
MIT Java Wordnet Interface (JWI)

User's Guide

Version 2.2.x

Mark A. Finlayson

(markaf@alum.mit.edu)

December 9, 2013

1 Purpose of the Software

This MIT Java Wordnet Interface (JWI) is a Java library for interfacing with the Wordnet electronic dictionary. It features API calls to retrieve index words, synsets, and morphological exceptions from the Wordnet data files. It also has calls that allow following lexical and semantic pointers, and contains classes that can perform simple morphological processing. The library has no GUI elements.

JWI is freely available for all purposes, as long as proper acknowledgement is made. Details can be found in the license, which is included at the end of this document.

2 Wordnet Versions Supported

JWI has been tested and works with the following versions of Wordnet.

Princeton Wordnet

- Wordnet 3.1
- Wordnet 3.0 (full version)
- Wordnet 3.0 (database only distribution)
- Wordnet 2.1
- Wordnet 2.0
- Wordnet 1.7.1
- Wordnet 1.7.1
- Wordnet 1.6 (No access to cousin files or index.gloss file)

Stanford Augmented Wordnet

- Wordnet 2.1 + 10k
- Wordnet 2.1 + 20k
- Wordnet 2.1 + 30k
- Wordnet 2.1 + 40k

JWI is not compatible with Wordnet version 1.5. The Stanford Augmented Wordnet versions 400k(cropped) and 400k(all) have errors in their byte-offsets, alphabetical ordering, and adjective satellite markings, and so JWI does not work reliably with them. No version of Wordnet is included with the JWI distribution, and must be downloaded separately.

3 Getting Started

The main interface for accessing dictionary data is the `edu.mit.jwi.IDictionary` interface. The standard implementation of this interface is the `edu.mit.jwi.Dictionary` class. In the simplest case, where you are using Wordnet with the data files on the same filesystem as your Java program, you can instantiate the `Dictionary` class with a single argument, a Java URL object that points to the directory where the Wordnet dictionary data files are located.

An example of this can be found in Listing 1, in the form of a Java method `testDictionary()`. In that method, the first block of three lines (4-6) deals with constructing a URL object that points to the Wordnet data files. In this particular example, the base Wordnet directory is assumed to be stored in a system environment variable called `WNHOME`. Note that the `WNHOME` variable points to the root of the Wordnet installation directory and the dictionary data directory “dict” must be appended to this path. This may be different on your system depending on where your Wordnet files are located. The second block of code, two lines long (9-10), constructs an instance of the default `Dictionary` object, and opens it by calling the `open()` method. The final block of six lines (13-18) demonstrates searching the dictionary for the first sense of the noun “dog”. Listing 2 shows the console output of the method.

```

1 public void testDictionary() throws IOException {
2
3     // construct the URL to the Wordnet dictionary directory
4     String wnhome = System.getenv("WNHOME");
5     String path = wnhome + File.separator + "dict";
6     URL url = new URL("file", null, path);
7
8     // construct the dictionary object and open it
9     IDictionary dict = new Dictionary(url);
10    dict.open();
11
12    // look up first sense of the word "dog"
13    IIndexWord idxWord = dict.getIndexWord("dog", POS.NOUN);
14    IWordID wordID = idxWord.getWordIDs().get(0);
15    IWord word = dict.getWord(wordID);
16    System.out.println("Id = " + wordID);
17    System.out.println("Lemma = " + word.getLemma());
18    System.out.println("Gloss = " + word.getSynset().getGloss());
19 }

```

Listing 1: Basic use of JWI

```

1 Id = WID-2084071-n-?-dog
2 Lemma = dog
3 Gloss = a member of the genus Canis (probably descended from the common
         wolf) that has been domesticated by man since prehistoric times; occurs
         in many breeds; "the dog barked all night"

```

Listing 2: Output of the `testDictionary()` method in Listing 1 (for Wordnet 3.0)

