Research article

Semantics in the time of coronavirus:
"Virus", "bacteria", "germs", "disease" and related concepts[1]

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Abstract

This study proposes Natural Semantic Metalanguage semantic explications for the English words 'virus' (in two senses), 'bacteria', 'germs', and for the related words 'sick', 'ill', and 'disease'. We concentrate on their "naïve" or "folk" meanings (Apresjan 1992) in everyday English, as opposed to scientific or semi-scientific meanings. In this way, the paper makes a start on uncovering the folk epidemiology embedded in the English lexicon. The semantics of words like 'virus', 'bacteria' and 'germs' is not, however, a purely academic matter. It is also a matter of effective health education and health communication. To reach people at a time of an epidemic, explanations need to connect with "ordinary people's" ways of thinking and speaking. This paper argues that the simple and cross-translatable words of NSM, and minimal languages based on it, can be effective tools not only for linguistic semantics but also for education and communication everywhere – at the local school and in the world at large.

Keywords: *virus, germs, bacteria, Natural Semantic Metalanguage, Coronavirus, health communication, health education*

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[1] An earlier version of this paper was presented at the NSM Online Seminar 6 April 2020. A recorded version is available on the YouTube channel NSM Lab.

Семантика во время коронавируса: "Virus", "bacteria", "germs", "disease" и соотносимые понятия[2]

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Аннотация

В работе предлагается семантическая экспликация английских слов 'virus' (в двух значениях), 'bacteria', 'germs' и соотносимых с ними слов 'sick', 'ill', 'disease' с позиций Естественного Семантического Метаязыка. Особое внимание уделяется их «наивным» или «народным» значениям (Апресян 1992) в бытовой английской речи в противовес научным или околонаучным значениям. Таким образом, в статье положено начало рассмотрению народной эпидемиологии, воплощенной в английский лексикон. Однако семантика таких слов, как 'virus', 'bacteria' и 'germs', относится не только к научной сфере. Она также касается эффективного образования и коммуникации в области здравоохранения. Чтобы «достучаться» до людей во время эпидемии, объяснения должны соответствовать образу мыслей обычных людей и способам их языкового выражения. В статье утверждается, что простые и легко переводимые слова Естественного Семантического Метаязыка, а также основанные на нем минимальные языки могут стать эффективными инструментами не только для лингвистической семантики, но и для образования, а также коммуникации в самом широком плане.

Ключевые слова: *вирус, микробы, бактерии, Естественный Семантический Метаязык, коронавирус, коммуникация и образование в сфере здравоохранения*

1. Opening points

The aim of this study is to propose NSM semantic explications for the English words *virus* (in two senses), *bacteria, germs*, and for the related words *sick, ill,* and *disease.* We are well aware that some of these lack equivalents in many languages, and that in other languages their apparent translation equivalents may differ in meaning (cf. Apresjan V. 2014). Except for a few side observations, however, we do not pursue cross-linguistic differences here. Also, due to limitations of space, the evidence presented for each explication must be abbreviated and partial. Even so, we hope that the set of seven explications taken as a whole "hangs together" sufficiently well to be convincing.

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[2] Более ранняя версия этого исследования была представлена на онлайн-семинаре, посвященном Естественному Семантическому Метаязыку, 6 апреля 2020 г. Запись выступления доступна в YouTube на канале NSM Lab.

The NSM approach to semantic explication is well known, cf. Wierzbicka (2014); Goddard and Wierzbicka (2014); Goddard (2018); Gladkova and Larina (2018). Semantic explication is a form of conceptual analysis, disciplined by the requirement that explications be composed solely of simple, cross-translatable words: universal semantic primes and universal (or near-universal) semantic molecules. Explications should be plausibly substitutable into naturally-occurring examples of the relevant expressions and satisfy native speaker intuitions. Developing explications is an iterative trial and error process. Semantic intuition plays a key role in the process (how could it be otherwise?), but just as important is the evidence of linguistic usage, especially facts about stable phraseology and collocational tendencies, and even grammatical evidence, such as where nouns like *disease*, *virus*, and *bacteria* fall on the spectrum of "countability".

