here proposed. It might be thought, however, that classial-GS can

[14] It should be clear that (D_{PC1}) defines Perfect Communities *of particulars* and so it might be asked how shall we avoid imperfect communities of ordered n-tuples. If we cannot avoid them, we shall have solved ICD in the case of properties but not in the case of relations. But it should be clear that by letting 'α**0**' to stand for any class of particulars or of *ordered* n-tuples and making $f(x) = \{X_1 0,\ldots,X_i 0\}$ if and only if x is a particular *or an ordered n-tuple* and the members of $\{X_1 0,\ldots,X_i 0\}$ are all and only the properties of x, we obtain a solution to the ICD both for properties and relations.

benefit from the strategy of assigning properties to classes and so present an alternative definition of Perfect Communities in accord with Resemblance Nominalism. This is the subject of the next section.

§3.5 The classial analogue to Goodman's solution reconsidered

In §2.2 we rejected classial-GS, the classial analogue to Goodman's solution, for failing to show how being a class of particulars all of which share a property depends on the resemblance relations among those particulars. But might not classial-GS adopt our procedure of giving classes properties in function of the properties of their members and then introduce a resemblance predicate 'M' on the basis of which to define Perfect Communities? The assignment of properties to classes should be made by the following function $g(x)$, whose value is the set of properties of x:

$$g(x) = \begin{cases} \{X_1^0,\ldots,X_i^0\} \text{ if and only if } x \text{ is a } \textit{particular} \text{ and the members of } \{X_1^0,\ldots,X_i^0\} \text{ are all and only the properties of } x. \\ \{X_1^1,\ldots,X_i^1\} \text{ if and only if } x = \{y_1,\ldots, y_m\}, \text{ where } y_1,\ldots, y_m \text{ are particulars and } m \geq 1, \text{ and } g(y_1) \cap \ldots \cap g(y_m) = \{X_1^0,\ldots,X_i^0\}. \\ \varnothing \text{ otherwise.} \end{cases}$$

Classial-GS would then explain the dyadic resemblance predicate 'M' as applying to every two classes sharing some property and define Perfect Communities as follows:

$$(D_{PC2})\quad \alpha^0 \text{ is a Perfect Community} =_{\text{def.}} (\beta^0)(\chi^0)(\beta^0 \subseteq \alpha^0 \ \&\ \chi^0 \subseteq \alpha^0 \supset M\beta^0\chi^0)$$

That is, α^0 is a Perfect Community if and only if all its non-empty subclasses satisfy the resemblance predicate 'M', i.e. if and only if every two non-empty subclasses of it share some property. It should be obvious that (D_{PC2}) is extensionally correct. (Note that in the definiens of (D_{PC2}) β^0 and χ^0 are bound to be non-empty, since we stipulated that 'β^0' and 'χ^0' stand for classes of particulars. Note also that the Goodmanian requirement that the subclasses of α^0 be disjoint has been dropped. This is because it actually plays no rôle, and classial-GS is subject to the same objection whether or not it requires the subclasses of α^0 to be disjoint.)

But classial-GS is still not philosophically acceptable to a Resemblance Nominalist, since classial-GS has still not made the resemblance between classes depend on the pairwise resemblance of their members. For β^0 and χ^0 resemble only if they share some property, and they share some property only if there is a property common to the members of β^0 which is common to the members of χ^0. But suppose β^0 has more than two members. How is the fact that the members of β^0 have a property in common represented in terms of the resemblances among its members? Surely not by saying that every two members of β^0 resemble. That is not enough to stop β^0 being an Imperfect Community. But then, how is it that β^0 and χ^0 satisfying 'M' depends on their respective members resembling each other? One might appeal to a collective relation of resemblance, but that is, as we have seen, not the right thing to do. So even if classial-GS assigns properties to classes much as we have assigned properties to pairs, i.e. *two*-membered classes, classial-GS has achieved nothing in the way of finding a definition of Perfect Communities philosophically satisfactory to Resemblance Nominalists.

Thus (D_{PC_1}) is the definition of Perfect Communities Resemblance Nominalists should choose. But is it a completely satisfactory definition of Perfect Communities? For, given that we made α^0 represent a *finite* class of particulars, (D_{PC_1}) defines only *finite* Perfect Communities. This looks like an important limitation on (D_{PC_1}) for, unless Resemblance Nominalists could show that the classes they should aim to account for in terms of resemblances are finite, they should aspire to define Perfect Communities in general, not just finite ones. In the next and final section I shall show that this limitation on (D_{PC_1}) is not as important as it seems to be.