4 What's New

The major new feature in JWI 2.2.x is the ability to load a dictionary fully into memory. This begets a substantial performance improvement. To take advantage, use the new `edu.mit.jwi.RAMDictionary` class, as shown in 3. There are several options to control loading; see the `edu.mit.jwi.data.ILoadable` interface.

```

1 public void testRAMDictionary(File wnDir) throws Exception {
2
3     // construct the dictionary object and open it
4     IRAMDictionary dict = new RAMDictionary(wnDir, ILoadPolicy.NO_LOAD);
5     dict.open();
6
7     // do something
8     trek(dict);
9
10    // now load into memory
11    System.out.print("\nLoading Wordnet into memory...");
12    long t = System.currentTimeMillis();
13    dict.load(true);
14    System.out.printf("done (%1d msec)\n", System.currentTimeMillis()-t);
15
16    // try it again, this time in memory
17    trek(dict);
18 }
19
20 public void trek(IDictionary dict){
21     int tickNext = 0;
22     int tickSize = 20000;
23     int seen = 0;
24     System.out.print("Treking across Wordnet");
25     long t = System.currentTimeMillis();
26     for(POS pos : POS.values())
27         for(Iterator<IIndexWord> i = dict.getIndexWordIterator(pos); i.
28             hasNext(); )
29             for(IWordID wid : i.next().getWordIDs()){
30                 seen += dict.getWord(wid).getSynset().getWords().size();
31                 if(seen > tickNext){
32                     System.out.print('.');
33                     tickNext = seen + tickSize;
34                 }
35             }
36     System.out.printf("done (%1d msec)\n", System.currentTimeMillis()-t);
37     System.out.println("In my trek I saw " + seen + " words");
38 }

```

Listing 3: Using JWI completely in-memory

```

1 Treking across Wordnet.....done (3467 msec)
2 In my trek I saw 522858 words
3
4 Loading Wordnet into memory...done (5728 msec)
5 Treking across Wordnet.....done (205 msec)
6 In my trek I saw 522858 words

```

Listing 4: Output of the `testRAMDictionary()` method in Listing 3 (for Wordnet 3.0)

5 Frequently Asked Questions

5.1 Which implementation of IDictionary should I use? Do I need to use RAMDictionary?

Most will not need the performance edge that comes from loading all of Wordnet into memory. JWI is already pretty fast. For most, the standard `edu.mit.jwi.Dictionary` class, pointing to a local directory containing the Wordnet files, will do. If you're worried about wasted computations, increase the cache size. For most, the inconvenience inherent in waiting five or ten seconds for Wordnet to do a blocking load, or the slowdown of the whole application during a non-blocking load, or having to remember to set the heap size correctly, will be more of a hassle than just using the on-disk implementation.

5.2 I'm using RAMDictionary and I'm getting an OutOfMemoryError. What do I do?

Wordnet is quite large, and usually won't fit into the standard heap on most 32-bit JVMs. You need to increase your heap size. On the Sun JVM, this involves the command line flag `-Xmx` along with a reasonable heap size, say, 500 MB or 1 GB.

5.3 Why doesn't JWI return a word I know is in Wordnet?

The `IDictionary` interface contract states that you must pass in the root form of the word you are looking for. If you pass in a plural form of a noun (such as "dogs" instead of "dog"), or a non-base form of verb ("running" instead of "run"), it won't give you back the right objects. Use the `edu.mit.jwi.morph.WordnetStemmer` class to obtain root forms for words, before passing them to the dictionary for lookup.

5.4 How do I retrieve the synonyms of a word?

Each meaning, or *synset*, in Wordnet has multiple lexical forms or collocations associated with it. The meaning of the word dog implied in sentence "My dog Fido barks," has three: *dog*, *domestic_dog*, and *Canis_familiaris*. To obtain this list, we must first get a handle to the `ISynset` object for that meaning. Then, we can get the graphical forms by iterating over all the `IWord` objects associated with that synset. Java code that does this is shown in Listing 5.

```

1 public void getSynonyms(IDictionary dict){
2
3     // look up first sense of the word "dog"
4     IIndexWord idxWord = dict.getIndexWord("dog", POS.NOUN);
5     IWordID wordID = idxWord.getWordIDs().get(0); // 1st meaning
6     IWord word = dict.getWord(wordID);
7     ISynset synset = word.getSynset();
8
9     // iterate over words associated with the synset
10    for(IWord w : synset.getWords())
11        System.out.println(w.getLemma());
12 }

```

Listing 5: Retrieving the synonyms of the first meaning of the word "dog"

```

1 dog
2 domestic_dog
3 Canis_familiaris

```

Listing 6: Output of the `getSynonyms()` method in Listing 5 (for Wordnet 3.0)