To complete these brief opening points, we want to emphasise that polysemy is always a factor in semantic analysis. The analyst must always be alert (attuned) to the possibility of polysemy, i.e. be prepared to distinguish between different meanings and to treat them separately. In this study, we find it important to distinguish what may be called "naïve" meanings from "scientific" meanings. We place the word "scientific" in scare quotes to encompass not only fully scientific meanings, but also what might be termed semi-scientific meanings that are widely circulating in the speech community.[3]

Our focus in this study is capturing "naïve" or "folk" meanings, in the sense of Apresjan (1992). In a celebrated quotation, Apresjan explains as follows:

> The task of the lexicographer … consists of discovering the naïve picture of the world hidden in lexical meanings and presenting it in a system of definitions … Second, folk pictures of the world, obtained through analysis of meanings of words in various languages, may differ in details, whereas a scientific picture of the world does not depend on the language used to describe it (p.35)

In the same discussion, Apresjan mentions that "folk pictures of the world" each include a folk geometry, a folk physics, a folk psychology, and so on, "developed in the course of the centuries" and reflecting "the material and spiritual experience of a people (native speakers of a certain language". In this study we make a start on uncovering the folk epidemiology embedded in the English lexicon.

We also hope that our findings will be useful to inform and improve health communication, education (especially early childhood education) and "emergency linguistics" (cf. Li 2020). We will return to this theme in the Concluding Remarks (section 5).

2. 'Virus-2' (*the virus*)

At the time of writing (late 2020), the world is the grip of the global coronavirus pandemic. For this reason, we begin our study not with the primary

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[3] For early NSM discussions on the difference between scientific and semi-scientific meanings, see Wierzbicka (1985).

meaning of the word *virus*, which we designate 'virus-1', but rather with the meaning shown in examples (1a) and (1b) below. This meaning, which we designate 'virus-2', is explicated in [A] below. Roughly speaking, 'virus-2', typically in the expression *the virus*, designates the current pandemic situation.[4] This meaning is of course highly contingent and will presumably fade within the next few years. Notice in (1a) that the expression *the virus* occurs with the temporal preposition *before*; and in (1b), the 'latest news' is presumably about what is happening with the spread of coronavirus, case numbers, efforts to contain it, and so on.

(1a) *Even before the virus, the economy was barely limping along.*
(1b) *And now for the latest news on the virus.*

Explication [A] is presented in three sections, labelled (a)-(c).

[A] <u>virus-2</u> (e.g. 'even before the virus, …')
a.   something very bad is happening in many countries on earth now, very bad things are happening to many people
     this is happening because there is virus-1 of one kind ("coronavirus") in these people's bodies
b.   when there is virus-1 of this kind in the bodies of some people in a place, a short time after, this virus-1 can be in the bodies of many other people in this place
c.   because of this, after some time this virus-1 can be in the bodies of many people in many places

Obviously, explication [A] depends in part on 'virus-1', which we will explicate in section 4, comparing it with the meanings of *bacteria* and *germs*. Section (a) describes the situation of a world-wide pandemic (something very bad is happening in many countries on earth now, very bad things are happening to many people) due to a 'virus-1 of one kind ("coronavirus")' being in these people's bodies. Sections (b) and (c), respectively, spell out our understanding that this virus-1 can move from one person's body to many other people's bodies (i.e. it is "contagious"), and thus can easily "spread" from one place to many places.

3. 'Sick', 'ill', and 'disease'

Before examining the words *virus*, *bacteria* and *germs*, it will be helpful to take a look at the words *ill*, *sick*, and *disease*, which obviously play a great part in coronavirus discourse and health communication in English. We note that many languages, even European languages such as French and Danish, do not have exact lexical equivalents of these words because they do make any comparable

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[4] Two points to note. First, and trivially, the expression *the virus* can also be used at the present time to refer to coronavirus itself. Second, even in the sense 'virus-2', the determiner *the* is not found when the word appears as a noun modifier, e.g. in common "coronatime" expressions such as *virus suppression* and *virus control measures*.

distinctions.[5] Putting these words (*ill, sick, disease*) under the semantic microscope is not only an exercise in semantic precision. It can also help bring to light semantic distinctions and metalanguage phrasings that may be relevant for explicating other concepts in this general domain.

