

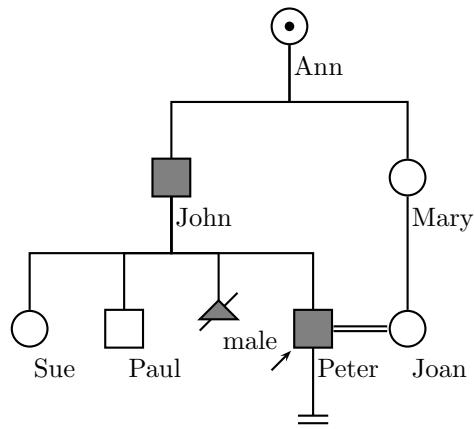
# Creating Medical Pedigrees with PSTricks and L<sup>A</sup>T<sub>E</sub>X. \*

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## Abstract

A set of macros based on **PSTricks** to draw medical pedigrees according to the recommendations for standardized human pedigree nomenclature. The drawing commands place the symbols on a **pspicture** canvas. An interface for making trees is also provided. The package can be used both with L<sup>A</sup>T<sub>E</sub>X and PLAIN T<sub>E</sub>X. A separate **Perl** program for generating T<sub>E</sub>X files from spreadsheets is provided elsewhere on CTAN.



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# 1 User Guide

## 1.1 Introduction

Medical pedigree is a very important tool for clinicians, genetic researchers and educators. As stated in [1], “The construction of an accurate family pedigree is a fundamental component of a clinical genetic evaluation and of human genetic research.” Unfortunately, up to now most geneticists make the pedigrees manually. There are several programs for doing so (see a list at <http://www.kumc.edu/gec/prof/genecomp.html#pedigree>), but they are rather expensive, lack multilanguage support and the quality of typesetting is somewhat lacking. This package tries to offer a L<sup>A</sup>T<sub>E</sub>X-based solution for this problem. It could be used with a companion Perl program `pedigree` [4], which converts databases of patients into a L<sup>A</sup>T<sub>E</sub>X file.

Note that there are ways to draw genealogical trees with `PSTricks` [3]; see the beautiful ones at <http://www.tug.org/PSTricks/main.cgi?file=Examples/Genealogy/genealogy>. Unfortunately, medical pedigrees are often not *trees*. Therefore we do not use tree approach throughout, but provide it as an alternative. Our general approach is based on the use of nodes [3, Part VII]. Each person or entity is a node, and the lines are in fact `\nclines`. This provides a flexibility to draw complex pedigrees.

Each node in the system *must* have a name. To prevent confusion with names of individuals, we call such name an *id*. As usual in `PSTricks`, it is a sequence of letters and numbers starting with a letter. This rule is very important; a name like 1 or 1-1 can lead to mysterious PostScript errors.

Our symbols follows the standard [1] with the exception that we do not implement showing several conditions on the same chart.

To use the package, add the line

```
\usepackage{pst-pdgr}
```

to a L<sup>A</sup>T<sub>E</sub>X document or

```
\input pst-pdgr.tex
```

to a PLAIN T<sub>E</sub>X one. Note that since this is a `PSTricks` package, you need to use `tex-dvips` path to compile your document. If you need a PDF document, you can use `ps2pdf` or packages like `pst-pdf`, `ps4pdf`, `pstricks`.

If you are using the package in a L<sup>A</sup>T<sub>E</sub>X document, you have an added benefit of a local configuration file `pst-pdgr.cfg`. Such file, if exists, will be read. It can be used to override package settings (use `\AtEndOfPackage` for this).

## 1.2 Global Settings

By default the size of each node is 0.5 `unit`. You can change the size by setting the value of `unit` (1cm by default) with `\psset`



Figure 1: Setting Style of Affected Individuals



Figure 2: Use of Foreground Colors for Affected Individuals

**\affectedstyle**  
**\affectedbgcolor**

By default the affected individual is drawn as a black node. This could be changed by setting `\affectedstyle` and `\affectedbgcolor`, see Figure 1. Sometimes we need to write something inside a node representing an affected individual. An example in [1] changes in this situation the style from filled to hatched, which looks inconsistent. We rather change the color of the foreground, as shown on Fig. 2.

### 1.3 Node Drawing Commands

The node drawing commands are based on the `\pnode` commands from `PSTricks` [3, Part VII]. It is the preferred command for drawing, for example, a “marriage node” (see the examples below). It is useful to remember this when drawing complex pedigrees.

#### 1.3.1 One Person

**\pstPerson**

The main command in the package is `\pstPerson`. It draws one person, which is a `PSTricks` node. It has the following structure: `\pstPerson[options]{id}`. The parameter `<i>id</i>` is the name of the node. It can be used to make connections to the node (see below).

There are many options to this command. As other `PSTricks` options, the also can be set globally through `\psset` command.

*options*  
  **sex**  
  **condition**  
  **deceased**  
  **proband**  
  **adopted**  
  **evaluated**

The first group of options describes the state of the person: `sex`, condition with respect to the decease, whether the person is deceased, is a proband, was adopted and was evaluated. These options are listed in Table 1. Some options of this group can take only two values: `true` or `false`. For simplicity the clause `=true` can be omitted, so the clauses `adopted=true` and `adopted` are equivalent. Two

Option	Values	Default	Description
<code>sex</code>	<code>male, female, unknown</code>	<code>unknown</code>	Sex of the person
<code>condition</code>	<code>normal, obligatory, asymptomatic, affected</code>	<code>normal</code>	The condition of the person
<code>deceased</code>	<code>true, false</code>	<code>false</code>	Whether the person is deceased
<code>proband</code>	<code>true, false</code>	<code>false</code>	Whether the person is a proband
<code>adopted</code>	<code>true, false</code>	<code>false</code>	Whether the individual is adopted
<code>evaluated</code>	<code>true, false</code>	<code>false</code>	Whether a documented evaluation took place

Table 1: Options Showing State of a Person

options: `sex` and `condition` can take several values each (geneticists consider three possibilities for sex: `male`, `female` and `unknown`). Again for simplicity the clauses `sex=` and `condition=` can be omitted, so the invocations `sex=male` and `male` are equivalent, as well as `condition=asymptomatic` and `asymptomatic`.

The second group of options (Table 2) is used to putting text comments inside the symbol, above it, below it or to the right or left to it. The text will be typeset in a PSTricks LR-box [3]; additional control over the text position can be achieved by using `\parbox` or PLAIN T<sub>E</sub>X boxes.

The third group of options (Table 3) is used to set the text position with respect to the node. They set the reference point of the text. They correspond to the usual notation: `r` being right, `l` being left, `t` being top, `b` being bottom and `B` being baseline. The setting `={}` makes the reference point to be the center of the box. Note that to prevent the text above and below the symbol to clash with the descent lines, the spaces of `2\pslinewidth` are added to the right and to the left of the symbol.

Examples of usage of this command are shown in Table 4.

### 1.3.2 Pregnancy Not Carried To Term

`\pstAbortion` The command `\pstAbortion` is used to draw a pregnancy not carried to term: spontaneous abortions or terminated pregnancies. The format of it the same as for the command `\pstPerson` (see Section 1.3.1): `\pstAbortion[⟨options⟩]{⟨id⟩}`. However, many of options listed in Table 1 are silently ignored. The only options meaningful for these nodes are `sex` and `condition` (only `normal` and `affected` values are possible). All options listed in Table 2 and 3 are valid and have the same meaning as in Section 1.3.1.

`option` The command has also an option `sab` with the values `true` or `false`. If it is `true`, the pregnancy is a spontaneous abortion. Otherwise it is terminated.

Option	Values	Default	Description
<code>insidetext</code>	String	None	A text to be placed inside the symbol (number of individuals, pregnancy, etc.)
<code>abovetext</code>	String	None	A text to be placed above the symbol (name, number, etc.)
<code>belowtext</code>	String	None	A text to be placed below the symbol (name, number, etc.)
<code>lefttext</code>	String	None	A text to be placed to the left of the symbol (name, number, etc.)
<code>righttext</code>	String	None	A text to be placed to the right of the symbol (name, number, etc.)