5.5 How do I retrieve the hypernyms of a word?

Each synset is connected to other synsets by semantic pointers. One of the most prevalent of these is the *Hypernym* pointer, which points from a meaning to other meanings that are “more general” in some fashion; these are called hypernyms. The sense of dog used in the previous example has a two hypernyms: the subset of mammals that are closely related to dogs, such as wolves or jackals (this Synset has synonyms *canine* and *canid*), and the set of domesticated animals (with synonyms *domestic_animal* and *domesticated_animal*). To obtain these synsets, we must first get a handle to the `ISynset` object for the meaning for dog. Then, we can retrieve the hypernym synsets via the `getRelatedSynsets(IPointerType)` method. Java code that does this is shown in Listing 7.

```

1 public void getHypernyms(IDictionary dict){
2
3     // get the synset
4     IIndexWord idxWord = dict.getIndexWord("dog", POS.NOUN);
5     IWordID wordID = idxWord.getWordIDs().get(0); // 1st meaning
6     IWord word = dict.getWord(wordID);
7     ISynset synset = word.getSynset();
8
9     // get the hypernyms
10    List<ISynsetID> hypernyms =
11        synset.getRelatedSynsets(Pointer.HYPERNYM);
12
13    // print out each hypernyms id and synonyms
14    List<IWord> words;
15    for(ISynsetID sid : hypernyms){
16        words = dict.getSynset(sid).getWords();
17        System.out.print(sid + " {");
18        for(Iterator<IWord> i = words.iterator(); i.hasNext();){
19            System.out.print(i.next().getLemma());
20            if(i.hasNext())
21                System.out.print(", ");
22        }
23        System.out.println("}");
24    }
25 }
```

Listing 7: Retrieving the hypernyms of the word “dog”

```

1 SID-2083346-n {canine, canid}
2 SID-1317541-n {domestic_animal, domesticated_animal}
```

Listing 8: Output of the `getHypernyms()` method in Listing 7 (for Wordnet 3.0)

5.6 Why doesn't JWI have a pointer from item X to item Y that I know is in Wordnet?

For this, the problem is usually that you are trying to retrieve synsets via *lexical pointers*, or `IWord` objects via *semantic pointers*. The key difference between the two is that semantic pointers are between synsets (i.e., meanings, such as the domesticated animal meaning captured in `{dog, domestic_dog, canis_familiaris}`), and lexical pointers are between word forms (e.g., the dog word form of the above meaning only). To retrieve semantic pointers, one uses the `ISynset.getRelatedSynsets(IPointer)` method, and to retrieve lexical pointers, one should use the `IWord.getRelatedWords(IPointer)` method. If you pass a lexical pointer (say DERIVED) to the `getRelatedSynsets` method, you won't get anything back.

These two types of pointers are not well distinguished in the Wordnet documentation. Figure 1 diagrams the relationship. As can be seen, in JWI, lexical pointers are found only between `IWord` objects, and semantic pointers are found only between `ISynset` objects. There are no pointers that connect a word to a synset. Thus, you can only find hypernyms of synsets, and you can only find derived forms of words.