She was ill: what does it mean? According to our understanding, the meaning can be spelt out as in explication [B]. As an initial observation, there is an older meaning of the English word *ill* which means, essentially, 'bad'. This is preserved in fixed phrases and expressions, such as *ill will, ill fated, ill conceived,* and *It's an ill wind that blows nobody good*. This makes perfect sense, as we can see throughout explication [B] that 'bad' plays a key role in components like 'something bad was happening to her', 'something bad was happening in her body' and 'she felt something bad at that time'. It is notable that in French, for example, the word *malade* is based on the root *mal* 'bad'.

The final lines of [B] say that someone who is *ill* feels something bad, not like at other times, and that they are somewhat incapacitated: 'she couldn't do some things at that time like at other times'.

> [B] *She was <u>ill</u>.*
> a. something bad was happening to her at that time because something bad was happening in her body[6]
> b. it was happening for some time, not a short time
> c. she felt something bad at that time, not like at other times
>   she couldn't do some things at that time like at other times

Looking now at explication [C] for *sick*, we can see that for the first couple of lines it is much the same as *ill*. The first, slight, difference comes at the end of the third line, which lacks the proviso 'not a short time' found in the corresponding line of [B]. The final lines of [C], for *sick*, however, are quite different from those for *ill*. They read: 'she could know that something bad was happening in her body because she felt something bad in her body'.

> [C] *She was <u>sick</u>.*
> a. something bad was happening to her at that time
>   because something bad was happening in her body
> b. it was happening for some time
> c. she could know that something bad was happening in her body
>   because she felt something bad in her body

Comparing explications [B] and [C], the claim is that *ill* and *sick* are very similar in meaning. They both focus on a person, on something bad happening to this person on account of something bad happening in their body, and they both

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[5] Some languages have conceptual elaborations along different lines, sometimes involving verbs rather than adjectives, cf. the somewhat old-fashioned English verb *to ail*.

[6] Note the wording of the expression 'happen in (her body)', as opposed to 'happen to (her body)'. In NSM theory, both types of expression are regarded as grammatical possibilities of the prime HAPPEN. See Chart of NSM Semantic Primes on nsm-approach.net/resources.

refer to this person's feelings. They are a little different in their "durational" framing (section b), but the main difference is that in the case of *ill*, there is reference to reduced capabilities, while in the case of *sick* there is something like a potential awareness of one's condition, based on feeling something bad in the body. [Note[7]]

We now move to the noun *disease*. Notably, unlike *illness* and *sickness*, it is not based on any corresponding adjective. *Disease* is thus a "free standing" noun. It is explicated in [D] below, which supersedes an earlier explication in Goddard and Wierzbicka (2014: 211-12). The first two sections of [D] pertain to the status of the noun *disease*, which designates 'something of one kind'. More specifically, *disease* is an abstract noun which identifies a kind of reified discourse topic linked with a certain way of thinking. These components reflect the position that many abstract nouns are ways of "naming" mental models or scenarios, so that people can speak about them; cf. Goddard and Wierzbicka (2014: Ch 9). We will not discuss this here, except to say that these first three lines, with variations, appear in explications for a large number of abstract nouns.

Our primary interest is in the way of thinking associated with the "*disease* concept", as set out in section (c) of the explication. The first two lines of this section present the idea that 'very bad things of many kinds can happen to people's bodies', and that 'when these things happen, they happen for some time, not a short time'. These components establish a certain "framing" that recognises recurrent kinds of bodily afflictions. The third line brings in the idea that the cause can be internal to the body: 'they happen because something bad happens in these people's bodies for some time', and the final line holds out the idea that 'some people' (presumably, doctors and/or medical scientists) 'can know why these things happen in people's bodies'.

