Narrinyeri tribe, Murray mouth, South Australia.

Two primary classes.	Divided into	And having totems.	Line of Descent.
Nil ..	Nil	Black duck, black snipe, black swan, teal, leech, cat-fish, whip-snake, mullet, wild dog, mountain duck, kangaroo rat, butter-fish, coot, tern, bull ant, whale, pelican, musk duck, wattle gum.	Male line.

Kŭlin tribe, Victoria.

Waa (crow) ..	Nil	Nil	Male.
Bŭnjil (eagle-hawk)	Nil	Small hawk.	

NOTE.—We are indebted to the following correspondents for the above information:—
Wakelbŭra—Mr. J. C. Muirhead, Elgin Downs, Queensland.
Kŭnandabŭri—Mr. W. J. O'Donnell, Cooper's Creek, Queensland.
Tŭrra—Rev. Julius Kühn, Yorke Peninsula, South Australia.
Narrinyeri—Mr. F. Taplin, Port Macleay, South Australia.

The following paper was read by the author :—

ANALYSIS *of* RELATIONSHIPS *of* CONSANGUINITY *and* AFFINITY.

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[WITH PLATES II TO V.]

THE problem we have to consider may be described as how to develop a systematic notation capable of denoting any relationship of consanguinity or affinity. Such a notation, it is evident, will be able to serve as an instrument in further inquiries, and will bear a relation to the ordinary system of terms, the same as that which the notation of chemistry bears to the arbitrarily chosen names of substances. Like the chemist, we first analyse as much as is possible, then choose symbols for the elements resulting from our analysis, and express the compound ideas in terms of these fundamental

symbols. Further, a graphic method can be developed analogous to that used by the chemist.

In several papers recently published,[1] I have considered the problem from the purely mathematical point of view; at present, I wish to present the method, and some applications, in a simple, self-contained form. I was invited to undertake this task by the distinguished anthropologist, Dr. E. B. Tylor, in the hope that the method may prove of service in investigating certain problems of comparative jurisprudence.

I have found from my own course of study, and also from the nature of other notations which I have met with, that there is a tendency to stop the analysis before pushing it far enough. I refer specially to the ingenious notation of Mr. Francis Galton, as used by him in his work on "Hereditary Genius." For example, with a single symbol to denote such an idea as brother, it is impossible to build up a scientific notation; the idea must be resolved into its constituent ideas. At first,[2] I took for a basis the four ideas of son of a man, son of a woman, daughter of a man, daughter of a woman; next,[3] I found it more convenient to proceed with symbols denoting child of a man, and child of a woman; and, finally,[4] I found what I believe is the proper basis, namely, the separation of the idea of sex from the idea of descent.

There are two fundamental relationships of the highest generality, namely, *child* and *parent*, the one relationship being the reciprocal of the other. These can be combined so as to express any of the complex relationships; thus, grandchild is expressed by *child of child;* grand-parent by *parent of parent;* brother or sister by *child of parent;* and consort by *parent of child.* The two latter expressions are taken subject to a certain condition (*see* p. 48). In the same way, great grandchild is expressed by *child of child of child,* nephew or niece by *child of child of parent,* and so on.

For the sake of shortness, let c be used to denote child, p to denote parent, and let "of" be expressed by juxtaposition, then grandchild will be denoted by $c\,c$, brother or sister by $c\,p$, consort by $p\,c$, grandparent by $p\,p$. This method leads to an exhaustive and orderly notation for relationships, as will be seen by turning to Table I. It contains what may be called the general relationships of the first five orders. The order of a relationship is defined as depending upon the number

[1] "Proc. Roy. Soc., Edinb.," vol. x, p. 224; vol. xi, pp. 5 and 162. "Phil. Mag," June 1881. "Educational Times," reprint vol. xxxvi.

[2] "Proc. Roy. Soc., Edinb.," vol. x, p. 224.

[3] Ibid., vol. xi, p. 6.