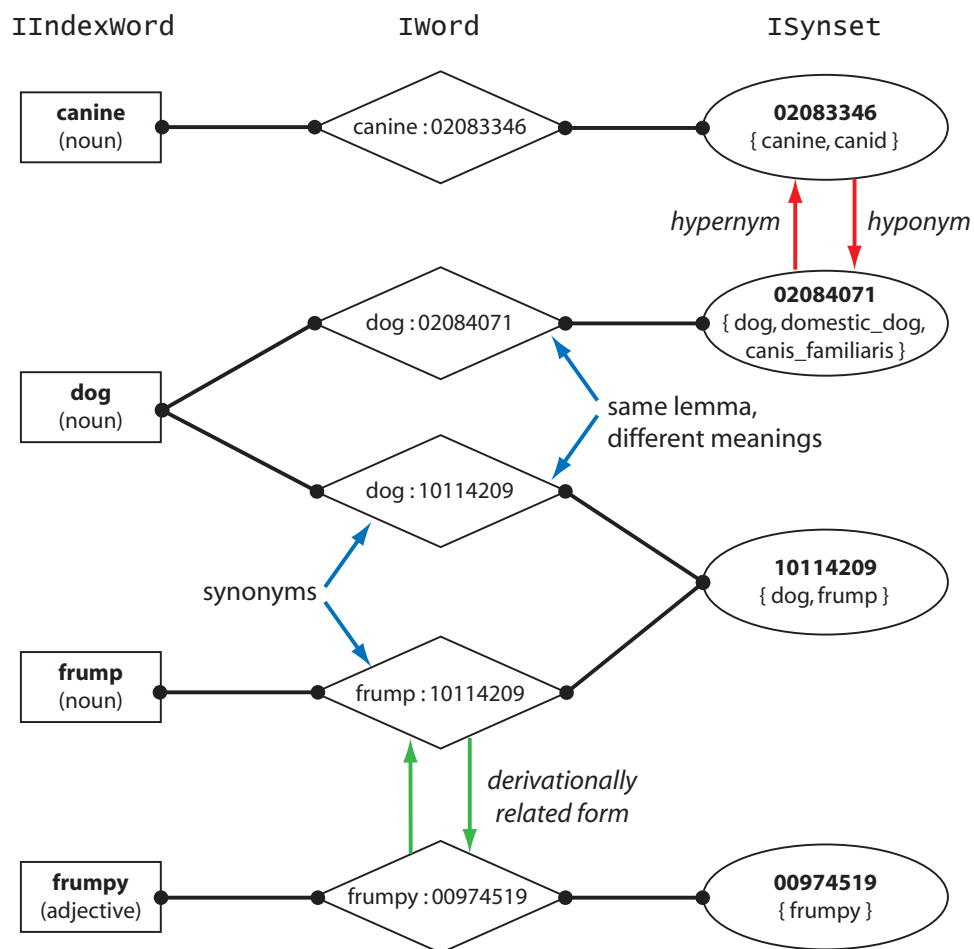


Figure 1: The structure of Wordnet: index words, words, synsets, synonyms, lexical pointers (green arrows) and semantic pointers (red arrows) (for Wordnet 3.0)

5.7 How do I know which pointers are lexical and which are semantic?

Unfortunately, the Wordnet documentation doesn't give much hint about which pointers are used as lexical pointers, which are used as semantic pointers, and which as both. Fortunately for those seeking an answer to this question, I wrote some code that sifts through Wordnet and counts the instances of each. Those numbers for Wordnet 3.0 are found in Table 1. The counts for the Wordnet 2.0 and 2.1 are similar, and the separation of lexical and semantic pointers between lexical and semantic is exactly the same, with the exception that Wordnet 2.0 uses REGION and REGION_MEMBER types only as semantic pointers.

Pointer	Lexical	Semantic	Total	Both?
ALSO_SEE	580	2692	3272	Yes
ANTONYM	7979	-	7979	-
ATTRIBUTE	-	1278	1278	-
CAUSE	-	220	220	-
DERIVED	74714	-	74714	-
DERIVED_ADJ	3222	-	3222	-
ENTAILMENT	-	408	408	-
HOLONYM_MEM	-	12293	12293	-
HOLONYM_PRT	-	9097	9097	-
HOLONYM_SUB	-	797	797	-
HYPERNYM	-	89089	89089	-
HYPERNYM_IN	-	8577	8577	-
HYPONYM	-	89089	89089	-
HYPONYM_INS	-	8577	8577	-
MERONYM_MEM	-	12293	12293	-
MERONYM_PRT	-	9097	9097	-
MERONYM_SUB	-	797	797	-
PARTICIPLE	73	-	73	-
PERTAINYM	4799	-	4799	-
REGION	15	1345	1360	Yes
REGION_MEM	15	1345	1360	Yes
SIMILAR_TO	-	21386	21386	-
TOPIC	11	6643	6654	Yes
TOPIC_MEM	11	6643	6654	Yes
USAGE	409	967	1376	Yes
USAGE_MEM	409	967	1376	Yes
VERB_GROUP	2	1748	1750	Yes
Total	92239	285348	377587	

Table 1: Counts of Lexical and Semantic Pointers (for Wordnet 3.0)

5.8 Can JWI load itself completely into memory?

Yes, JWI now has the ability, as of version 2.2.0, to load itself completely into memory. For the cost of several hundred megabytes of memory, you get a significant speedup. See the `edu.mit.jwi.RAMDictionary` class.