> [D] *a disease*
> a. something of one kind
>   people can speak about this something with the word 'disease'
>   ["discourse topic"]
> b. people can say something about something with this word when they think
> like this:
> c. "very bad things of many kinds can happen to people's bodies
>   when these things happen, they happen for some time, not a short time
>   they happen because something bad happens in these people's bodies
>   for some time
>   some people can know why these things happen in people's bodies"

Strikingly, in way of thinking associated with the "*disease* concept" there is no reference to people's feelings or to people's individual awareness, as there is in the words *sick* and *ill*. In this sense, it can be said that the "*disease* concept" is not

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[7] The expression *mentally ill* is an extended meaning, based on [B] but not identical to it. The absence of a comparable expression **mentally sick* presumably follows from the fact that the final "bodily awareness" component in [C] disallows the extension.

particularly existential or experiential in character. It has a more detached, "objective" quality. The focus of interest is on what kinds of causal processes are happening in people's bodies and on how these can be understood, rather than on how the affected people are thinking or feeling.[8]

Note that nothing in explication [D] restricts it to infectious diseases. The explication will apply readily to non-infectious bodily afflictions such as *cancer*, *heart disease*, *MS* (Multiple Sclerosis) and *Alzheimer's*, and to what are sometimes called "genetic diseases" (or disorders), such as *Huntington's disease*.

4. 'Virus-1', 'bacteria' and 'germs'

We now zero in on three English nouns which are clearly at the forefront of discourse in these times of coronavirus. We first discuss *virus* and *bacteria*, and then the broader (and older) notion of *germs*. In this section we will adduce some evidence about word frequencies and collocational tendencies from WordBanks Online, a commercially available, closed corpus of English (about 550 million words). Most of the data in WordBanks dates from the years 2001-2005, i.e. from well before the coronavirus pandemic. This means that it does not reflect the current intense discourse interest in coronavirus and the numerous lexical and phrasal neologisms associated with it. We see this as an advantage for our purposes. It should be noted, however, that the corpus naturally includes many examples connected with HIV, SARS, swine flu and other seasonal influenza viruses.

The examples in (2) below show the most common and everyday sense of the word *virus*, which we designate 'virus-1'.

(2a) *I must've picked up a virus.*
(2b) *Colds are caused by a virus.*
(2c) *Howard is out of ... [the] team after going down with a virus.*
(2d) *It's only a matter of time before such a virus adapts itself to spread more easily from person to person and cause a severe worldwide outbreak.*

Explication [E] is presented in four sections. As a reminder, we are concerned here with the "naïve" concept behind the term *virus* in everyday English, not with an advanced scientific understanding. Section (a) presents 'virus-1' as 'something of one kind' with many sub-kinds. Most people are probably don't know the medical names of many viruses, but that there are different kinds of virus is common knowledge. In WordBanks, one finds expressions like *influenza/flu virus*, and more short-lived designations such as *H5N1 virus*. Of course, in today's world, probably most people know the term *coronavirus*.

Section (b) presents the idea that a virus consists of tiny little "bits" ('many very very small things') which cannot be seen by people. This understanding is no

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[8] The absence of experiential components may help explain why the *disease* concept is readily extended to animals, and even to plants. It is also consistent with the critique from medical humanities, which, briefly put, accuses the *disease* concept of eliding the feelings and perspectives of patients (cf. Marini 2017).

doubt reinforced at the present time by visual representations of coronavirus, used on television and internet, as consisting of little spheres with spikes.

Sections (c) – (e) are closely related. The first captures the idea that many of these tiny virus bits can be in a person's body at some times; the second adds the understanding that viruses in one person's body can rapidly ('after a very short time') spread to many other people in the same place[9]; and the third states that this can cause something bad to happen in this someone's body. Clearly, these meaning components connect with similar components in explications [B] – [D] for *ill*, *sick*, and *disease*. Joining the dots, so to speak, the implication is that viruses can be responsible for illness, sickness and disease.

Explication [E] concludes with a highly anthropocentric component, in section (f): 'people can think about things of this kind like this: "these things do very bad things to people's bodies"'. This reflects the idea that viruses are (or rather, can be) thought of as "bad agents". It is also supported, indirectly, by the extended meaning of *virus* in relation to computers, to designate a malicious, as well as fast-spreading, piece of software.