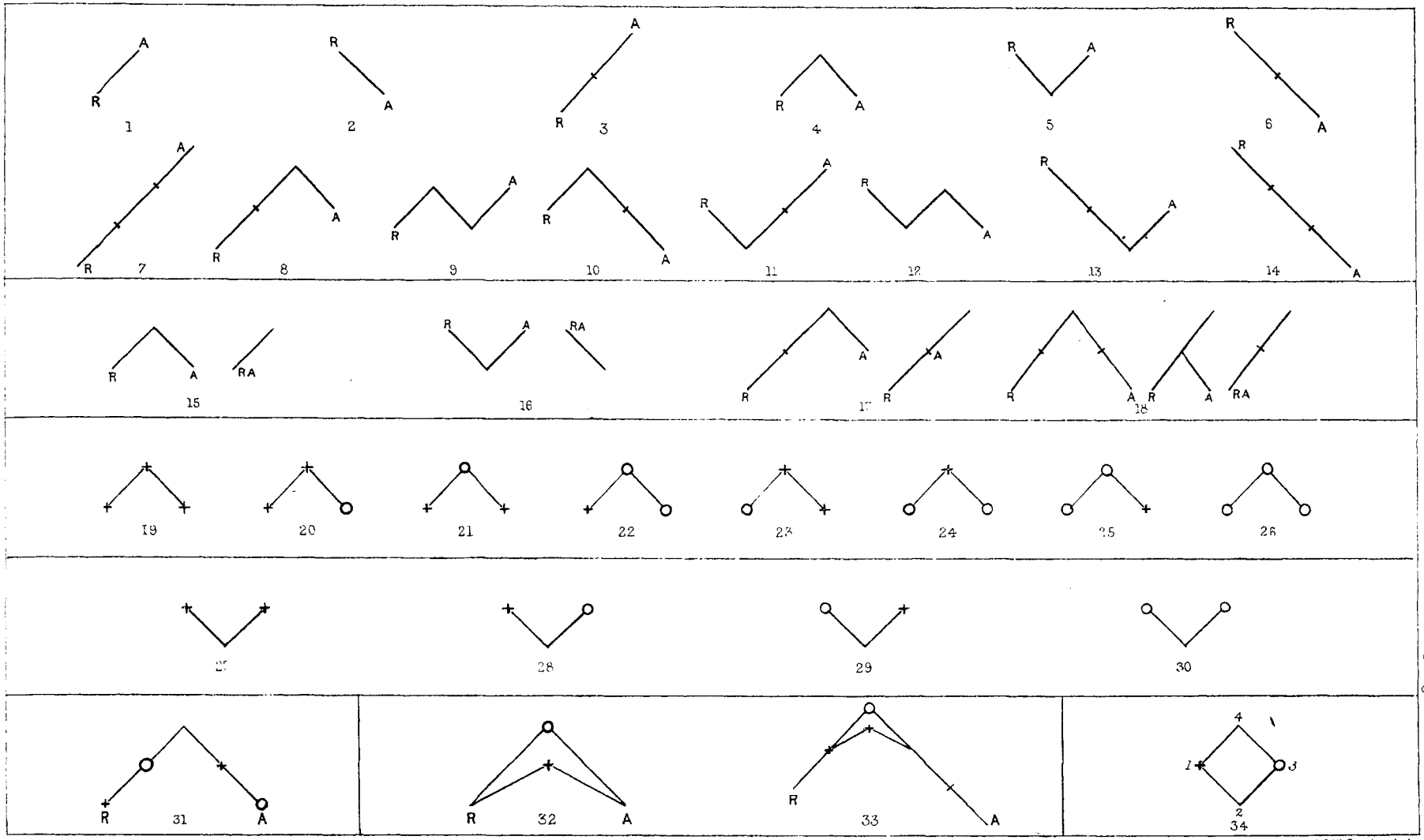
[4] Ibid., vol. xi, p. 162.

of letters, whether *c's* or *p's*, required to express it, and the relationships exhibited may be called *general* in contrast to the specific relationships into which they are broken up by the introduction of the distinction of sex. The relationships of any order are derived from those of the preceding order first by prefixing *c*, and secondly by prefixing *p*. The number of genera in the first order is 2, in the second 4, in the third 8, and so on, the number being doubled each time.

It will be convenient to have special terms to denote the person from whom a relationship is reckoned, the person to whom the relationship refers, and the persons through whom the relationship is traced. The two former may be called the extremes, and the others the intermediates. Of the extremes, the former may be called the origin, and will be denoted by *A*, while the latter may be called the relation, and will be denoted by *R*. The intermediates may be denoted by *B*, *C*. &c.

The relationship denoted by *c* will be graphically represented by a line drawn upwards, and, as far as is possible, of constant length; while that denoted by *p* will be represented by a line of equal length drawn downwards. The first fourteen relationships are represented on this method in figs. 1 to 14, Plate II. The line starting from *R* is drawn from left to right. There is always an intermediate at an angle; the presence of an intermediate on a straight line is indicated by a small transverse line; for example in fig. 3, Plate II.

In most cases, the genus relationship in the second column of Table I has two meanings, the one, its most general meaning (entered in the third column), the other a special meaning obtained by supposing the relationship to be irreducible (entered in the fourth column). For example, *c p A* denotes in general, *a child of a parent of A*, thus denoting the origin *A* as a particular case. Again, *p c A* denotes in general, *a parent of a child of A*, thus applying not only to a consort of *A*, but to the person *A*, him or herself. Similarly, *c c p A* denotes in general, *a child of a child of a parent of A*, thus applying as a singular case to a child of *A*. We may have reduction following reduction; for example, *c c p p A* denotes in general, *a grandchild of a grandparent of A*, which may reduce to a child of a parent of *A*, which may further reduce to *A*. Thus, a general relationship may reduce to one of a lower order, or to *self*; the irreducible meaning is obtained by supposing such singular cases of the general meaning to be excluded. The reducible relationships are those in which a change from *c* to *p* or from *p* to *c* occurs; hence, they include all the genera except the first and the last of each order. The two meanings are indicated graphically by supposing in the one case, that two



PL. II FIGURES ILLUSTRATING THE GRAPHIC NOTATION.

J & W Emslie, lith

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lines which can collapse may collapse, and in the other case, by supposing that such lines may not collapse. Figs. 15 to 18, Plate II, indicate graphically the examples considered above. It is evident that a relationship of an odd order can reduce only to one of an odd order, and a relationship of an even order only to one of an even order.