Table 2: Options for Making Textual Comments

Option	Values	Default	Description
<code>abovetextrp</code>	Combination of <code>r</code> or <code>l</code> and <code>t</code> , <code>b</code> or <code>B</code>	<code>1B</code>	The reference point for the text above the symbol
<code>belowtextrp</code>	Combination of <code>r</code> or <code>l</code> and <code>t</code> , <code>b</code> or <code>B</code>	<code>1t</code>	The reference point for the text below the symbol
<code>lefttextrp</code>	Combination of <code>r</code> or <code>l</code> and <code>t</code> , <code>b</code> or <code>B</code>	<code>r</code>	The reference point for the text to the left the symbol
<code>righttextrp</code>	Combination of <code>r</code> or <code>l</code> and <code>t</code> , <code>b</code> or <code>B</code>	<code>1</code>	The reference point for the text to the right the symbol

Table 3: Options for Setting Text Reference Point

Command	Result
<code>\pstPerson[condition=asymptomatic]{P}</code>	
<code>\pstPerson[condition=affected, sex=male, evaluated]{P}</code>	 *
<code>\pstPerson[obligatory, female]{P}</code>	
<code>\pstPerson[asymptomatic, male, proband]{P}</code>	
<code>\pstPerson[condition=obligatory, sex=male, deceased]{P}</code>	 Jane
<code>\pstPerson[sex=female, adopted, condition=affected, abovetext=Jane]{P}</code>	
<code>\pstPerson[sex=male, condition=affected, belowtext=20 yr, deceased]{P}</code>	 20 yr
<code>\pstPerson[unknown, affected, righttext=\parbox{1cm}{\footnotesize A \\ \tiny w}]{P}</code>	 A 1 w
<code>\pstPerson[sex=male, insidetext=5]{P}</code>	 5
<code>\pstPerson[sex=female, condition=affected, insidetext=P]{P}</code>	 P
<code>\pstPerson[sex=female, affected, belowtext=\parbox{1cm}{\centering SB\\2wks}, deceased]{P}</code>	 SB 2wks

Table 4: Examples of Persons

Command	Symbol
\pstAbortion[belowtext=male]{A}	 male
\pstAbortion[sab, righttext=1w]{A}	 1w
\pstAbortion[affected]{A}	

Table 5: Examples of Abortion Symbols

Command	Symbol
\pstChildless[belowtext=vasectomy]{C}	 vasectomy
\pstChildless[belowtext=anospermia, infertile]{C}	 = anospermia

Table 6: Examples of Childlessness or Infertility Symbols

Examples of usage of this command are shown in Table 5.

### 1.3.3 Childlessness and Infertility

The symbols for childlessness and infertility are listed under “line definitions” in [1]. However, to make the placing the symbols on the chart more flexible, we assign nodes to them.

\pstChildless

The command for drawing these symbols has the same structure as the other node drawing commands: \pstChildless{[options]}{id}. While all options listed in Table 4 are valid, the only meaningful one is `belowtext`. Note that the option `belowtextrp` is silently ignored: the text is always centered below the infertility symbol.

*option*  
`infertile`

There is one additional option `infertile`, which can have values `true` or `false`. If it is `false`, the person (or relationship) is childless by choice (or by an unknown reason). The clause `=true` can be omitted.

## 1.4 Connection Drawing Commands

The connections in pedigrees are based on \ncline and friends. There are, however, some additional features for pedigree connections.

### 1.4.1 Relationship

\pstRelationship

Relationships are marriages or other unions. The main command for drawing

Option	Values	Default	Description
<code>broken</code>	<code>true, false</code>	<code>false</code>	Whether the relationship no longer exists
<code>consanguinic</code>	<code>true, false</code>	<code>false</code>	Whether the relationship is consanguinic
<code>descentnode</code>	Node name	None	A node that will be used to draw descent lines for the relationship
<code>brokenpos</code>	A number between 0 and 1	0.3	Where to put the symbol for broken relationship on the line (as a fraction of the line length)
<code>descentnodepos</code>	A number	0.5	Where to put the the descent node on the relationship line
<code>rellinecmd</code>	Name	<code>ncline</code>	Name of the line drawing command (without \)

Table 7: Options for Relationship Lines

relationships is `\pstRelationship[<options>]{<nodeA>}->{<nodeB>}`. It draws a relationship line between `{<nodeA>}` and `{<nodeB>}`. Normal **PSTricks** options like `linestyle=dashed` can be used with the expected effect.

*options*  
`broken`  
`consanguinic`  
`descentnode`  
`brokenpos`  
`descentnodepos`  
`rellinecmd`

There are also several options specific for this command, listed in Table 7. The options `broken` and `consanguinic` are self-explanatory. The option `descentnode` is used, if we want the descent lines to start at a node on the relationship line. The name of this descent node must satisfy the usual criteria for the node (see Section 1.1). The options `brokenpos` and `descentnodepos` determine, where on the relationship line the corresponding objects are placed. The option `rellinecmd` allows to change the default straight line for the relationship to something else, like `ncbar`, `ncangle`, etc. Examples of this command use are shown in Table 8

#### 1.4.2 Descent

The paper [1] distinguishes between descent line and sibs line. We, however, will call all segments of the line, joining a parent (or a descent node) and a child, the descent line. The main command for showing parent-child relations is `\pstDescent[<options>]{<Parent>}->{<Child>}`. The descent line consists of three segments: the vertical arm from the parent node, the vertical arm from the child node and the horizontal segment connecting these arms. When there are several sibs, the horizontal segments form the sibs line. The length `descarmA` is the length of the first segment. By default it is 0.8 (in **PSTricks** units), but it can be changed by the usual `\psset` command or in the option list of `\pstDescent`. Note that it is calculated from the center of the node rather than from the node edge.

`\pstDescent`  
*option*  
`descarmA`

New in v0.3

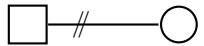
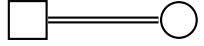
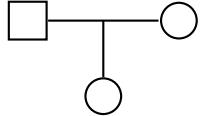
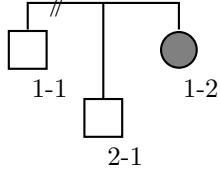
Command	Result
<pre>\rput(0.5,0.5){\pstPerson[male]{A}} \rput(2.5,0.5){\pstPerson[female]{B}} \pstRelationship[broken]{A}{B}</pre>	
<pre>\rput(0.5,0.5){\pstPerson[male]{A}} \rput(2.5,0.5){\pstPerson[female]{B}} \pstRelationship[consanguinic]{A}{B}</pre>	
<pre>\rput(0.5,1.5){\pstPerson[male]{A}} \rput(2.5,1.5){\pstPerson[female]{B}} \rput(1.5,0.5){\pstPerson[female]{C}} \pstRelationship[descentnode=AB]{A}{B} \ncline{AB}{C}</pre>	
<pre>\rput(0.5,1.5){\ pstPerson[male, belowtext=1-1]{A}} \rput(2.5,1.5){\ pstPerson[affected, female, belowtext=1-2]{B}} \rput(1.5,0.6){\pstPerson[male, belowtext=2-1]{C}} \pstRelationship[descentnode=AB, rellinecmd=ncangle, angleA=90, angleB=90, descentnodepos=1.5, broken, brokenpos=1.2]{A}{B} \ncline{AB}{C}</pre>	

Table 8: Examples of Relationships

Examples of `\pstDescent` are shown in Table 9. Note the `PSTricks` option `linestyle=dashed` used to show social parentage in the first example.

