Abstract: This invention relates, in part, to newly identified polynucleotides, polypeptides, variants and derivatives thereof; processes for making the polynucleotides and the polypeptides, and their variants and derivatives; and uses of the polynucleotides, polypeptides, variants and derivatives. The invention also relates to compositions of orthogonal aminoacyl-tRNA synthetases, and pairs of orthogonal aminoacyl-tRNA synthetases, and orthogonal tRNAs that incorporate fluorinated amino acids into proteins in response to selector codons. The present invention also includes translation biochemistry methods for site-specific incorporation of fluorinated amino acids, for example, $^{18}$F- or $^{19}$F-labelled amino acids, into proteins or peptides. Such amino acids may be used as an NMR probe for characterizing protein structure, dynamics, and reactivity or for radionuclide imaging (e.g., PET). Fluorinated amino acids may also be used to stabilize proteins or peptides.
INTERNATIONAL SEARCH REPORT

International application No.
PCT/US 07/03217

A. CLASSIFICATION OF SUBJECT MATTER
IPC(8) - C12Q 1/68; C12N 9/22 (2007.10)
USPC - 435/6; 435/199
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
USPC: 435/6; 435/199

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
PUBWEST/PGBP, USPTO, JSCO, EPAB, EPAB; Google; PubMed: orthogonal, aminoacyl-tRNA, synthetase, tRNA, amino acid, fluorinated, kinase, km, SEQ ID Nο:3, SEQ ID Nο:4

C. DOCUMENTS CONSIDERED TO BE RELEVANT

<table>
<thead>
<tr>
<th>Category*</th>
<th>Citation of document, with indication, where appropriate, of the relevant passages</th>
<th>Relevant to claim No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
<td>US 2005/0227318 A1 (ALFONTA et al) 13 October 2005 (13.10.2005); para [0005], [0006], [0014],[0015], [0024], [0027],[0028], [0034], [0035], [0039], [0058], [0094], [0109], [0112], [0140]; SEQ ID Nο:4</td>
<td>1-3, 6-8 and 22-29</td>
</tr>
<tr>
<td>Y</td>
<td>US 2003/0082575 A1 (SCHULTZ et al) 1 May 2003 (01.05.2003); abstract: Fig. 12, third compound; Fig. 17, top row, third compound; Fig. 18, second row, third compound; Fig. 26, top row, third and fourth compounds</td>
<td>9-15</td>
</tr>
</tbody>
</table>

Further documents are listed in the continuation of Box C. [ ]

* Special categories of cited documents
  "A" - document defining the general state of the art which is not considered to be of particular relevance
  "E" - earlier application or patent but published on or after the international filing date
  "L" - document which may throw doubts on novelty or which is cited to establish the publication date of another citation or other special reason (as specified)
  "O" - document referring to an oral disclosure, use, exhibit/On or other means
  "P" - document published prior to the international filing date but later than the priority date claimed
  "T" - later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
  "X" - document of particular relevance, the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
  "Y" - document of particular relevance, the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
  "&" - member of the same patent family

Date of the actual completion of the international search
7 November 2007 (07.11.2007)

Date of mailing of the international search report
07 DEC 2007

Name and mailing address of the ISA/AJS
Mail Stop PCT, Attn: ISA/US, Commissioner for Patents
P.O. Box 1450, Alexandria, Virginia 22313-1450
Facsimile No. 517-273-3201

Lee W. Young
PCT/ISA/210 (second sheet) (April 2007)
INTERNATIONAL SEARCH REPORT

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.;  
   because they relate to subject matter not required to be searched by this Authority, namely:

2. ☑ Claims Nos.;  
   because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. ☐ Claims Nos.;  
   because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

..........................................................  
See extra sheet ..........................................................

1. ☑ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.

2. ☐ As all searchable claims could be searched without effort justifying additional fees, this Authority did not invite payment of additional fees.

3. ☑ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☑ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:
   Group I: Claims 1-15, 20-29, 34-35, and 37-38, limited to SEQ ID No. 3.

Remark on Protest  
☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.

☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.

☐ No protest accompanied the payment of additional search fees.

Form PCMS A/2 10 (continuation of first sheet (2)) (April 2007)