[E]   virus-1, e.g. *a virus*
a. something of one kind
    there are many kinds of things of this kind
b. when there is something of this kind somewhere, there are many very very small things of this kind there[10], people can't see them
c. there can be many such things in people's bodies at some times
d. when there are many of these very very small things in someone's body, a very short time after there can be many of them in the bodies of other people in the same place
e. when they are in someone's body, something bad can happen in this someone's body because of it
f. people can think about things of this kind like this: "these things do very bad things to people's bodies"

How does *virus* compare with *bacteria*? A sample of common examples, mostly from WordBanks, is given in (3) below. It is noticeable in the corpus that the word *bacteria* tends to occur preferentially in written or scripted texts, often with a popular science or medical tone. It is also notable that *bacteria* occurs much less frequently in the corpus than *virus*: 12.82 tokens per million vs. 42.84 per

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[9] The sub-component about "rapidity" ('after a very short time') is indirectly supported by the extended meaning of the adjective *viral*, in the expression 'to go viral', meaning to spread very rapidly over the internet.

[10] Notice the use of the "double very" construction, necessary to capture the difference in scale between 'very small' things, such as *mosquitoes*, for example, and 'very very small' things such as *viruses*, *germs*, and the like. The idea of "microscopic" size, so to speak, is of course, also conveyed by the component 'people cannot see them'. *Viruses*, *germs*, and such are not the only words belonging to might call the "invisible world": also included are words like *atoms* and *electrons*. The "invisible world" beckons as a fascinating project from a semantic point of view.

million. (The frequency of *virus* is somewhat boosted by the sense 'computer virus', but even so the contrast is impressive.)

> (3a) *Antibiotics only work against bacteria, not against viruses.*
> (3b) *Even if only a few bacteria get through, that is still enough to cause infection.*
> (3c) *Jacuzzis are tricky to sterilise because bacteria thrive in relatively high water temperatures.*
> (3d) *Boiling and cooking at the correct temperature are two good ways to kill bacteria in food.*
> (3e) *Dettol Glen 20. Surface spray disinfectant, hospital grade KILLS 99/9% of germs* & viruses*** [from a product label[11]]

In terms of collocations, the words *bacteria* and *virus* have much in common, but there are also several notable differences, one being that *bacteria* (but not *virus*) often occurs with verbs like *live (in), thrive (in), grow (in), breed (in)* and *flourish (in).* These expressions strongly imply that bacteria are thought of as living, and in this connection, expressions related to *killing bacteria* occur at high frequency. Also unlike *virus* (in this respect), expressions identifying places where *bacteria* live, or can live, are fairly common, including 'in water' and 'in food'. Adjectival modifiers referring to places in the human body are also fairly common, e.g. *intestinal bacteria*, *bacteria in the bowel (gut, mouth,* etc.). We reserve further comments on collocations and phraseology till after an explication has been presented.

Explication [F] is for the meaning we designate 'bacteria-1'. Somewhat like 'virus-1' in this respect, it is a type of "non-count" noun (the word *bacterium* is hardly used). The explication is presented in four sections. Many of the components overlap with those of 'virus-1', but there are also subtle but significant differences. The first appears as early as the first line in section (a), where *bacteria* are characterised as 'very very small living things' which people cannot see and which occurs in various different kinds. The main point of difference with *virus* is that *bacteria* are clearly represented as 'living things'.

Section (b) presents the dual ideas that *bacteria* can "multiply" in one place, and that they can quickly "spread" from one place to another.

Section (c) brings the *bacteria* concept closer to home, so to speak, by stating that: 'often there are many of these very very small living things in places where people live'. It is worth noting that there is nothing like this in the explication for *virus*.

Section (d) continues to say that such things (*bacteria*) can be in people's bodies (not necessarily coming from other people's bodies), and that when there are, they can cause harm in the body.[12]

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[11] The asterisks direct the reader to a box elsewhere on the label where various kinds of germs and viruses are named.

[12] Unlike as with 'virus-1', there is no final "how people think about them" component in *bacteria*. This reflects the more scientific, and less colloquial, tone of the word *bacteria*.

[F]   bacteria-1

a. very very small living things, people can't see them
there are many kinds (of such very very small living things)
b. when there are many of these very very small living things somewhere at some time, a short time after there can be many many more
when there are many of these very very small living things in one place at some time, a short time after, there can be many of them in other places near that place
c. often there are many of these very very small living things in places where people live
d. very very small living things of this kind can be in people's bodies at some times
when they [=these things] are in someone's body for some time, something bad can happen in this someone's body because of it

In considering this explication [F] for 'bacteria-1', it is important to bear in mind that it is intended to model a "naïve" everyday meaning, in Apresjan's (1992) sense. According to our observations, the meaning 'bacteria-1' is quite common and it often appears without any modifier; or, putting it another way, when the word *bacteria* appears without any modifier, the intended meaning appears to be 'bacteria-1'.