### 1.4.3 Twins

`\pstTwins` A special care is needed when we talk about twins. First, the user must define a *twin node*: the node which is used as a nexus for twin lines. Then the following command draws all the necessary lines:

```
\pstTwins[⟨options⟩]{⟨Parent⟩}{⟨TwinNode⟩}{⟨LeftTwin⟩}{⟨RightTwin⟩}.
```

*options*  
`monozygotic` The options for this command are listed in Table 10. The option `monozygotic` allows to show that the twins are monozygotic. The actual position of the horizontal line is determined by the option `mzlinepos`. If it is unknown, whether the twins are monozygotic or not, `qzygotic` options draws a question mark, as recommended by [1]. Note that `mzlinepos` in this situation helps to position the question mark properly. The option `addtwin` allows to draw pedigrees with more than two twins. It can be repeated several times if necessary. Examples of the usage of this command are shown in Table 11.

*option*  
`descarmA` The first part of the `\pstTwins` line has the same shape as `\pstDescent`. The option `descarmA` has the same meaning, as for `\pstDescent`. Therefore if there are both twins and non-twins, as in the first example in Table 11, the sibs segment is drawn correctly.

## 1.5 Making Trees

As discussed above (Section 1.1), the medical pedigrees are not necessary trees. Even if they are, they are usually not simple layered trees. Nevertheless sometimes pedigree can be represented as a layered tree. For such cases we provide tree drawing commands. See the discussion in [4] for more details.

`\TpstPerson` The macros `\TpstPerson`, `\TpstAbortion` and `\TpstChildless` have the same  
`\TpstAbortion` options and arguments as their “normal” counterparts. You probably need to use  
`\TpstChildless` command like

```
\def\psedge{\pstDescent}
\psset{descarmA=1}
```

in your code. An example of us of such commands is shown on Figure 3. Note that the resulting figure is *not* a tree! The corresponding code is shown on Figure 4.

## 1.6 More Examples

A number of examples were listed above. Here we show even more examples of complex pedigrees.

On Figure 5 we show an example of a pedigree from [2]. The corresponding code is listed on Figure 6.

A very complex pedigree is used as an example in [1]. On Figure 7 we reproduce this pedigree. The corresponding code is shown on Figures 8, 9 and 10.

Command	Result
<pre>\rput(1.5,2){\pstPerson[female]{A}} \rput(0.5,0.5){\pstPerson[female, adopted]{B}} \rput(1.5,0.5){\pstPerson[male]{C}} \rput(2.5,0.5){\pstAbortion[female]{D}} \pstDescent[linestyle=dashed]{A}{B} \pstDescent{A}{C} \pstDescent{A}{D}</pre>	
<pre>\psset{descarmA=1} \rput(0.5,2){\pstPerson[male, belowtext=Fred]{A}} \rput(2.5,2){\pstPerson[female, obligatory, belowtext=Ginger]{B}} \pstRelationship[descentnode=AB]{A}{B} \rput(0.5,0.5){\pstPerson[male, asymptomatic, belowtext=John]{C1}} \rput(1.5,0.5){\pstPerson[female, belowtext=Mary]{C2}} \rput(2.5,0.5){\pstAbortion[sab, affected, belowtext=male]{C3}} \pstDescent{AB}{C1} \pstDescent{AB}{C2} \pstDescent{AB}{C3}</pre>	
<pre>\rput(0.5,1.5){\pstPerson[male]{A}} \rput(2.5,1.5){\pstPerson[female]{B}} \pstRelationship[descentnode=AB]{A}{B} \rput(1.5,0.5){\pstChildless[infertile, belowtext=anospermia]{C}} \pstDescent{AB}{C}</pre>	

Table 9: Examples of Descent Lines

Option	Values	Default	Description
<code>monozygotic</code>	true, false	false	Whether the twins are monozygotic
<code>qzygotic</code>	true, false	false	Whether the monozygosity of twins is questionable
<code>addtwin</code>	Twin node	Node	Additional twin node id if there are more than two twins (this option may be repeated)
<code>mzlinepos</code>	A number	0.5	Where to put the horizontal line for monozygotic twins (as a factor of the total line length)

Table 10: Options for Twins Lines

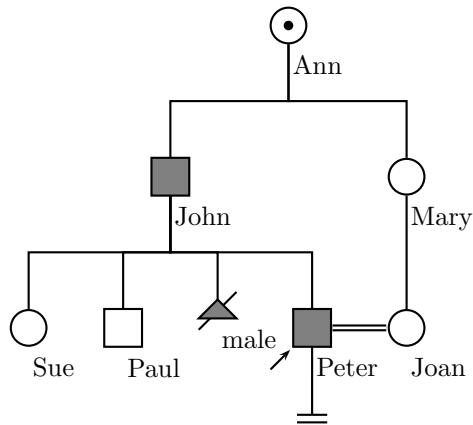


Figure 3: Example of Using Tree-Making Commands

Command	Result
<pre>\rput(1.5,2){\pstPerson[female]{A}} \rput(1,1.1){\pnode{Twins}} \rput(0.5,0.5){\pstPerson[male]{B}} \rput(1.5,0.5){\pstPerson[male]{C}} \rput(2.5,0.5){\pstPerson[female]{D}} \pstTwins[monozygotic]{A}{Twins}{B}{C} \pstDescent{A}{D}</pre>	
<pre>\rput(0.5,2){\pstPerson[male]{A}} \rput(2.5,2){\pstPerson[female]{B}} \pstRelationship[descentnode=AB]{A}{B} \rput(1.5,1.2){\pnode{Twins}} \rput(1,0.5){\pstPerson[male]{C1}} \rput(2,0.5){\pstPerson[male]{C2}} \pstTwins[qzygotic, mzlinepos=0.8]{AB}{Twins}{C1}{C2}</pre>	
<pre>\rput(1.5,2){\pstPerson[male]{A}} \rput(1.5,1.5){\pnode{Twins}} \rput(0.5,0.5){\pstPerson[female]{B}} \rput(1.2,0.5){\pstPerson[female]{C}} \rput(1.9,0.5){\pstPerson[female]{D}} \rput(2.6,0.5){\pstPerson[female]{E}} \pstTwins[descarmA=0.5, addtwin=C, addtwin=D]{A}{Twins}{B}{E}</pre>	

Table 11: Examples of Twins Lines

```

\begin{pspicture}(0,1)(7,7)
\rput(3,4){%
\pstree{\TpstPerson[female, obligatory, belowtext=Ann]{Ann}}{%
\def\psedge{\pstDescent}\psset{descrmA=1}
\pstree{\TpstPerson[male, affected, belowtext=John]{John}}{%
\TpstPerson[female, belowtext=Sue]{Sue}
\TpstPerson[male, belowtext=Paul]{Paul}
\TpstAbortion[affected, belowtext=male]{A1}
\pstree[thislevelsep=1.2]{\TpstPerson[male, belowtext=Peter, affected, proband]{Peter}}{%
\def\psedge{\ncline}
\TpstChildless[infertile]{C1}
}
}
\pstree{\TpstPerson[female, belowtext=Mary]{Mary}}{%
\TpstPerson[female, belowtext=Joan]{Joan}
}
}
}
\pstRelationship[consanguinic]{Peter}{Joan}
\end{pspicture}