5.9 Who do the following messages that are following printed to `System.err` mean?

1229375196772 - Error on direct access in verb data file: check CR/LF endings

The Wordnet .data files (i.e., the four files that either start or end with data, e.g., `noun.data`, `verb.data`, etc.) are indexed by byte offset. The line endings in the files are indicated in the standard UNIX way, by a single linefeed (LF) character, often written as “`\n`”. In contrast, the standard linefeed on Windows systems is a carriage-return character followed by a linefeed (CR/LF), often written “`\r\n`”. Some archive extraction programs automatically convert LF linefeeds to CR/LF linefeeds, especially if you're on a Windows system. If this was done, the Wordnet data files will have an extra character at the end of each line, and the byte offsets will no longer index to the right places. As of JWI 2.1.5, there is a check for this, where the above error prints. The error doesn't prevent JWI from running, but it does cause a reduction in performance. I recommend you re-extract your data files from the Wordnet archive, making sure you have the option to automatically convert line endings unchecked. For example, in WinZip 9, there is option under Configuration – Miscellaneous called “TAR smart CR/LF conversion”. Make sure it is unchecked when extracting the wordnet files.

5.10 Why are all my ISynset objects null?

See the answer to Question 5.9. In versions of JWI before 2.1.5, there was no check for corrupted line endings in the data files, and the symptom is no errors except null synset objects.

5.11 Why does the `Dictionary.getExceptionIterator` method throw a `NullPointerException`?

This happens when using JWI 2.2.3 or earlier on the “database only” distribution of Wordnet that was released for version 3.0. Princeton did not include the exception files in that distribution, which causes the `getExceptionIterator` method to throw an exception. The solution is to either upgrade JWI 2.2.4 or later; copy the exception files from another download of Wordnet; or create empty exception files in your wordnet data directory with the names `adj.exc`, `adv.exc`, `noun.exc`, and `verb.exc`.

5.12 How do I license JWI for commercial use?

As of version 2.2.2, JWI is free to use for all purposes, as long as proper copyright acknowledgment is made. No special license is needed for commercial use.

5.13 How do I report a bug / request a feature / heap praise upon you for making such cool software?

If you find a bug, have a feature request, or wish to send your praises, please contact me via my permanent email forwarding address markaf@alum.mit.edu.

6 License

The following is the full text of the MIT Java Wordnet Interface license.

Copyright (c) 2007-2013 Massachusetts Institute of Technology.

All rights reserved.

This program and the accompanying materials are made available by MIT under the terms of this license. Contact markaf@alum.mit.edu for further details.

The following constitutes the JWI License. It is identical to the Creative Commons Attribution Version 3.0 Unported License, which can be found on the web at:

<http://creativecommons.org/licenses/by/3.0/legalcode>

THE WORK (AS DEFINED BELOW) IS PROVIDED UNDER THE TERMS OF THIS CREATIVE COMMONS PUBLIC LICENSE ("CCPL" OR "LICENSE"). THE WORK IS PROTECTED BY COPYRIGHT AND/OR OTHER APPLICABLE LAW. ANY USE OF THE WORK OTHER THAN AS AUTHORIZED UNDER THIS LICENSE OR COPYRIGHT LAW IS PROHIBITED.

BY EXERCISING ANY RIGHTS TO THE WORK PROVIDED HERE, YOU ACCEPT AND AGREE TO BE BOUND BY THE TERMS OF THIS LICENSE. TO THE EXTENT THIS LICENSE MAY BE CONSIDERED TO BE A CONTRACT, THE LICENSOR GRANTS YOU THE RIGHTS CONTAINED HERE IN CONSIDERATION OF YOUR ACCEPTANCE OF SUCH TERMS AND CONDITIONS.