Regarding the use of the terms in the fourth column, it is necessary to make the following observations. By *brother* is meant what is usually denoted by half-brother, that is, son of the same father *or* son of the same mother. In accordance with this system, son of the same father *and* son of the same mother is considered as *two-fold* brother. To develop a complete scientific notation demands this view of the subject; for, consider the relationship of *first cousin*. In this country it may exist singly, or two-fold, or three-fold, or four-fold. We should then require to speak of cousin, three-quarters cousin, half cousin, quarter cousin. But, in addition to the awkwardness of employing fractions, there is this defect, that the four-fold limit depends, not upon biological but upon moral law. Hence for the purpose of an exact investigation, it is preferable to say cousin, two-fold cousin, three-fold cousin, four-fold cousin.

The expression *consort* may be taken in three different senses, according to the nature of the investigation; first, in the simple sense of co-parent of a child; secondly, in the sense of legitimate co-parent of a child; thirdly, in the sense of husband or wife, that is, legitimate, actual or potential, co-parent of a child. In what follows, the term is generally used in the last signification, but it may be used in either of the other significations should a particular investigation demand it.

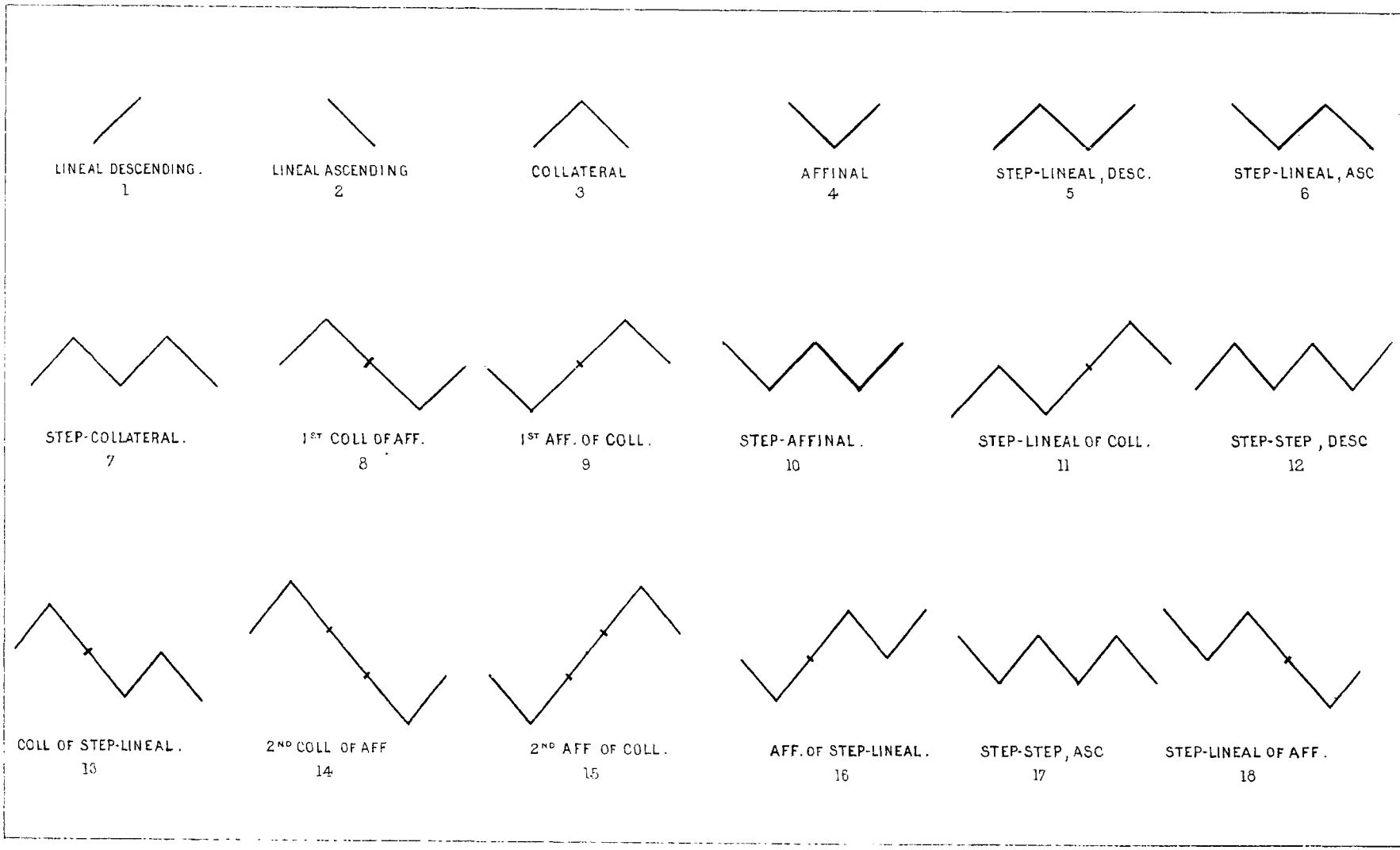
The term *step-child* is used in a sense which is probably more general than the sense ordinarily attached. Suppose that A marries B, and that they have a child X, and that B afterwards marries C, and that they have a child Y, then X would, in the ordinary acceptation of the term, be a step-child of C; but in a systematic nomenclature, it is convenient to extend the meaning of the term, so that it may apply equally to the relationship of Y to A. I use the term *step* in this extended sense throughout.