```

Figure 4: Code Producing Figure 3

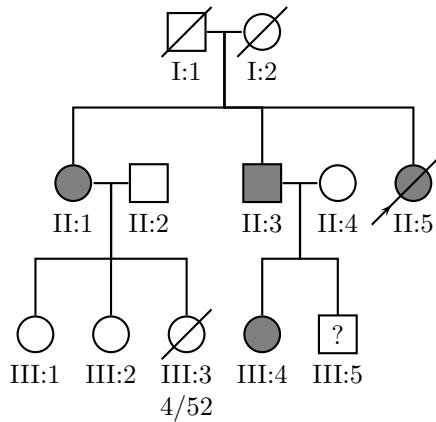


Figure 5: Example of a Pedigree of a Family With PROMM From [2, p. 48]

```

\begin{pspicture}(6,6)
\psset{belowtextrp=t, descarmA=1}
\rput(2.5,5.5){\pstPerson[male, deceased, belowtext=I:1]{I:1}}
\rput(3.5,5.5){\pstPerson[female, deceased, belowtext=I:2]{I:2}}
\pstRelationship[descentnode=I:1_2]{I:1}{I:2}
\rput(1,3.5){\pstPerson[female, affected, belowtext=II:1]{II:1}}
\pstDescent{I:1_2}{II:1}
\rput(2,3.5){\pstPerson[male, belowtext=II:2]{II:2}}
\pstRelationship[descentnode=II:1_2]{II:1}{II:2}
\rput(3.5,3.5){\pstPerson[male, affected, belowtext=II:3]{II:3}}
\pstDescent{I:1_2}{II:3}
\rput(4.5,3.5){\pstPerson[female, belowtext=II:4]{II:4}}
\pstRelationship[descentnode=II:3_4]{II:3}{II:4}
\rput(5.5,3.5){\pstPerson[female, affected, deceased, proband,
    belowtext=II:5]{II:5}}
\pstDescent{I:1_2}{II:5}
\rput(0.5,1.5){\pstPerson[female, belowtext=III:1]{III:1}}
\pstDescent{II:1_2}{III:1}
\rput(1.5,1.5){\pstPerson[female, belowtext=III:2]{III:2}}
\pstDescent{II:1_2}{III:2}
\rput(2.5,1.5){\pstPerson[female, deceased,
    belowtext=\parbox{2cm}{\centering III:3\backslash4/52}]{III:3}}
\pstDescent{II:1_2}{III:3}
\rput(3.5,1.5){\pstPerson[female, affected,
    belowtext=III:4]{III:4}}
\pstDescent{II:3_4}{III:4}
\rput(4.5,1.5){\pstPerson[male, insidetext=?,
    belowtext=III:5]{III:5}}
\pstDescent{II:3_4}{III:5}
\end{pspicture}

```

Figure 6: Code Producing Figure 5

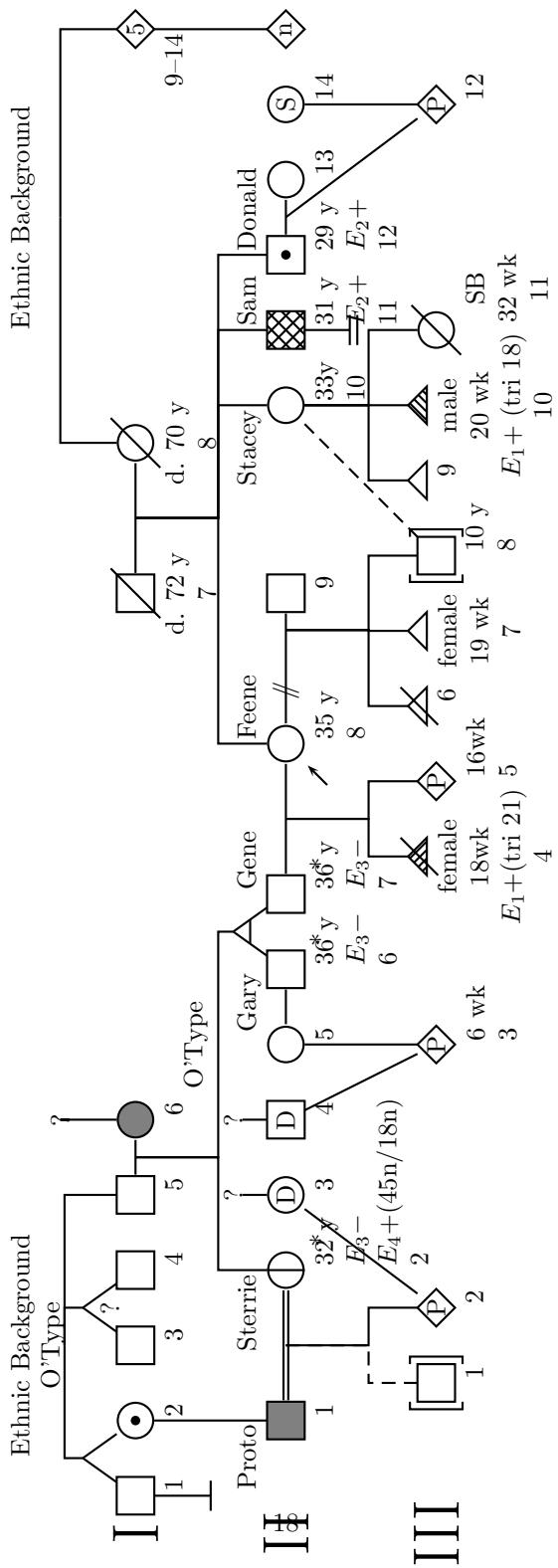


Figure 7: A Complex Pedigree From [1]

```

\psset{descarmA=1.1, hatchsep=1.5pt}
\rput(3.5,8){Ethnic Background}
\rput(18.5,8){Ethnic Background}
\rput(3.5,7.5){\rnode{OType1}{\texttt{O'Type}}}
\rput(18.5,7.5){\pnode{Origin2}}
\rput(6.5,7.5){\rnode{Quest1}{?}}
\rput(1,6.5){\texttt{Huge I}}
\rput(1.5,6.5){\pstPerson[male, belowtext=1]{I1}}
\rput(2.5,6.5){\pstPerson[female, obligatory, belowtext=2]{I2}}
\rput(3.5,6.5){\pstPerson[male, belowtext=3]{I3}}
\rput(4.5,6.5){\pstPerson[male, belowtext=4]{I4}}
\rput(5.5,6.5){\pstPerson[male, belowtext=5]{I5}}
\rput(6.5,6.5){\pstPerson[female, affected,
    belowtext=6]{I6}}
\rput(2,7.2){\pnode{Twins1}}
\rput(4,7.2){\pnode{Twins2}}
\pstTwins[descarmA=0]{\rnode{OType1}{\texttt{Twins1}}}{\rnode{I1}{I1}}{\rnode{I2}{I2}}
\pstTwins[qzygotic, descarmA=0, mzlinepos=0.8]{\rnode{OType1}{\texttt{Twins2}}}{\rnode{I3}{I3}}{\rnode{I4}{I4}}
\pstDescent[descarmA=0]{\rnode{OType1}{\texttt{I5}}}{\rnode{I5}{I5}}
\pstDescent[descarmA=0]{\rnode{Quest1}{\texttt{I6}}}{\rnode{I6}{I6}}
\pstRelationship[descentnode=I5I6]{\rnode{I5}{I5}}{\rnode{I6}{I6}}
\rput(1.5,5.5){\pstChildless{CI1}}
\ncline{I1}{CI1}
\rput(13.5,6.5){\pstPerson[male, deceased, belowtext=rt,
    belowtext=\parbox{2cm}{\centering d. 72 y\|7}]{I7}}
\rput(15.5,6.5){\pstPerson[female, deceased, belowtext=rt,
    belowtext=\parbox{2cm}{\centering d. 70 y\|8}]{I8}}
\pstRelationship[descentnode=I7I8]{\rnode{I7}{I7}}{\rnode{I8}{I8}}
\rput(21,6.5){\pstPerson[insidetext=5, belowtext=9--14,
    belowtext=rt]{I9}}
\pstDescent[descarmA=0]{\pnode{Origin2}{I8}}{\rnode{I9}{I9}}