§3.6 Infinite Imperfect Communities

The first question to answer is, then, whether we could obtain a general definition of Perfect Communities just by letting α^0 in (D_{PC_1}) stand for any Perfect Community, whether finite or infinite. The answer is no. For we showed that if α^0 is an Imperfect Community then there is some n such that α^n is a Non-community by showing that the hereditary pairs whose bases jointly exhaust the members of α^0 share no property. But if x and y are hereditary pairs whose bases jointly exhaust the members of an infinite α^0, x and y must have infinitely many bases and so there are infinite descending $\in$-chains running from x and y to their respective bases. But infinite descending $\in$-chains are ruled out by the axiom of foundation. Thus, just waiving the restriction on α^0 to stand for finite Perfect Communities will not make (D_{PC_1}) a general definition of Perfect Communities.

But how serious is this a limitation on our proposed solution to the ICD? Not very serious, I think, and this for three reasons. First, even if it fails to distinguish infinite Perfect Communities from infinite Imperfect Communities, it is interesting to see how the ICD can be avoided in the finite case, since the alternative solutions do not work even there.

Second, the axiom of foundation has been challenged and 'non-well-founded' set theories in which this axiom does not hold have been developed. This opens a door for a solution to the ICD that distinguishes between infinite Perfect Communities and infinite Imperfect Communities. But I cannot discuss here how and to what extent the solution to the ICD proposed here might be framed in a non-well-founded set theory.

Third, but more important, even conforming to the axiom of foundation it is possible to improve (D_{PC_1}) in a substantial way, just by letting α^0 stand for any Perfect Community, whether finite or infinite. To see this let me first distinguish between *Minimal* Imperfect Communities and *Non-Minimal* Imperfect Communities. An Imperfect Community is *minimal* if and only if all its finite non-empty proper subclasses are Perfect Communities, while an Imperfect Community is *non-minimal* if and only if it is not minimal. Tables 10 and 11 below represent a Minimal and a Non-Minimal Imperfect Community respectively, for while all finite non-empty proper subclasses of $\{a,b,c,d\}$ are Perfect Communities, there is at least one finite non-empty proper subclass of $\{e,f,g,h\}$, namely $\{e,f,g\}$, that is an Imperfect Community:

Table 10

	F^0	G^0	H^0	I^0
a	0	1	1	1
b	1	0	1	1
c	1	1	0	1
d	1	1	1	0

Table 11

	F^0	G^0	H^0	I^0
e	0	1	1	1
f	1	0	1	1
g	1	1	0	0
h	1	1	1	0

Now the point I wish to make is that the members of an *infinite Minimal* Imperfect Community would be particulars having infinitely many different properties. Proof: Suppose α^0 is an infinite *Minimal* Imperfect Community and one of its members, *a*, has *n* properties, where *n* is some positive integer. Each of these *n* properties is such that at least one member of α^0 must lack it, otherwise α^0 would be a Perfect Community. Now consider the class β^0 satisfying the following conditions: (1) β^0 is a proper subclass of α^0, (2) *a* is a member of β^0, (3) every other member of β^0 lacks at least one of the properties of *a* and (4) for each property $\mathbf{F}^0$ of *a*, one and only one member of α^0 lacking $\mathbf{F}^0$ belongs to β^0. β^0 is finite (it has n+1 members) and, according to condition (4), it is an Imperfect Community, but it is also a proper subclass of α^0, against our hypothesis that α^0 is a *Minimal* infinite Imperfect Community. Thus, if α^0 is an infinite *Minimal* Imperfect Community, each of its members must have infinitely many properties.

Now if the properties in question are sparse, as the properties of Resemblance Nominalism are, then one is justified in rejecting the possibility of particulars having infinitely many properties. This is *not*, it must be clear, rejecting the possibility of there being infinitely many different properties. It is simply rejecting that a single particular can have infinitely many properties, when the properties in question are those like masses, temperatures, shapes, colours etc. And it should be noted that for the ICD to arise, a certain limit to the abundance of properties must be imposed. In particular, it must not be the case that whenever we have two properties $\mathbf{F}^0$ and $\mathbf{G}^0$ the disjunctive property $\mathbf{F}^0 \vee \mathbf{G}^0$ exists. Otherwise there would be some property common to the members of every class, i.e. there would be no Imperfect Communities. But if one rejects the possibility of particulars having infinitely many sparse properties, then one must reject *infinite Minimal* Imperfect Communities.