In the case of certain irreducible relationships, equivalent terms are, so far as I know, wanting in the English language. For example, $p\,c\,p\,c$, which from its analogy to $c\,p\,c\,p$ (step-brother or step-sister) I have ventured to express as *step-consort;* also $c\,p\,c\,p\,c$, which I have expressed as *step-step-child*. It will be observed that a special irreducible term is required for, and only for, each genus which has its letters arranged alternately.

Column fifth contains a classification of the genus relationships proceeding upon their characteristic parts. Suppose that from each relationship which has a combination of *c's* or of *p's* at its front, or at its end, all the letters of the combination are cut off excepting one, then, those relationships which leave the same remainder may be said to have the same *characteristic.* Such a group of relationships fall naturally into a class. The several characteristics to be met with in relationships occurring within the first five orders are exhibited on Plate III. Words are in common use to express the classes determined by the first three characteristics, namely, 1st descending lineal or descendant, 2nd ascending lineal or ancestor, and 3rd collateral; but there is, so far as I am aware, no single term to denote the fourth. It embraces all the ancestors of any consort of any descendant of self (including consort of self). As this group embraces the relationships by affinity in the strictest sense of the phrase, it may, for the sake of shortness, and to provide a means of developing a nomenclature for the more complex classes, be denoted by *affinal.*

Each class comprises a number of sub-classes (col. 6th), determined by the number of letters in the combination of *c's* (or *p's*) at the end of the relationship. If, further, the number of letters in the combination at the front of the relationship be specified (col. 7th), the genus is then wholly determined. This last entry has the best title to the denomination of the degree, but to avoid the use of that ambiguous word, I shall call it the *Number.* Not only is it only relationships of the same class, but it is only relationships of the same sub-class which can properly be compared as to degree. As it is, the degree is reckoned by different authorities in different ways. In the case of the first two classes, the lineal ascending and the lineal descending, there is no ambiguity; the degree coincides with the number of the table. In the case of the third class—the collateral—the degree of the civilians is equal to the sum of the sub-class and number, while that of the canonists is the greater of the two. In the case of the fourth class, there is room for still greater ambiguity, owing to the difficulty of reckoning the degree of $c\,p$, that is, of consort. The only unambiguous and perfectly general method, is first to specify the class, then the sub-class, and then the number.

In the eighth column I have entered the *Index* of the Relationship. It is obtained from the notation in the second column by counting the number of *c's* or the number of *p's* following one another, and writing the sum of the *c's* with a + sign before it, and the sum of the *p's* with a − sign before it. When the relationship is given to be irreducible, the



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PL. III. CHARACTERISTICS OF THE CLASSES OCCURRING IN THE FIRST FIVE ORDERS.

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numbers in the index cannot in any case destroy one another. But, if the relationship is reducible, the reduction may take place in any way by which a positive 1 can destroy a neighbouring negative 1. A relationship, and the forms to which it can reduce, compose a class of relationships which naturally group together. It is evident that the class, sub-class, and number, may be read off from the index; and, were it not for the distinction of sex, which still requires to be symbolised, the index might be a sufficient notation.

The ninth column contains another classification—proceeding upon what may be called the *sign* of the relationships. The sign is determined by the first direction of the line, and by the subsequent number of changes; hence, it may be deduced from the index, by neglecting the numbers, and retaining only the several signs. The common property denoted by the sign + is descendant; by − ancestor; by + − descendant of ancestor; by − + ancestor of descendant. The irreducible meanings of the two latter are *collateral* and *affinal* respectively. So far this classification agrees with that in column fifth, but when we proceed to the next class + − + that is, descendant of ancestor of descendant, we find that it embraces several of the Classes, namely, step-lineal descending, 1st collateral of affinal, and 2nd collateral of affinal. Its irreducible meaning is any descendant of an affinal, not being, as such, a descendant of self. Similarly, − + − means ancestor of descendant of ancestor, its irreducible meaning being any ancestor of a collateral, not being, as such, an ancestor of self. The other signs may be read off in a similar manner.

In the last column there is entered the *interval*, by which is meant the number of generations separating the two extremes of the relationship. A cipher indicates that they are of the same generation; a number without a sign that the relation is younger than the origin by the given number of generations; and a number with the − sign, that the relation is older than the origin by the given number of generations. The value of the interval is deduced from the notation by summing up all the *c's*, and all the *p's*, and subtracting the latter sum from the former.

A very natural classification of the general relationships is formed by grouping together those having the same interval. The result is the systematic development of the idea involved in the Chinese grades. "All men who are born into the world," says a Chinese author, "have nine ranks of relations. My own generation is one grade, my father's is one, my grandfather's is one, that of my grandfather's father is one, and that of my grandfather's grandfather is one; thus above me are four grades: my

son's generation is one grade, my grandson's is one, that of my grandson's son is one, and that of my grandson's grandson is one; thus below me are four grades of relations: including myself in the estimate, there are in all nine grades. These are brethren, and though each grade belongs to a different house or family, yet they are all my relations, and these are called the nine grades of relations."[1] The relationships of the first five orders fall within the first eleven grades.