```

Figure 8: Code for Figure 7: Generation I

```

\rput(1,4.5){\Huge II}
\rput(2.5,4.5){\pstPerson[male, affected, belowtext=1,
    abovetext=Proto, abovetextrp=rB]{II1}}
\pstDescent{I2}{II1}
\rput(4.5,4.5){\pstPerson[female, asymptomatic,
    belowtext=\parbox{3cm}{32 y\\$E_3-$\\$E_4+(45n/18n)\\2}, abovetext={Sterrie},
    abovetextrp=rB, evaluated]{II2}}
\pstDescent{I5I6}{II2}
\pstRelationship[consanguinic, descentnode=II1II2]{II1}{II2}
\rput(5.5,5.2){\rnode{Quest2}{?}}
\rput(5.5,4.5){\pstPerson[female, insidetext=D,
    belowtext=3]{II3}}
\ncline{Quest2}{II3}
\rput(6.5,5.2){\rnode{Quest3}{?}}
\rput(6.5,4.5){\pstPerson[male, insidetext=D,
    belowtext=4]{II4}}
\ncline{Quest3}{II4}
\rput(7.5,4.5){\pstPerson[female, belowtext=5]{II5}}
\rput(8.5,4.5){\pstPerson[male, abovetext=Gary, abovetextrp=rB,
    belowtext=\parbox{2cm}{36 y\\$E_3-$\\6},
    evaluated]{II6}}
\rput(9.5,4.5){\pstPerson[male, abovetext={Gene},
    belowtext=\parbox{2cm}{36 y\\$E_3-$\\7},
    evaluated]{II7}}
\rput(9.5,2){\pnodetwins}
\pstTwins[monozygotic]{I5I6}{Twins3}{II6}{II7}
\pstRelationship{II5}{II6}
\rput(7.5,5.7){0' Type}
\rput(11.5,4.5){\pstPerson[female, proband,
    belowtext=\parbox{1cm}{35 y\\8}, abovetext=Feene]{II8}}
\pstRelationship[descentnode=II7II8]{II7}{II8}
\rput(13.5,4.5){\pstPerson[male, belowtext=9]{II9}}
\pstRelationship[broken, descentnode=II8II9,
    descentnodepos=0.85]{II8}{II9}
\rput(16,4.5){\pstPerson[abovetext=Stacey, female,
    abovetextrp=rB,
    belowtext=\parbox{1cm}{33y\\ 10}]{II10}}
\def\affectedstyle{\fillstyle=crosshatch}
\rput(17,4.5){\pstPerson[male, affected, abovetext=Sam,
    belowtext=\parbox{3cm}{31 y\\ $E_2+$\\11},
    hatchsep=3pt]{II11}}
\rput(17,3.6){\pstChildless[infertile]{C2}}
\ncline{II11}{C2}
\rput(18,4.5){\pstPerson[male, obligatory,
    abovetext=Donald,
    belowtext=\parbox{3cm}{29 y\\ $E_2+$\\12}]{II12}}
\pstDescent{I7I8}{II8}
\pstDescent{I7I8}{II10}
\pstDescent{I7I8}{II11}
\pstDescent{I7I8}{II12}
\rput(19,4.5){\pstPerson[female, belowtext=13]{II13}}
\pstRelationship[descentnode=II12II13]{II12}{II13}
\rput(20,4.5){\pstPerson[female, insidetext=S,
    belowtext=14]{II14}}
\rput(21,4.5){\pstPerson[insidetext=n]{II15}}
\pstDescent{I9}{II15}

```

```

\rput(1,2.5){\Huge III}
\rput(3,2.5){\pstPerson[male, adopted, belowtext=1]{III1}}
\rput(4,2.5){\pstPerson[insidetext=P, belowtext=2]{III2}}
\pstDescent[linestyle=dashed]{II1III2}{III1}
\pstDescent{III1III2}{III2}
\ncline{II3}{III2}
\rput(7.5,2.5){\pstPerson[insidetext=P,
    belowtext=\parbox{2cm}{6 wk\3}{III3}}
\pstDescent{III5}{III3}
\ncline{II4}{III3}
\def\affectedstyle{fillstyle=vlines}
\rput(10,2.5){\pstAbortion[affected,
    belowtext=\parbox{2cm}{\centering
        female\\18wk\$E_1+(tri 21)\4},
    belowtextrp=t]{III4}}
\rput(11,2.5){\pstPerson[insidetext=P,
    belowtext=\parbox{1cm}{16wk\5}{III5}}
\pstDescent{II7III8}{III4}
\pstDescent{II7III8}{III5}
\rput(12,2.5){\pstAbortion[belowtext=6]{III6}}
\rput(13,2.5){\pstAbortion[sab, belowtextrp=t,
    belowtext=\parbox{2cm}{\centering female\\19 wk\\
    7}]{III7}}
\rput(14,2.5){\pstPerson[adopted, male,
    belowtext=\parbox{1cm}{10 y\8}{III8}}
\pstDescent{II8III9}{III6}
\pstDescent{II8III9}{III7}
\pstDescent{II8III9}{III8}
\ncline[linestyle=dashed]{II10}{III8}
\rput(15,2.5){\pstAbortion[sab, belowtext=9]{III9}}
\def\affectedstyle{fillstyle=hlines}
\rput(16,2.5){\pstAbortion[sab, belowtextrp=t, affected,
    belowtext=\parbox{2cm}{\centering male\\ 20 wk\$E_1+$
    (tri 18)\\ 10}{III10}}
\rput(17,2.5){\pstPerson[deceased, female,
    belowtext=\parbox{1cm}{\centering SB\\32 wk\\
    11}]{III11}}
\pstDescent{II10}{III9}
\pstDescent{II10}{III10}
\pstDescent{II10}{III11}
\rput(20,2.5){\pstPerson[insidetext=P,
    belowtext=12]{III12}}
\pstDescent{II14}{III12}
\ncline{II12III13}{III12}

```

Figure 10: Code for Figure 7: Generation III

## 2 Implementation

### 2.1 Identification and Setting Up

Traditionally *PSTricks* works in two regimes: the *L<sup>A</sup>T<sub>E</sub>Xone* and the plain one. Probably it is a good idea to keep this tradition. Therefore we will use a *T<sub>E</sub>X* file *pst-pdgr.tex* and a *L<sup>A</sup>T<sub>E</sub>Xfile* *pst-pdgr.sty*. They have different means of preventing from loading twice and identification.

\PSTPedigreeLoaded A *T<sub>E</sub>X* guard \PSTPedigreeLoaded prevents the double loading of the file:

```
1 <*tex>
2 \csname PSTPedigreeLoaded\endcsname
3 \let\PSTPedigreeLoaded\endinput
4 </tex>
```

Now we can start real identification. Note the difference between the ways a *L<sup>A</sup>T<sub>E</sub>X* style, a *L<sup>A</sup>T<sub>E</sub>X* configuration file and a *T<sub>E</sub>X* file announce itself

```
5 <|latex>\NeedsTeXFormat{LaTeX2e}
6 <|latex>\ProvidesPackage{pst-pdgr}
7 <cfg>\ProvidesFile{pst-pdgr.cfg}
8 <tex>\message{
9 [2017/11/20 v0.4 Medical Pedigree with PSTricks]
10 <tex>}
```

The *L<sup>A</sup>T<sub>E</sub>X* style is in fact just a wrapper: it calls the configuration file, and then the *T<sub>E</sub>Xfile*, which does the real work:

```
11 <*latex>
12 \RequirePackage{pstricks}%
13 \InputIfFileExists{pst-pdgr.cfg}{%
14   \typeout{Loading configuration file pst-pdgr.cfg}%
15   \typeout{Configuration file pst-pdgr.cfg is not found}%
16 \input{pst-pdgr.tex}
17 </latex>
```

Now we are dealing (almost) exclusively with *T<sub>E</sub>X*.

18 <\*tex>

Check the packages we use are loaded:

```
19 \ifx\PSTricksLoaded\endinput\else\input pstricks.tex\fi
20 \ifx\PSTnodesLoaded\endinput\else\input pst-node.tex\fi
21 \ifx\PSTTreeLoaded\endinput\else\input pst-tree.tex\fi
22 \ifx\PSTXKeyLoaded\endinput\else\input pst-xkey.tex\fi
```

We set up that @ symbol:

23 \catcode`\@=11\relax

and set up keys for our package

24 \pst@addfams{pst-pdgr}

## 2.2 Global Parameters

These macros define the way affected individuals are drawn

\affectedbgcolor The background color:

```
25 \def\affectedbgcolor{gray}
```

\affectedfgcolor The foreground color for the text:

```
26 \def\affectedfgcolor{white}
```

\affectedstyle And the style:

```
27 \def\affectedstyle{fillstyle=solid, fillcolor=\affectedbgcolor}
```

\pst@pdgr@intxtcolor Normally the color of the inside text for normal persons is the current color:

```
28 \def\pst@pdgr@instxtcolor{\relax}
```

## 2.3 Options

Here we define the option for the commands and their action.