1. Definitions

a. "Adaptation" means a work based upon the Work, or upon the Work and other pre-existing works, such as a translation, adaptation, derivative work, arrangement of music or other alterations of a literary or artistic work, or phonogram or performance and includes cinematographic adaptations or any other form in which the Work may be recast, transformed, or adapted including in any form recognizably derived from the original, except that a work that constitutes a Collection will not be considered an Adaptation for the purpose of this License. For the avoidance of doubt, where the Work is a musical work, performance or phonogram, the synchronization of the Work in timed-relation with a moving image ("synching") will be considered an Adaptation for the purpose of this License.

b. "Collection" means a collection of literary or artistic works, such as encyclopedias and anthologies, or performances, phonograms or broadcasts, or other works or subject matter other than works listed in Section 1(f) below, which, by reason of the selection and arrangement of their contents, constitute intellectual creations, in which the Work is included in its entirety in unmodified form along with one or more other contributions, each constituting separate and independent works in themselves, which together are assembled into a collective whole. A work that constitutes a Collection will not be considered an Adaptation (as defined above) for the purposes of this License.

c. "Distribute" means to make available to the public the original and copies of the Work or Adaptation, as appropriate, through sale or other transfer of ownership.

d. "Licensor" means the individual, individuals, entity or entities that offer(s) the Work under the terms of this License.

e. "Original Author" means, in the case of a literary or artistic work, the individual, individuals, entity or entities who created the Work or if no individual or entity can be identified, the publisher; and in addition (i) in the case of a performance the actors, singers, musicians, dancers, and other persons who act, sing, deliver, declaim, play in, interpret or otherwise perform literary or artistic works or expressions of folklore; (ii) in the case of a phonogram the producer being the person or legal entity who first fixes the sounds of a performance or other sounds; and, (iii) in the case of broadcasts, the organization that transmits the broadcast.

f. "Work" means the literary and/or artistic work offered under the terms of this License including without limitation any production in the literary, scientific and artistic domain, whatever may be the mode or form of its expression including digital form, such as a book, pamphlet and other writing; a lecture, address, sermon or other work of the same nature; a dramatic or dramatico-musical work; a choreographic work or entertainment in dumb show; a musical composition with or without words; a cinematographic work to which are assimilated works expressed by a process analogous to cinematography; a work of drawing, painting, architecture, sculpture, engraving or lithography; a photographic work to which are assimilated works expressed by a process analogous to photography; a work of applied art; an illustration, map, plan, sketch or three-dimensional work relative to geography, topography, architecture or science; a performance; a broadcast; a phonogram; a compilation of data to the extent it is protected as a copyrightable work; or a work performed by a variety or circus performer to the extent it is not otherwise considered a literary or artistic work.

g. "You" means an individual or entity exercising rights under this License who has not previously violated the terms of this License with respect to the Work, or who has received express permission from the Licensor to exercise rights under this License despite a previous violation.

h. "Publicly Perform" means to perform public recitations of the Work and to communicate to the public those public recitations, by any means or process, including by wire or wireless means or public digital performances; to make available to the public Works in such a way that members of the public may access these Works from a place and at a place individually chosen by them; to perform the Work to the public by any means or process and the communication to the public of the performances of the Work, including by public digital performance; to broadcast and rebroadcast the Work by any means including signs, sounds or images.

i. "Reproduce" means to make copies of the Work by any means including without limitation by sound or visual recordings and the right of fixation and reproducing fixations of the Work, including storage of a protected performance or phonogram in digital form or other electronic medium.

2. Fair Dealing Rights.

Nothing in this License is intended to reduce, limit, or restrict any uses free from copyright or rights arising from limitations or exceptions that are provided for in connection with the copyright protection under copyright law or other applicable laws.

3. License Grant

Subject to the terms and conditions of this License, Licensor hereby grants You a worldwide, royalty-free, non-exclusive, perpetual (for the duration of the applicable copyright) license to exercise the rights in the Work as stated below:

a. to Reproduce the Work, to incorporate the Work into one or more Collections, and to Reproduce the Work as incorporated in the Collections;

b. to create and Reproduce Adaptations provided that any such Adaptation, including any translation in any medium, takes reasonable steps to clearly label, demarcate or otherwise identify that changes were made to the original Work. For example, a translation could be marked "The original work was translated from English to Spanish," or a modification could indicate "The original work has been modified."

c. to Distribute and Publicly Perform the Work including as incorporated in Collections;

d. and, to Distribute and Publicly Perform Adaptations.