The classification by grade is capable of serving as a basis for a nomenclature. A common term is required to denote any general relationship falling into a given grade, and qualifying words or phrases to denote the several ways in which the relationship may pass from *self* or the grade 0, to the given grades. The nature of the connecting line corresponds to the "different house or family" mentioned above. For example, the first four general relationships ending in the grade 1 are child proper, nephew or niece, step-child, child-in-law. Here the idea of the grade, namely, child, enters into three of these English terms, and the genera are separated by adding on qualifying phrases. What more reasonable to expect, than that the second *genus* should also in some languages be named on the same principle? If we examine the terms for the relationships ending in grade 0, we shall find that they exhibit a similar tendency to group under a generalised idea of *brother* or *sister*, the principal exception being *consort*. In gesture language, however, consort is represented by the same sign as brother or sister, namely, by the two forefingers placed close to one another.[2] Any nomenclature built upon this basis is called by Morgan *classificatory*; but the distinction is very rough, for there is more or less of this kind of classification in every nomenclature. It is so natural that I had drawn it out before hearing of Morgan's classificatory systems.

Having classified the general relationships in various ways, I now proceed to divide them into species by the introduction of a notation for sex. Let m be used to denote *male*, and f to denote *female*; then as the adjective male or female may apply to each of the nouns child or parent, we may attach an m or an f to any letter in a general relationship. It is convenient to place the symbol of the adjective before the symbol of the noun to which it refers: thus $m\,c$ denotes son, $m\,c\,m\,c$ son of son, $m\,p$ father, and so on. Also as the origin of a relationship may be either man or woman, we may have an m or an f after the last c or p of the relationship; for example $m\,c\,m$ denotes son of a man, and $m\,c\,f$ son of a woman. A relationship which has

[1] Morgan's "Systems of Consanguinity and Affinity," p. 415.
[2] Tylor's "Early History of Mankind," p. 37.

neither m nor f at its end is applicable to any person independently of sex.

The symbols m and f are conveniently represented on a diagram by the marks × and o respectively. I find these marks so used in genealogical tables by Mr. Galton.[1] I used to employ a short transverse stroke, instead of the cross, but it is better to reserve the stroke for indicating the position of an intermediate person of either, or of indeterminate sex, in cases where it is not necessarily indicated by a corner (p. 48). This notation is exemplified in figs 19–26, Plate II, where we have the different species of brother or sister relationships indicated.

A general relationship is specialised as much as is possible with respect to sex, when it has a sex-symbol for either extreme, and for each of the intermediates. In Table II the general relationships of the first two orders are broken up into species of the kind referred to. The permutations of the sex-symbols m and f are formed in the same manner as those of the descent symbols c and p (p. 48), that is, by first taking m and f, then prefixing m before each of these, and also prefixing f, then by prefixing m and f severally before each of these four results, and so on. The manner in which the sex-symbols follow one another gives us the idea of *line*. To find the species into which the general relationships of a given order break up, all that we have to do is to write, as in Table II, the permutations of c and p, in a vertical column, and those of m and f in a horizontal row; then the result to be entered in a given place is determined by the row and the column which intersect in that place. The species in the second row of the second order are those represented graphically in figs. 19–26, Plate I. I use the term *brother german*, to denote brother on the father's side, following McLennan[2]; Sir H. Maine[3] uses the longer term *brother consanguineous*. In the case of the third genus of the same order, we have several remarkable species. The sixth and the eighth species necessarily reduce to simple forms—a mother of the son of a woman is necessarily the woman referred to, and a mother of a daughter of a woman is necessarily the woman referred to. The two corresponding male species,—the first and the third—are not so necessarily reducible; they are so only in countries where monandry is established. Hence the rule is, that $f\,p\,c\,f$ always reduces to f; and $m\,p\,c\,m$ to m where monandry is established. On the other hand $m\,p\,c\,f$ and $f\,p\,c\,m$ are necessarily irreducible, owing to the fact that sex in mankind is dicœcious. Hence of the

[1] Galton's "Hereditary Genius," p. 93.
[2] McLennan's "Studies in Ancient History," p. 176.
[3] Sir H. Maine's "Ancient Law," p. 152.

four lines (figs. 27–30, Plate II) the first necessarily collapses where monandry is established, the second and third cannot collapse, and the fourth necessarily collapses.

I may observe here that the expression in words entered below a notation is always intended to be the exact equivalent of the notation, so far as existing English words can convey the meaning. An entry of this sort, of course, differs from one which means that the relationship denoted belongs to the class described; for then it is the sum of all the relationships, which are said to belong to the given class, that is the equivalent of the class. For instance, brother or sister-in-law is not the equivalent of *c p p c*, but of *c p p c* and *p c c p* taken together. The relationship to which a given relationship reduces may not be the exact equivalent of the relationship; it is one which necessarily follows from the given relationship, as such.

Another important system of relationships (Table III) is obtained by supposing the sex of the extremes to be given; that is, by specifying *m* or *f* at the front and at the end. When the relationships are considered to be irreducible, the specification of the sex of the relation may determine the sex of some of the intermediates, or of the origin. This depends on the Laws of Reduction stated on page 53. The rule for putting in the consequent specifications of sex is as follows:—When a relationship begins with *p c*, the sex-symbol after the *p c* is the opposite of that in front, and should this *p c* be followed by another, the sex-symbol following the latter will be the same as that in front. In the same way the sex-symbol at the end, when immediately preceded by *p c*, requires the sex-symbol before the *p c* to be its opposite, and so on.