It is true that there is a second, more "scientific", meaning, which we would designate 'bacteria-2'. 'Bacteria-2' are not necessarily harmful. Many people know that there are many kinds of bacteria-2 in the human body at all times, and that some of them are actually vital to human health; hence, expressions like *beneficial bacteria*, *friendly bacteria*, *good bacteria*.[13]

We now come to *germs*, which is, perhaps, the most interesting of the three words (*virus*, *bacteria*, *germs*) from a semantic and cultural point of view. Partly this is because it is, intuitively, the most well established and most naïve of the three, and the one which is used first to give instruction to young children, as in example (4d) below. Note that examples (4b) and (4c) come from the COCA (Corpus of Contemporary American English), rather than from WordBanks.

(4a) *We thought it best to let everyone stay home and keep their germs to themselves.*
(4b) *So, if you re-use a wipe, say, you clean the sink, then a counter -- you may simply transfer germs from one area to another* [COCA, Mag, Good Housekeeping 2008]
(4c) *All it takes is a sneeze or cough for germs to spread to the child's hands, and through the air to others* [COCA, Mag, Today's Parent 1994]

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[13] In WordBanks, "positive" modifying adjectives such as *friendly* (73)/*beneficial* (33) occur at about the same frequency as *harmful* (93); but when *bacteria* occurs without any modifier, the overwhelmingly favoured interpretation is a negative one. As well, the apparently tautological expression *harmful bacteria* often appears in contexts in which a contrast is being drawn with 'beneficial bacteria', e.g. *Antibiotics are invaluable for their destructive effect on harmful bacteria, but unfortunately they often kill friendly bacteria too.*

(4d) *Some kids may think that germs are bugs or cooties or other gross stuff.*
Actually, germs are tiny organisms, or living things, that can cause disease.
[from KidsHealth.com]

Surprisingly, in the WordBanks corpus, the lemma 'germ' is by far the least frequent – a mere 3.61 tokens per million, compared with 12.82 per mill for 'bacterium', and 42.631 for 'virus'; and this is despite occurrences of *germ* being bolstered by expressions such as *germ warfare* and by the older meaning preserved in expressions like *a germ of truth* and *wheat germ, oat germ,* etc. We believe this apparent low frequency reflects WordBanks' bias in favour of written/scripted language and educated speech, and the relative lack of speech with and by children.

Though more research is required before one can be definitive, in our experience when native speakers of English are asked to choose the most "basic" of the three words *virus, bacteria* and *germs,* they invariably select *germs*. Likewise, when parents are asked which of the three words they first use with their children, again the answer is *germs*. Perhaps this hints at another reason why *germs* has a lower-than-expected frequency, i.e. that it seems excessively naïve, even embarrassingly non-scientific, compared with *virus* and *bacteria*: a child's word, or at least, not a word to be taken seriously by educated adults.[14] And indeed, from a scientific and medical point of view, the word *germs* does gloss over (or, fails to discriminate between) several different categories of disease-causing "pathogens" (not only bacteria and viruses, but also fungi and protozoa).

In the present study, however, we are interested in the concept of *germs* precisely because of its naïve and impressionistically basic quality. It is explicated in [G] below. We invite readers to read and consider the explication, which has several novel features, before moving to our commentary below.