### 2.3.1 Choice Options

This groups of options sets a key from a given set of choices.

\pst@pdgr@sex First, the sex of the person. The numbers 0, 1 and 2 correspond to the sequence in the alternatives list

```
29 \def\pst@pdgr@sex{0}
30 \define@choicekey[psset]{pst-pdgr}{sex}[\pst@pdgr@temp \pst@pdgr@sex]{%
31   unknown, male, female}[unknown]{}
```

\pst@pdgr@condition Next, the condition of the person. The numbers again correspond to the sequence in the alternatives list

```
32 \def\pst@pdgr@condition{0}
33 \define@choicekey[psset]{pst-pdgr}{condition}{%
34   condition}[\pst@pdgr@temp \pst@pdgr@condition]{%
35   normal, obligatory, asymptomatic, affected}[normal]{}
```

A bunch of shortcuts

```
36 \define@key[psset]{pst-pdgr}{unknown}[]{\psset{sex=unknown}}
37 \define@key[psset]{pst-pdgr}{male}[]{\psset{sex=male}}
38 \define@key[psset]{pst-pdgr}{female}[]{\psset{sex=female}}
39 \define@key[psset]{pst-pdgr}{normal}[]{\psset{condition=normal}}
40 \define@key[psset]{pst-pdgr}{obligatory}[]{\psset{condition=obligatory}}
41 \define@key[psset]{pst-pdgr}{asymptomatic}[]{\psset{condition=asymptomatic}}
42 \define@key[psset]{pst-pdgr}{affected}[]{\psset{condition=affected}}
```

### 2.3.2 Boolean Options

True or false options.

- \pst@pdgr@defineboolkey We use our own version of definition of boolean keys, rather than the one provided by `xkeyval`.  
43 \def\pst@pdgr@defineboolkey#1{%
44 \expandafter\newif\csname ifpst@pdgr@#1\endcsname%
45 \csname pst@pdgr@#1false\endcsname%
46 \define@key[psset]{pst-pdgr}{#1}[true]{%
47 \cnameuse{pst@pdgr@#1##1}}}
- \ifpst@pdgr@deceased Whether the individual is deceased:  
48 \pst@pdgr@defineboolkey{deceased}
- \ifpst@pdgr@proband Whether the individual is a proband:  
49 \pst@pdgr@defineboolkey{proband}
- \ifpst@pdgr@adopted Whether the individual is adopted:  
50 \pst@pdgr@defineboolkey{adopted}
- \ifpst@pdgr@evaluated Whether the individual is evaluated:  
51 \pst@pdgr@defineboolkey{evaluated}
- \ifpst@pdgr@sab Whether the abortion is SAB:  
52 \pst@pdgr@defineboolkey{sab}
- \ifpst@pdgr@infertile Whether the individual or relationship is infertile:  
53 \pst@pdgr@defineboolkey{infertile}
- \ifpst@pdgr@broken Whether the relationship is broken:  
54 \pst@pdgr@defineboolkey{broken}
- \ifpst@pdgr@consanguinic Whether the relationship is consanguinic:  
55 \pst@pdgr@defineboolkey{consanguinic}
- \ifpst@pdgr@monozygotic Whether the twins are monozygotic:  
56 \pst@pdgr@defineboolkey{monozygotic}
- \ifpst@pdgr@qzygotic Whether the are questionably monozygotic:  
57 \pst@pdgr@defineboolkey{qzygotic}

### 2.3.3 String Options

Options setting up strings.

\pst@pdgr@insidetext	Text inside the symbol
	58 \def\pst@pdgr@insidetext{}%
	59 \define@key[psset]{pst-pdgr}{insidetext}{%
	60 \def\pst@pdgr@insidetext{\#1}}%
\pst@pdgr@belowtext	Text below the symbol
	61 \def\pst@pdgr@belowtext{}%
	62 \define@key[psset]{pst-pdgr}{belowtext}{%
	63 \def\pst@pdgr@belowtext{\#1}}%
\pst@pdgr@abovetext	Text above the symbol
	64 \def\pst@pdgr@abovetext{}%
	65 \define@key[psset]{pst-pdgr}{abovetext}{%
	66 \def\pst@pdgr@abovetext{\#1}}%
\pst@pdgr@lefttext	Text to the left of the symbol
	67 \def\pst@pdgr@lefttext{}%
	68 \define@key[psset]{pst-pdgr}{lefttext}{%
	69 \def\pst@pdgr@lefttext{\#1}}%
\pst@pdgr@righttext	Text to the right of the symbol
	70 \def\pst@pdgr@righttext{}%
	71 \define@key[psset]{pst-pdgr}{righttext}{%
	72 \def\pst@pdgr@righttext{\#1}}%
\pst@pdgr@descentnode	Name of the descent node
	73 \def\pst@pdgr@descentnode{}%
	74 \define@key[psset]{pst-pdgr}{descentnode}{%
	75 \def\pst@pdgr@descentnode{\#1}}%
\pst@pdgr@rellinecmd	Command to draw relationship lines:
	76 \def\pst@pdgr@rellinecmd{\ncline}%
	77 \define@key[psset]{pst-pdgr}{rellinecmd}{%
	78 \def\pst@pdgr@rellinecmd{\nameuse{\#1}}}%
	A number of text positioning commands.
\pst@pdgr@abovetextrp	The command to set the reference position for the text above the symbol.
	79 \def\pst@pdgr@abovetextrp{lB}%
	80 \define@key[psset]{pst-pdgr}{abovetextrp}{%
	81 \def\pst@pdgr@abovetextrp{\#1}}%
\pst@pdgr@belowtextrp	The command to set the reference position for the text below the symbol.
	82 \def\pst@pdgr@belowtextrp{lt}%
	83 \define@key[psset]{pst-pdgr}{belowtextrp}{%
	84 \def\pst@pdgr@belowtextrp{\#1}}%

`\pst@pdgr@lefttextrp` The command to set the reference position for the text to the left of the symbol.

```
85 \def\pst@pdgr@lefttextrp{r}%
86 \define@key[psset]{pst-pdgr}{lefttextrp}{%
87   \def\pst@pdgr@lefttextrp{\#1}}%
```

`\pst@pdgr@righttextrp` The command to set the reference position for the text to the right of the symbol.

```
88 \def\pst@pdgr@righttextrp{l}%
89 \define@key[psset]{pst-pdgr}{righttextrp}{%
90   \def\pst@pdgr@righttextrp{\#1}}%
```

The option `addtwin` for `\pstTwin` command is special. Since it can be repeated, we want it to be executed immediately. We store the name of the descentnode in `\pst@pdgr@tempnode`

```
91 \define@key[psset]{pst-pdgr}{addtwin}{\ncline{\pst@pdgr@tempnode}{\#1}}%
92 \define@key[psset]{pst-pdgr}{descentnode}{%
93   \def\pst@pdgr@descentnode{\#1}}%
```

### 2.3.4 Numerical Options

The options to set up numerical values.