In the table referred to, I have developed the general relationship *first* for the relation being male, and the origin female; and *secondly*, for the relation being female, and the origin male. The first series fully developed gives all the possible relationships of a man to a woman, the second series all the possible relationships of a woman to a man. Corresponding to any relationship in the one series, there is a relationship in the other series which is its reciprocal. Two relationships may be said to be reciprocal to one another, if when one denotes the relationship of *R* to *A*, the other denotes the consequent relationship of *A* to *R*. Hence the rule for deducing the reciprocal of a relationship is—Write the given relationship backwards, at the same time changing each *c* into *p*, and each *p* into *c*. For example, the reciprocal of *m c c p f* is *f c p p m*; if *R* is the nephew of the woman *A*, then *A* is the aunt of the man *R*.

The deducing of the reciprocal relationship is a special case

of the problem—Given a proposition stating a relationship between two persons, into how many equivalent forms can the statement be put? The solution will be best explained by means of an example. Suppose the given statement to be that represented by fig. 31, Plate II, namely, R is a son of a sister of the father of the woman A. This is expressed in the analytical notation by—

$$R = m\,c\,f\,c\,p\,m\,p\,f\,A, \qquad (1)$$

It follows that

$$p\,m\,R = f\,c\,p\,m\,p\,f\,A \qquad (2)$$

A parent of the man R is a sister of the father of the woman A.

$$p\,f\,p\,m\,R = p\,m\,p\,f\,A, \qquad (3)$$

A parent of the mother of the man R is a parent of the father of the woman A;

$$c\,p\,f\,p\,m\,R = m\,p\,f\,A, \qquad (4)$$

A brother of the mother of the man R is the father of the woman A.

$$\text{and } f\,c\,m\,c\,p\,f\,p\,m\,R = A, \qquad (5)$$

A daughter of a brother of the mother of the man R is A.

Thus the statement can be thrown into as many forms as there are persons involved in the relationship, each successive form being derived by taking away a c or a p, from the front of the right hand side, and putting a p or a c at the front of the left hand side. The final form is the reciprocal of the original form.

A statement of the laws of marriage of a country is obtained by marking those relationships of the first series, which are inconsistent with the relationship of husband, or those of the second series, which are inconsistent with the relationship of wife. I have marked with an asterisk the relationships explicitly excluded by the English Table of Degrees. Theoretically, no doubt, all the relationships of the lineal classes are excluded, those only being stated which are not rendered impossible by difference of grade. By the law of the Greek Church, all the relationships of this table, with the necessary exception of wife, and the impossible exception of wife of husband, are excluded. Not only so—to form a table exhibiting all the excluded relationships would require one embracing the first nine orders.

Table IV exhibits an important mode of developing the relationships of consanguinity. These embrace the general relationships of the lineal and collateral classes only; and they coincide with the *cognates* of the Romans, provided we generalise the meaning of c so as to denote not only actual child, but

also child by adoption. The principle by which the division into species is effected, is by writing m or f after each c and before each p of the general relationship. By grouping together the relationships at the beginning of the several rows, that is, all those traced exclusively through males, we obtain the agnatic system of the Roman law[1]; and by grouping together the relationships at the end of the several rows we obtain the uterine system, that is, the system resulting from tracing kinship through females only[2]. We can also obtain by separating out from this table, the system resulting from any other law of tracing kinships, as, for example, by tracing alternately through a male and a female.

It will be observed that to express fully the different specific relationships we require four and only four irreducible terms, namely, brother-german, brother-uterine, sister-german, sister-uterine, the reason being that the only change of letter that we can have is that from c to p. This is what Morgan calls a purely descriptive system. But other irreducible terms, though not required, might be introduced, and their introduction would not make the system less descriptive. On the other hand, if a language does not provide simple terms for the four collateral relationships mentioned, it is needless to expect that it will provide simple terms for the more complex collateral relationships.

It is now necessary to consider the proper mode of denoting compound relationships. An elementary relationship is one which denotes a single line of connection between the extremes; a compound relationship is one which denotes the simultaneous existence of several such lines. The simplest example is in the case of full brother or full sister. To denote that R is the full brother of A, we may write