But once one has rejected infinite *Minimal* Imperfect Communities, then by dropping the requirement that α^0 be *finite* one makes $(\mathrm{D}_{\mathrm{PC}_1})$ a comprehensive definition of Perfect Communities, since then all and only Perfect Communities, whether finite or infinite, satisfy its definiens. That infinite Perfect Communities satisfy the definiens of $(\mathrm{D}_{\mathrm{PC}_1})$, once the requirement that α^0 be finite is dropped, should be clear. And, having rejected infinite *Minimal* Imperfect Communities, no Imperfect Community could satisfy the definiens of $(\mathrm{D}_{\mathrm{PC}_1})$. For then every *infinite* Imperfect Community α^0 would have some *finite* Imperfect Community β^0 as a subclass. The class β^n having as members some nth-order pairs exhausting the members of β^0 is then a Non-community, and since β^0 is *finite*, there are only *finite* descending $\in$-chains running from the members of β^n to the members of β^0. But since every nth-order pair whose bases are members of β^0 is also an nth-order pair whose bases are members of α^0, β^n is a subclass of α^n, and so, since β^n is a Non-community, α^n is a Non-community, and from α^n to α^0 run only finite descending $\in$-chains. Thus α^0 does not satisfy the definiens of $(\mathrm{D}_{\mathrm{PC}_1})$ and no violation of the axiom of foundation is required.

I conclude that in $(\mathrm{D}_{\mathrm{PC}_1})$ the Resemblance Nominalist finds a satisfactory definition of Perfect Communities and that the ICD is no longer a problem for Resemblance Nominalism. This should be taken as a most important step towards the full development of Resemblance Nominalism.[15]

[15] Completion of this paper was possible thanks to the financial support of Churchill College, Cambridge. The paper has been previously read at some seminars and conferences at the universities of Brown, Cambridge and Leeds. I thank in general to those audiences. In particular, I thank Hugo Alvarez, David Armstrong, Jeremy Butterfield, Sy Friedman, Alan Hausman, Harold Hodes, Jane Heal, Dan Kleitman, Isaac Levi, David Lewis, Penelope Maddy, Fraser MacBride, David McCarty, Alex Oliver, Lorenzo Peña, Michael Potter, Baron Reed, Mary Tiles and Diego Vaggione, who helped me either by commenting on the paper or by discussing points having to do with the paper. Rosanna Keefe and Thomas Mormann commented extensively on the penultimate version of the paper and my understanding of the structure of the paper improved much as a result. Thomas Mormann was also very helpful in providing me with relevant material. The suggestions by three anonymous referees of this journal were very valuable in simplifying the final version of the paper. Very special thanks to Hugh Mellor for extensive comments and discussions of many previous versions of this paper and permanent encouragement while writing it and to Juan Rodriguez-Larreta for comments, encouragement and getting me interested in the ICD.

Philosophy and Phenomenological Research
Vol. LIX, No. 4, December 1999

Endurance, Psychological Continuity, and the Importance of Personal Identity*

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This paper argues that if persons last over time by "enduring", then no analysis or reduction of personal identity over time in terms of any sort of psychological continuity can be correct. In other words, any analysis of personal identity over time in terms of psychological continuity entails that persons are four-dimensional and have temporal parts. The paper then shows that if we abandon psychological analyses of personal identity—as we must if persons endure—Parfit's argument for the claim that identity does not matter in survival is easily undermined. The paper then suggests that this offers support for the claim that persons endure. Along the way the paper tries to clarify the contrast between the doctrine that persons endure and its rival, four-dimensionalism.

I

Persons enjoy identity over time. But persons do not have temporal parts. They are not four-dimensional entities "spread out" in time. Rather, persons last over time by enduring. Or so I say. The main objective of this paper is not to defend the thesis that persons endure over time—although I will say something in defense of it—but instead to highlight an important implication of that thesis. I will show that if persons endure, then it cannot be that personal identity over time should be analyzed in terms of—or is nothing other than—psychological continuity. In other words, I will show that any analysis or reduction of personal identity over time in terms of some kind of psychological continuity entails four-dimensional persons and temporal parts.

John Locke was the most important historical defender of the view that personal identity should be understood in terms of psychological continuity.

* Thanks to Anthony Ellis, Eugene Mills, Mark Murphy, Alvin Plantinga, Philip Quinn, Michael Rea, Ernest Sosa, Peter Vallentyne and three anonymous referees for helpful comments on this paper. I would also like to thank colloquium participants at the University of Virginia. I presented parts of this paper at the 1995 Eastern Division of the APA; I profited from the discussion which followed, from remarks made by my commentator, W.R. Carter, and from subsequent correspondence on these topics with Mark Heller and Theodore Sider. Work on an early version of this paper was supported by a grant from the Pew Evangelical Scholars Program.