`\psk@descarmA` The length of the arm A on the `\pstDescent` line.

```
94 \newdimen\psk@descarmA%
95 \define@key[psset]{pst-pdgr}{descarmA}{\pssetlength\psk@descarmA{\#1}}%
96 \psset{descarmA=0.8}%
```

`\pst@pdgr@descentnodepos` The position of the descent node on the relationship line

```
97 \def\pst@pdgr@descentnodepos{0.5}
98 \define@key[psset]{pst-pdgr}{descentnodepos}{%
99   \pst@checknum{\#1}\pst@pdgr@descentnodepos%
100  \ifdim\pst@pdgr@descentnodepos <0pt\relax
101    \def\pst@pdgr@descentnodepos{0.5}%
102  \else\@pstrickserr{Bad ‘descentnodepos’ value: ‘#1’. Must be >0}\@ehpa%
103  \fi}%
```

`\pst@pdgr@brokenpos` The position of the broken line symbol on the relationship line

```
104 \def\pst@pdgr@brokenpos{0.3}
105 \define@key[psset]{pst-pdgr}{brokenpos}{%
106   \pst@checknum{\#1}\pst@pdgr@brokenpos%
107  \ifdim\pst@pdgr@brokenpos <0pt\relax
108    \def\pst@pdgr@brokenpos{0.3}%
109  \else\@pstrickserr{Bad ‘brokenpos’ value: ‘#1’. Must be >0}\@ehpa%
110  \fi}%
```

`\pst@pdgr@mzlinepos` The position of the monozygotic line or question mark on the twins line:

```
111 \def\pst@pdgr@mzlinepos{0.5}
112 \define@key[psset]{pst-pdgr}{mzlinepos}{%
113   \pst@checknum{\#1}\pst@pdgr@mzlinepos%
```

```

114 \ifdim\pst@pdgr@mzlinepos \p@<\z@%
115   \def\pst@pdgr@mzlinepos{0.5}%
116   \opstrickserr{Bad `mzlinepos' value: '#1'. Must be >0}\@ehpa%
117 \fi%
118 \ifdim\pst@pdgr@mzlinepos \p@>\p@\relax%
119   \def\pst@pdgr@mzlinepos{0.5}%
120   \opstrickserr{Bad `mzlinepos' value: '#1'. Must be <1}\@ehpa%
121 \fi}%

```

## 2.4 Drawing A Person

And now the main macro.

`\pstPerson` First, the standard processing of optional parameter

```

122 \def\pstPerson{\@ifnextchar[{\pstPerson@i}{\pstPerson@i[]}}

```

`\pstPerson@i` And now we are ready for a real work. Actually we create a `rnode` and put everything inside. We add a `\pspicture` for the node to have non-zero size.

```

123 \def\pstPerson@i[#1]#2{%
124   \rnode{#2}{%
125     \psset{arrows=-, linestyle=solid}%
126     \psset{#1}%
127     \pspicture[shift=-0.25](-0.25,-0.25)(0.25,0.25)%
}

```

Condition processing.

```

128   \ifcase\pst@pdgr@condition\relax % Nothing to do if normal
129   \or % obligatory
130     \psdot(0,0)%
131   \or % asymptomatic
132     \qline(0,0.25)(0,-0.25)%
133   \or % affected
134     \expandafter\psset\expandafter{\affectedstyle}%
135     \def\pst@pdgr@instxtcolor{\csname\affectedfgcolor\endcsname}%
136   \fi%

```

The actual drawing

```

137   \ifcase\pst@pdgr@sex\relax % First, unknown sex. A diamond
138     \pspolygon(0,0.25)(0.25,0)(0,-0.25)(-0.25,0)%
139   \or % Male. A square with side 0.5
140     \pspolygon(-0.25,-0.25)(-0.25,0.25)(0.25,0.25)(0.25,-0.25)%
141   \or % Female. A circle with radius 0.25
142     \pscircle{0.25}%
143   \fi%

```

Necessary for next

```

144   \psset{fillstyle=none}%

```

Deceased or not?

```

145   \ifpst@pdgr@deceased%
146     \qline(-0.33,-0.33)(0.33,0.33)%
147   \fi%

```

Proband or not?

```
148      \ifpst@pdgr@proband%
149          \psline[arrows=>](-0.55,-0.55)(-0.29,-0.29)%
150      \fi%
```

Adopted or not?

```
151      \ifpst@pdgr@adopted%
152          \psline(-0.25,-0.35)(-0.35,-0.35)(-0.35,0.35)(-0.25,0.35)%
153          \psline(0.25,-0.35)(0.35,-0.35)(0.35,0.35)(0.25,0.35)%
154      \fi%
```

Evaluated or not?

```
155      \ifpst@pdgr@evaluated%
156          \rput(0.4,-0.4){$ast$}%
157      \fi%
```

Now a bunch of text putting commands

```
158      \ifx\pst@pdgr@abovetext\empty\relax\else%
159          \rput[\pst@pdgr@abovetextrp](0,0.4){%
160              \kern2\pslinewidth\pst@pdgr@abovetext\kern2\pslinewidth}%
161      \fi%
162      \ifx\pst@pdgr@belowtext\empty\relax\else%
163          \rput[\pst@pdgr@belowtextrp](0,-0.4){%
164              \kern2\pslinewidth\pst@pdgr@belowtext\kern2\pslinewidth}%
165      \fi%
166      \ifx\pst@pdgr@righttext\empty\relax\else%
167          \rput[\pst@pdgr@righttextrp](0.4,0){\pst@pdgr@righttext}%
168      \fi%
169      \ifx\pst@pdgr@lefttext\empty\relax\else%
170          \rput[\pst@pdgr@lefttextrp](-0.4,0){\pst@pdgr@lefttext}%
171      \fi%
```

Inside text is a bit more difficult since we want to be able to do reverse video if necessary

```
172      \ifx\pst@pdgr@insidetext\empty\relax\else%
173          \rput(0,0){\pst@pdgr@instxtcolor\pst@pdgr@insidetext}%
174      \fi%
175      \endpspicture%
176 }%
```

## 2.5 Drawing A Terminated Pregnancy

\pstAbortion First, the standard processing of optional parameter

```
177 \def\pstAbortion{\ifnextchar[{\pstAbortion@i}{\pstAbortion@i[]}}%
```

\pstAbortion@i And the actual macro:

```
178 \def\pstAbortion@i[#1]#2{%
179     \rnode{#2}{%
180         \psset{arrows=-, linestyle=solid}%
181         \psset{#1}%
182     }
```

The standard [1] requires the lines for the terminated pregnancies to be shorter than for the normal ones. A way to do this is to make the node *higher*:

```
182 \pspicture[shift=-0.25](-0.25,-0.25)(0.25,0.5)%
```

Condition processing:

```
183 \ifcase\pst@pdgr@condition\relax % Nothing to do if normal
184   \or \relax % Nothing to do if obligatory
185   \or \relax % Nothing to do if asymptomatic
186   \or % affected
187     \expandafter\psset\expandafter{\affectedstyle}%
188 \fi%
```

If this is a terminated pregnancy, we use the same symbol as for deceased:

```
189 \ifpst@pdgr@sab\relax\else%
190   \qline(-0.25,0.1)(0.25,0.6)%
191 \fi%
```

The actual drawing

```
192 \pspolygon(-0.25,0.25)(0,0.5)(0.25,0.25)
```

And text putting commands

```
193 \ifx\pst@pdgr@abovetext\empty\relax\else%
194   \rput[\pst@pdgr@abovetextrp](0,0.65){%
195     \kern2\pslinewidth\pst@pdgr@abovetext\kern2\pslinewidth}%
196 \fi%
197 \ifx\pst@pdgr@belowtext\empty\relax\else%
198   \rput[\pst@pdgr@belowtextrp](0,0.1){%
199     \kern2\pslinewidth\pst@pdgr@belowtext\kern2\pslinewidth}%
200 \fi%
201 \ifx\pst@pdgr@righttext\empty\relax\else%
202   \rput[\pst@pdgr@righttextrp](0.4,0.35){\pst@pdgr@righttext}%
203 \fi%
204 \ifx\pst@pdgr@lefttext\empty\relax\else%
205   \rput[\pst@pdgr@lefttextrp](-0.4,0.35){\pst@pdgr@lefttext}%
206 \fi%
207 \endpspicture%
208 }%
```