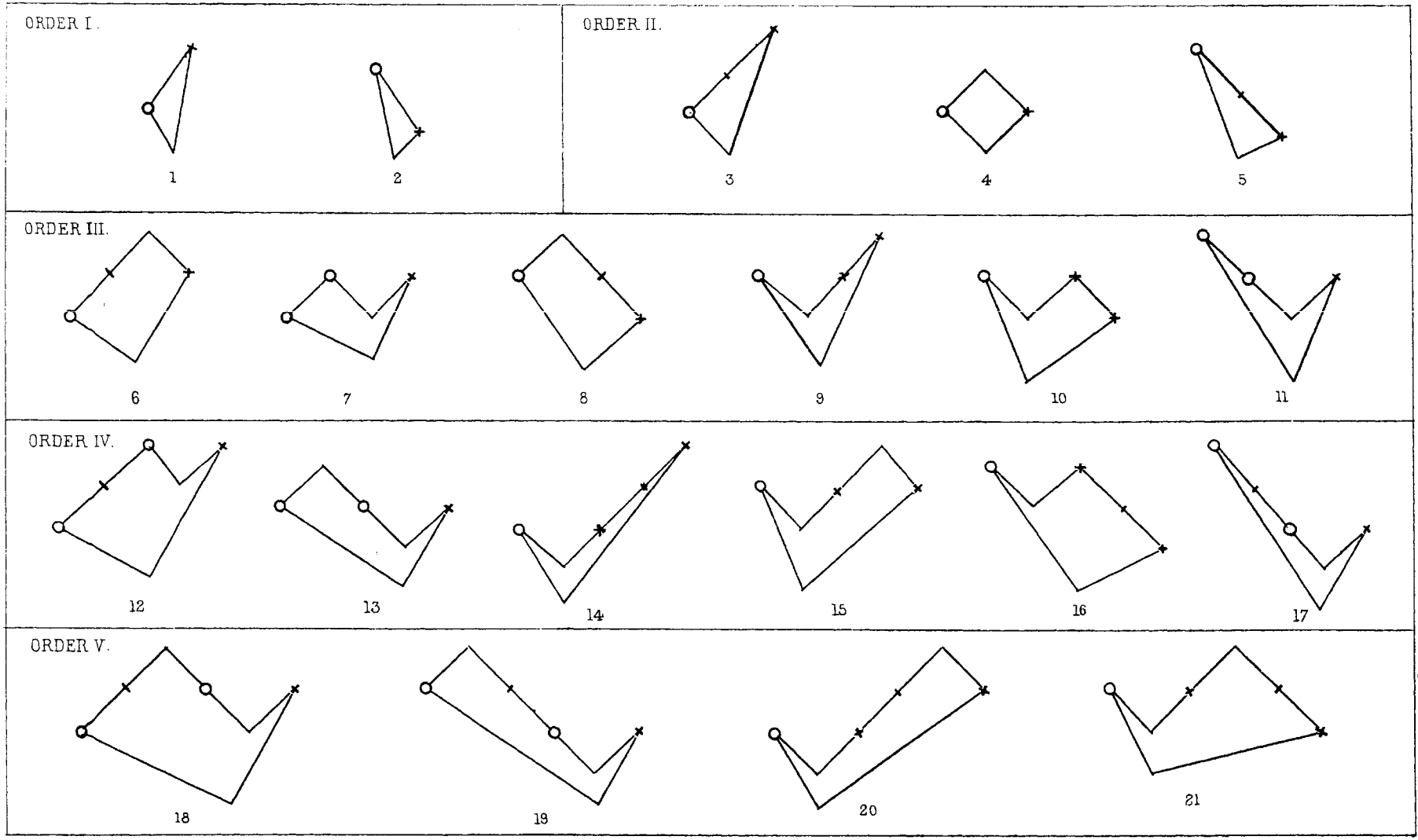
$$R = m \left\{ \begin{matrix} c\,m\,p \\ c\,f\,p \end{matrix} \right\} A$$

using a bracket to embrace the two members of the bifurcation. When the bifurcation does not commence with the relation or terminate in the origin, the common part may be written outside the bracket. For example, the statement that R is a child of a full brother of a grandparent of A may be written

$$R = c\,m \left\{ \begin{matrix} c\,m\,p \\ c\,f\,p \end{matrix} \right\} p\,p\,A.$$

Figs. 32, 33, Plate II, show how the above statements are expressed by the graphic notation; and other examples are to

[1] Sir H. Maine's "Ancient Law," p. 146.
[2] McLennan's "Studies in Ancient History," p. 124.



PL. IV. GRAPHICAL STATEMENT OF THE ENGLISH LAWS OF MARRIAGE AND THEIR CONSEQUENCES.

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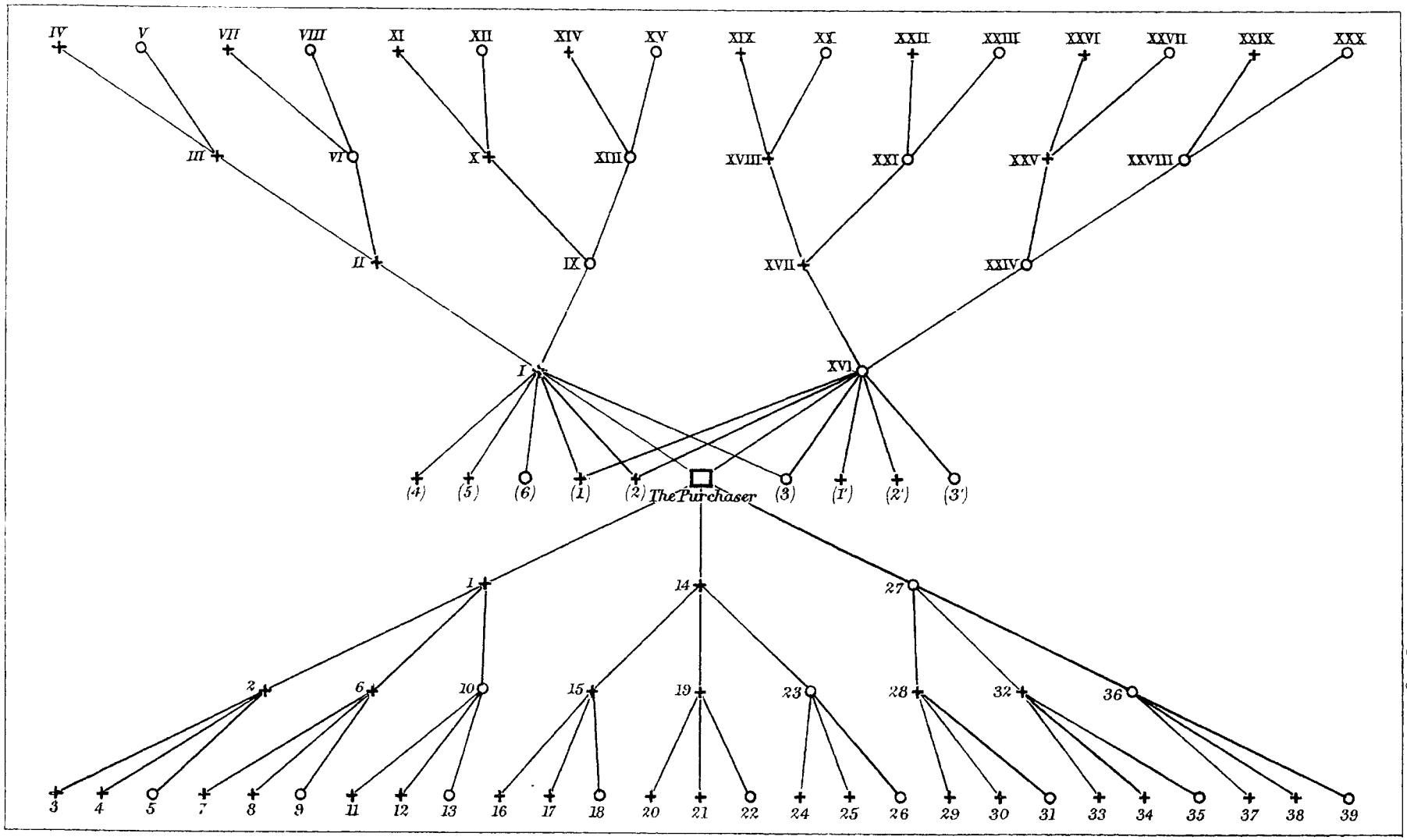