e. For the avoidance of doubt:

i. Non-waivable Compulsory License Schemes. In those jurisdictions in which the right to collect royalties through any statutory or compulsory licensing scheme cannot be waived, the Licensor reserves the exclusive right to collect such royalties for any exercise by You of the rights granted under this License;

ii. Waivable Compulsory License Schemes. In those jurisdictions in which the right to collect royalties through any statutory or compulsory licensing scheme can be waived, the Licensor reserves the exclusive right to collect such royalties for any exercise by You of the rights granted under this License if Your exercise of such rights is for a purpose or use which is otherwise than noncommercial as permitted under Section 4(b) and otherwise waives the right to collect royalties through any statutory or compulsory licensing scheme; and,

iii. Voluntary License Schemes. The Licensor reserves the right to collect royalties, whether individually or, in the event that the Licensor is a member of a collecting society that administers voluntary licensing schemes, via that society, from any exercise by You of the rights granted under this License that is for a purpose or use which is otherwise than noncommercial as permitted under Section 4(c).

The above rights may be exercised in all media and formats whether now known or hereafter devised. The above rights include the right to make such modifications as are technically necessary to exercise the rights in other media and formats. Subject to Section 8(f), all rights not expressly granted by

Licensors are hereby reserved, including but not limited to the rights set forth in Section 4(d).

4. Restrictions.

The license granted in Section 3 above is expressly made subject to and limited by the following restrictions:

a. You may Distribute or Publicly Perform the Work only under the terms of this License. You must include a copy of, or the Uniform Resource Identifier (URI) for, this License with every copy of the Work You Distribute or Publicly Perform. You may not offer or impose any terms on the Work that restrict the terms of this License or the ability of the recipient of the Work to exercise the rights granted to that recipient under the terms of the License. You may not sublicense the Work. You must keep intact all notices that refer to this License and to the disclaimer of warranties with every copy of the Work You Distribute or Publicly Perform. When You Distribute or Publicly Perform the Work, You may not impose any effective technological measures on the Work that restrict the ability of a recipient of the Work from You to exercise the rights granted to that recipient under the terms of the License. This Section 4(a) applies to the Work as incorporated in a Collection, but this does not require the Collection apart from the Work itself to be made subject to the terms of this License. If You create a Collection, upon notice from any Licensor You must, to the extent practicable, remove from the Collection any credit as required by Section 4(c), as requested. If You create an Adaptation, upon notice from any Licensor You must, to the extent practicable, remove from the Adaptation any credit as required by Section 4(c), as requested.

b. If You Distribute, or Publicly Perform the Work or any Adaptations or Collections, You must, unless a request has been made pursuant to Section 4(a), keep intact all copyright notices for the Work and provide, reasonable to the medium or means You are utilizing: (i) the name of the Original Author (or pseudonym, if applicable) if supplied, and/or if the Original Author and/or Licensor designate another party or parties (e.g., a sponsor institute, publishing entity, journal) for attribution ("Attribution Parties") in Licensor's copyright notice, terms of service or by other reasonable means, the name of such party or parties; (ii) the title of the Work if supplied; (iii) to the extent reasonably practicable, the URI, if any, that Licensor specifies to be associated with the Work, unless such URI does not refer to the copyright notice or licensing information for the Work; and, (iv) consistent with Section 3(b), in the case of an Adaptation, a credit identifying the use of the Work in the Adaptation (e.g., "French translation of the Work by Original Author," or "Screenplay based on original Work by Original Author"). The credit required by this Section 4(c) may be implemented in any reasonable manner; provided, however, that in the case of a Adaptation or Collection, at a minimum such credit will appear, if a credit for all contributing authors of the Adaptation or Collection appears, then as part of these credits and in a manner at least as prominent as the credits for the other contributing authors. For the avoidance of doubt, You may only use the credit required by this Section for the purpose of attribution in the manner set out above and, by exercising Your rights under this License, You may not implicitly or explicitly assert or imply any connection with, sponsorship or endorsement by the Original Author, Licensor and/or Attribution Parties, as appropriate, of You or Your use of the Work, without the separate, express prior written permission of the Original Author, Licensor and/or Attribution Parties.

c. Except as otherwise agreed in writing by the Licensor or as may be otherwise permitted by applicable law, if You Reproduce, Distribute or Publicly Perform the Work either by itself or as part of any Adaptations or Collections, You must not distort, mutilate, modify or take other derogatory action in relation to the Work which would be prejudicial to the Original Author's honor or reputation. Licensor agrees that in those jurisdictions (e.g. Japan), in which any exercise of the right granted in Section 3(b) of this License (the right to make Adaptations) would be deemed to be a distortion, mutilation, modification or other derogatory action prejudicial to the Original Author's honor and reputation, the Licensor will waive or not assert, as appropriate, this Section, to the fullest extent permitted by the applicable national law, to enable You to reasonably exercise Your right under Section 3(b) of this License (right to make Adaptations) but not otherwise.