[G] *germs*
a. very very small things of one kind, people can't see them
   often there are many many such things in places where people live
   often something bad happens to people because of this
b. often it happens like this:
   there are many very very small things of this kind on something
   someone touches this something with the hands
   after this, many of these very very small things are on this someone's hands
   after this, these very very small things are inside this someone's body
   something very bad can happen in this someone's body because of this
c. often it happens like this:
   there are many very very small things of this kind in something
   someone does something to this something with the hands

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[14] It is interesting to note that in the Simple English Wikipedia's entry for 'Germ theory of disease' the word "germs" is placed in inverted commas, whereas the words *bacteria* and *virus* are not. This suggests that bacteria and virus are seen by the authors as objective realities, whereas "germs" is seen as a naïve construct.

after this, some of it is inside this someone's mouth; a short time after this,
it is somewhere else inside this someone's body
something very bad can happen in this someone's body because of this
d. people can think about very very small things of this kind like this:
"they are like living things; they want to be inside people's bodies"

Explication [G] is much longer than any other in this study, reflecting our claim that the everyday concept of *germs* is a much richer concept than its cousins *virus* and *bacteria*. It is also much more anthropocentric, i.e. more closely linked to people. Already in section (a), close to the top of the explication, the idea is presented that *germs* often inhabit places where people live and that they therefore constitute an "invisible danger", so to speak, i.e. 'often something bad happens to people because of this'. Obviously, this implies that people would be well advised to take precautions.

The next two sections of the explication, i.e. sections (b) and (c), present two scenarios ('often it happens like this: …') which set out what one might call "routes of infection". The first route starts with there being many germs "on something". After this someone touches the thing with the hands, so that germs get on the hands, and subsequently get 'inside this someone's body' with harmful results.[15] The other route starts with there being many germs "in something", for instance, in food or drink, which someone transfers by the hand into the mouth, and thence to 'somewhere else inside this someone's body', again with harmful results.

As we see it, in these two sections the everyday English word *germs* is basically "channelling" what is known in the history of science as the "germ theory of disease", as it was developed in the second half of the 19th-century. It would be fair to say that in Anglo culture this late 19th-century germ theory has assumed the status of a folk theory.[16]

Returning to sections (b) and (c) of the explication, it should be clear that danger of germs, i.e. the prospect that 'something very bad can happen in someone's body' if germs are able to get inside, especially via the hands or mouth, is sufficient to motivate the taking of many precautions, both at an individual level (e.g. washing one's hands before eating and after going to the toilet; keeping the kitchen and bathroom/toilet clean; discarding contaminated food) and at the broader societal level (e.g. chlorinating the water supply; health regulations and inspections of

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[15] In NSM theory, "on (something)" is not regarded as a semantic prime but as an important semantic molecule; cf. Goddard (2002, 2018: Ch 5).

[16] Despite the global spread of the "germ theory" as a scientific/medical understanding, we do not want to imply that the exact details of the Anglo folk model are replicated in the vocabulary of other languages, even European languages. For example, the semantic content of the Polish word *zarazki*, the nearest equivalent to 'germs', is derived from the common verb *zarazić* 'to infect (someone')'. This suggests a somewhat different folk model, based more heavily on person-to-person transmission. The matter requires further investigation.

restaurants, cafes, and the like). It also links with the existence of disinfectants and germicides which are designed to "kill germs".[17]

The final section of the explication, section (d), includes a component stating that 'people can think about them (germs) like this: "they are like living things, they want to be inside people's bodies", thereby attributing something like animacy to them (albeit in a less definitive fashion than in *bacteria*) and something like agency or intentionality. The wording of the component 'they want to be inside people's bodies' is consistent with the more "naïve" character of the word *germs* compared with *bacteria* and *virus*.[18]

This completes our presentation of semantic explications. As this has been, as far as we know, the first attempt at a systematic semantic inquiry into aspects of English folk epidemiology, it goes without saying that there is great scope for further research; for example, into other polysemic meanings and extensions of the words considered here, into other associated words and concepts, and into cross-linguistic comparisons.

5. Concluding remarks: semantics in the time of coronavirus

It seems evident that if we want to explain what a word means we need to use some other words, simpler in meaning. To 17th century thinkers such as Leibniz, Descartes, Pascal, and Arnauld, this principle seemed uncontroversial. In today's world, however, it is neither recognised nor respected — neither in science nor in education.

For example, in Wikipedia the entry for "virus" starts with the sentence: "A virus is a submicroscopic infectious agent that replicates only inside the living cells of an organism". Then we read "For a more accessible and less technical introduction to this topic, see "Introduction to viruses". When we go to that "Introduction", however, we find that only one word, *submicroscopic*, has been replaced with a simpler one: *tiny*, and also that a new complex word *host* has been added: "A virus is a tiny infectious agent that reproduces inside the cells of living hosts".