## 2.6 Drawing A Childlessness Symbol

`\pstChildless` Again, the standard processing of optional parameter

```
209 \def\pstChildless{\ifnextchar[{\pstChildless@i}{\pstChildless@i[]}}%
```

`\pstChildless@i` And the actual macro:

```
210 \def\pstChildless@i[#1]#2{%
211   \rnode{#2}{%
212     \psset{arrows=-, linestyle=solid}%
213     \psset{#1}}%
```

The actual drawing depends on the `infertile` option. If it is true, we want a double line (an non-zero height). Otherwise this is a single line with zero height:

```

214      \ifpst@pdgr@infertile % double line
215          \pspicture[shift=-0.05](-0.2,-0.05)(0.2,0.05)%
216              \qline(-0.2,-0.05)(0.2,-0.05)%
217              \qline(-0.2,0.05)(0.2,0.05)%
218          \endpspicture%
219      \else % single line
220          \qline(-0.2,0)(0.2,0)%
221      \fi%

```

And the text below the symbol:

```

222      \ifx\pst@pdgr@belowtext\empty\relax\else%
223          \rput[t](0,-0.2){\pst@pdgr@belowtext}%
224      \fi%
225 }%

```

## 2.7 Drawing A Relationship Line

`\pstRelationship` The `\pstRelationship` command can have both optional and non-optional parameters:

```

226 \def\pstRelationship{\@ifnextchar[{%
227     \pstRelationship@i}{\pstRelationship@i[]}}%

```

`\pstRelationship@i` The actual macro:

```

228 \def\pstRelationship@i[#1]#2#3{%
229     \begingroup%
230     \psset{arrows=-, linestyle=solid, nodesep=0.7\pslinewidth}%
231     \psset{#1}%

```

A consanguinic relationship is shown by a double line:

```

232     \ifpst@pdgr@consanguinic%
233         \psset{doubleline=true}%
234     \else%
235         \psset{doubleline=false}%
236     \fi%

```

The actual drawing

```
237 \pst@pdgr@rellinecmd{#2}{#3}%

```

The broken relationships are shown using //:

```

238 \ifpst@pdgr@broken%
239     \lput(\pst@pdgr@brokenpos){/\kern-0.7ex/}%
240 \fi%

```

And the descent node

```

241     \ifx\pst@pdgr@descentnode\empty\relax%
242     \else%
243         \lput(\pst@pdgr@descentnodepos){\pnode{\pst@pdgr@descentnode}}%
244     \fi%
245     \endgroup%
246 }%

```

## 2.8 Drawing a Descent Line

**\ncAngles** In the new version of `pst-node.tex` (1.00 and up) `\ncangles` has the option `pcRef` for the arm lengths to be calculated from the node center. Unfortunately at this time we cannot be sure the users have the new version.

This macro is from Herbert Voß (<http://www.tug.org/mail-archives/pstricks/2007/004608.html>)

```

247 \def\ncAngles{\pst@object{ncAngles}}
248 \def\ncAngles@i{\check@arrow{\ncAngles@ii}}
249 \def\ncAngles@ii#1#2{%
250   \nc@object{Open}{#1}{#2}{1.5}{\ncAngles@iii \tx@NCAngles}}
251 %
252 \def\ncAngles@iii{%
253   tx@Dict begin \psline@iii pop end
254   /AngleA \psk@angleA def
255   /AngleB \psk@angleB def
256   /ArmA \psk@armA GetEdgeA yA yA1 sub dup mul xA xA1 sub dup mul add
257   sqrt sub def
258   /ArmB \psk@armB def
259   /ArmTypeA \psk@armtypeA def
260   /ArmTypeB \psk@armtypeB def }

```

**\pstDescent** The standard option processing command:

```
261 \def\pstDescent{\@ifnextchar[{\pstDescent@i}{\pstDescent@i[]}}%
```

**\pstDescent@i** The actual macro. Note that we want to set `armA` *after* processing user input, but all other options are processed after standard ones.

```

262 \def\pstDescent@i[#1]#2#3{%
263   \begingroup%
264   \psset{arrows=-, linestyle=solid, angleA=-90, %
265         angleB=90, armB=0}%
266   \psset{#1}%
267   \psset{armA=\psk@descarmA}%
268   \ncAngles{#2}{#3}%
269   \endgroup}%

```

## 2.9 Drawing Twins

**\pstTwins** The standard option processing command:

```
270 \def\pstTwins{\@ifnextchar[{\pstTwins@i}{\pstTwins@i[]}}%
```

**\pstTwins@i** The actual macro. Note that we need to keep the twin node in `\pst@pdgr@tempnode` to correctly process `addtwin`.

```

271 \def\pstTwins@i[#1]#2#3#4#5{%
272   \begingroup%
273   \def\pst@pdgr@tempnode{#3}
274   \psset{arrows=-, linestyle=solid, angleA=90, %
275         angleB=-90}%
276   \psset{#1}%

```

The descent line from the parent to the twin node

```

277 \pstDescent{#2}{#3}%

```

And the twin lines and nodes

```

278 \ncline{#3}{#4}%
279 \lput(\pst@pdgr@mzlinepos){\pnode{\pst@pdgr@tempnodeA}}%
280 \ncline{#3}{#5}%
281 \lput(\pst@pdgr@mzlinepos){\pnode{\pst@pdgr@tempnodeB}}%

```

The monozygotic or qzygotic line

```

282 \ifpst@pdgr@monozygotic%
283   \ncline{\pst@pdgr@tempnodeA}{\pst@pdgr@tempnodeB}%
284 \else%
285   \ifpst@pdgr@qzygotic%
286     \ncline[linestyle=none]{\pst@pdgr@tempnodeA}{\pst@pdgr@tempnodeB}%
287     \lput(0.5){?}%
288   \fi%
289 \fi%
290 \endgroup}%

```

## 2.10 Tree Making Commands

\pst@pdgr@makeTcommand The general macro to create a tree command from the normal command

```

291 \def\pst@pdgr@makeTcommand#1{%
292   \cnamedef{T#1}{%
293     \cifnextchar[\{\cnameuse{T#1@i}\}{\cnameuse{T#1@i}[]}\}%
294   \cnamedef{T#1@i}##1##2{%
295     \Tr{\cnameuse{#1@i}##1##2}\}%

```

And the macros

\TpstPerson Drawing a person

```

296 \pst@pdgr@makeTcommand{pstPerson}%

```

\TpstAbortion Drawing an abortion

```

297 \pst@pdgr@makeTcommand{pstAbortion}%

```

\TpstChildless Drawing a childlessness symbol

```

298 \pst@pdgr@makeTcommand{pstChildless}%

```

## 2.11 Finishing Touch

```

299 </tex>

```

### 3 Acknowledgements

The authors are grateful to Herbert Voß for help with `PSTricks` code. The support of `TEX` User Group is gratefully acknowledged. One of the authors (LA) was supported by Russian Foundation for Fundamental Research (travel grant 06-04-58811), Russian Federation President Council for Grants Supporting Young Scientists and Flagship Science Schools (grant MD-4245.2006.7)

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## Change History

v0.1	\pstPerson@i: Changed text positioning . . . . .	28
	General: The interface is mostly done . . . . .	1
v0.2	\pst@pdgr@abovetextrp: Added the command . . . . .	25
	\pst@pdgr@belowtextrp: Added the command . . . . .	26
	\pst@pdgr@lefttextrp: Added the command . . . . .	26
	\pst@pdgr@righttextrp: Added the command . . . . .	26
	\pstAbortion@i: Changed text positioning . . . . .	29
v0.3	\ncAngles: Introduced the macro . . . . .	31
	\psk@descarmA: Introduced new length . . . . .	26
	\pstDescent: Rewrote using new code from Herbert Voß . . . . .	31
	General: Added option descarmA . . . . .	10
	Documentation update . . . . .	1

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