5. Representations, Warranties and Disclaimer.

UNLESS OTHERWISE MUTUALLY AGREED TO BY THE PARTIES IN WRITING, LICENSOR OFFERS THE WORK AS-IS AND MAKES NO REPRESENTATIONS OR WARRANTIES OF ANY KIND CONCERNING THE WORK, EXPRESS, IMPLIED, STATUTORY OR OTHERWISE, INCLUDING, WITHOUT LIMITATION, WARRANTIES OF TITLE, MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, NONINFRINGEMENT, OR THE ABSENCE OF LATENT OR OTHER DEFECTS, ACCURACY, OR THE PRESENCE OF ABSENCE OF ERRORS, WHETHER OR NOT DISCOVERABLE. SOME JURISDICTIONS DO NOT ALLOW THE EXCLUSION OF IMPLIED WARRANTIES, SO SUCH EXCLUSION MAY NOT APPLY TO YOU.

6. Limitation on Liability.

EXCEPT TO THE EXTENT REQUIRED BY APPLICABLE LAW, IN NO EVENT WILL LICENSOR BE LIABLE TO YOU ON ANY LEGAL THEORY FOR ANY SPECIAL, INCIDENTAL, CONSEQUENTIAL, PUNITIVE OR EXEMPLARY DAMAGES ARISING OUT OF THIS LICENSE OR THE USE OF THE WORK, EVEN IF LICENSOR HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES.

7. Termination.

a. This License and the rights granted hereunder will terminate automatically upon any breach by You of the terms of this License. Individuals or entities who have received Adaptations or Collections from You under this License, however, will not have their licenses terminated provided such individuals or entities remain in full compliance with those licenses. Sections 1, 2, 5, 6, 7, and 8 will survive any termination of this License.

b. Subject to the above terms and conditions, the license granted here is perpetual (for the duration of the applicable copyright in the Work). Notwithstanding the above, Licensor reserves the right to release the Work under different license terms or to stop distributing the Work at any time; provided, however that any such election will not serve to withdraw this License (or any other license that has been, or is required to be, granted under the terms of this License), and this License will continue in full force and effect unless terminated as stated above.

8. Miscellaneous.

a. Each time You Distribute or Publicly Perform the Work or a Collection, the Licensor offers to the recipient a license to the Work on the same terms and conditions as the license granted to You under this License.

b. Each time You Distribute or Publicly Perform an Adaptation, Licensor offers to the recipient a license to the original Work on the same terms and conditions as the license granted to You under this License.

c. If any provision of this License is invalid or unenforceable under applicable law, it shall not affect the validity or enforceability of the remainder of the terms of this License, and without further action by the parties to this agreement, such provision shall be reformed to the minimum extent necessary to make such provision valid and enforceable.

d. No term or provision of this License shall be deemed waived and no breach consented to unless such waiver or consent shall be in writing and signed by the party to be charged with such waiver or consent.

e. This License constitutes the entire agreement between the parties with respect to the Work licensed here. There are no understandings, agreements or representations with respect to the Work not specified here. Licensor shall not be bound by any additional provisions that may appear in any communication from You. This License may not be modified without the mutual written agreement of the Licensor and You.

f. The rights granted under, and the subject matter referenced, in this License were drafted utilizing the terminology of the Berne Convention for the Protection of Literary and Artistic Works (as amended on September 28, 1979), the Rome Convention of 1961, the WIPO Copyright Treaty of 1996, the WIPO Performances and Phonograms Treaty of 1996 and the Universal Copyright Convention (as revised on July 24, 1971). These rights and subject matter take effect in the relevant jurisdiction in which the License terms are sought to be enforced according to the corresponding provisions of the implementation of those treaty provisions in the applicable national law. If the standard suite of rights granted under applicable copyright law includes additional rights not granted under this License, such additional rights are deemed to be included in the License; this License is not intended to restrict the license of any rights under applicable law.