But what is "an infectious agent"? There is no such entry in Wikipedia, and the entry for "infection" explains the concept through the phrase *infectious agents*. "An infection is the invasion of an organism's body tissues by disease-causing agents, their multiplication, and the reaction of the host tissues to the infectious agents and the toxins they produce." No explanation of "infectious agents" is offered anywhere.

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[17] Although it is perfectly idiomatic in English to speak of 'killing germs', similar expressions are not equally natural or widespread in all languages. NSM theory posits that one meaning of 'kill', as found in the frame 'this someone killed someone', is likely to be a universal semantic molecule, but research also indicates that languages differ greatly their extensions and polysemies of "kill" words. English, in particular, is very flexible in allowing one to speak not only of killing animals, but also of killing insects, and even plants. English even allows event nouns to be subjects of *kill*, e.g. *The explosion killed five people*.

[18] It is true that explication [E] for *virus* includes the component 'these things do very bad things to people's bodies', but this does not sound similarly naïve. Scientists often speak of inanimate entities and substances as if they were agents ("doing" things).

The so-called "Simple English Wikipedia" is not much better in this regard. For example, the entry for "bacteria" opens as follows: "Bacteria (sing. Bacterium) are very small organisms. They are protokaryotic organisms." The beginning of the entry for "virus" is perhaps slightly better, but not much better: "A virus is a microscopic parasite that can infect living organisms and cause disease." Similarly, the entry for "Germ theory of disease" explains this concept using words like *pathogen*, *microorganism*, *hosts* and *bacterium* (there is no entry for "germs" as such).

It seems clear that the authors of such entries are not trying to be mischievous, but genuinely don't know how to explain meanings and ideas clearly, without circularity and without using technical terms whose meanings are not explained.

These explanations are good examples of what used to be called *ignotum per ignotum* ('one unknown via another unknown') or *ignotum per ignotius* ('something unknown via something even more unknown'). They also remind us of Leibniz's insights formulated 350 years ago: "The greatest clarity is found in commonplace terms with their popular usage retained. There is always a certain obscurity in technical terms"; and "technical terms are to be avoided". Yes, technical terms can't always be avoided but before they are used, they need to be analysed into "popular ones". Hence, as Leibniz put it: "a perfect demonstration … carries out such analysis to the ultimate and best-known elements" (Leibniz 1989/1690: 123).

As we have tried to demonstrate with our explications of *bacteria*, *virus* and *germs*, both circularity and obscurity can be avoided if one tries to go, from the start, right down to the concepts which are both simple and self-explanatory. Wittgenstein's (1980: 62e) words, directed at philosophers, seem wonderfully apt in the case of linguists too: "One keeps forgetting to go right down to the foundations. One doesn't put the question marks deep enough down."

To try to explain a word like *virus* through complex words like *microorganism*, *infectious agent* or *infectious* means not going deep enough down. When we go "right down to the foundations" we find words there which are both simple and self-explanatory and thus can save us from both circularity and obscurity. At the same time, if in these explanations we can stay clear of any technical and scientific language we can reveal everyday thinking explicable through everyday words.

As mentioned in Section 1, naive or folk epidemiology can differ from culture to culture and from language to language. But the wonder of it all is that if we go "right down to the foundations", we find words there which are not only clear to all speakers of one language (including children), but which are cross-translatable into other languages. Being cross-translatable, such words can allow us to formulate "global messages" when global messages are needed, such as at the time of a pandemic.

The semantics of words like *virus*, *bacteria* and *germs* is not a purely academic matter. It is also a matter of effective health education and health communication

(cf. Diget in press/2021; Wierzbicka 2018, in press/2021). To reach people at a time of an epidemic, explanations need to connect with "ordinary people's" ways of thinking and speaking.

Health messages intended for "ordinary people" need to be understandable to these "ordinary people"; and a globalised world needs global messages which are clear and cross-translatable. As we hope the paper illustrates, the simple and cross-translatable words of NSM, and minimal languages based on it, can be effective tools not only for linguistic semantics but also for education and communication everywhere – at the local school and in the world at large.

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