J & W Emslie, lith

PL.V. DESCENT OF PROPERTY ACCORDING TO THE ENGLISH LAW.

Journ. Anthropolog. Inst., Vol. XII, Pl. V

be found on Plates IV and V. The two branches of a bifurcation may or may not be of the same genus relationship.

It is best to consider compound relationships as embracing any combination of elementary relationships, and then to classify them into the possible and the impossible. The latter may be further classified according to the law or laws which render them impossible. Several of these laws have already been referred to, namely—(1) the dicœcious nature of sex; (2) the definiteness of mother; (3) the definiteness of father where monandry prevails. Other laws are, (4) the continuity of a person's life, which prevents any ancestor of a person from also being a descendant of that person; (5) the maximum length of human life compared with the minimum length of a generation, which renders impossible the marriage of parties separated by a certain number of generations; (6) the marriage laws of a country preventing marriage between parties already nearly related.

On Plate IV I have exhibited the combinations rendered impossible by the English Laws of Marriage (following the Table of Degrees, p. 55). In each case we have a cyclic relationship, and the impossibility of the existence of this cycle may be expressed in various ways. We can take each person in turn as being both relation and origin of the relationship, and then transform each of these statements in accordance with the rule (p. 55). For example, take the fourth impossible cycle, the primary meaning of which is that a man cannot be the husband of a sister of himself. This is the reading obtained by taking No. 1 (*see* fig. 34, Plate II) as both relation and origin of the supposed relationship. By taking No. 2 we obtain—A person cannot be the child of a sister of the father of him or herself. By taking No. 3 we obtain—A woman cannot be the sister of the husband of herself. Finally by taking No. 4—A person cannot be the parent of the husband of the daughter of him or herself. To show how any one of these statements may be further transformed, in accordance with the rule on p. 55, take the first—

	$m\,A$	cannot be	$m\,p\,c\,f\,c\,p\,m\,A.$	(1)
Then	$c\,m\,A$	cannot be	$c\,f\,c\,p\,m\,A;$	(2)
and	$p\,c\,m\,A$	cannot be	$f\,c\,p\,m\,A;$	(3)
and	$p\,f\,p\,c\,m\,A$	cannot be	$p\,m\,A;$	(4)
and	$c\,p\,f\,p\,c\,m\,A$	cannot be	$m\,A.$	(5)

The meanings of these several transformations are:

A child of the man A cannot be a son of a sister of A; (2)
A wife of A cannot be a sister of A; (3)

A parent-in-law of the man A cannot be a parent of A; (4)

A brother of the wife of A cannot be A himself. (5)

The last form is the reciprocal of the first; it is obtained by going in the opposite direction round the cycle. It may be shown in a similar manner that each of the other three principal statements has five forms. Let the number of persons involved in such a cycle be n; then the number of principal statements is n, and the number of forms for each of these is $n + 1$; hence the total number of forms is $n(n + 1)$.

The above is the only impossible cycle which occurs in the combination of two cousin relationships.

By means of this notation we can easily calculate the amount of consanguinity existing between two persons connected by a given relationship, provided we can first settle two principles, namely, the relative parts to be ascribed to father and mother, and secondly, how far the consanguinity derived by one child from a parent is equivalent to the consanguinity derived by another child from the same parent. Suppose that the answers to these questions respectively are that the parts are equal, and that the consanguinities are wholly equivalent; then in the case of any lineal relationship the consanguinity will be measured by a product of as many halves as there are letters in the relationship; and in the case of any collateral relationship the number of times half is repeated in the product will be less than the number of letters in the relationship by one. In the case of a compound relationship the total value of the consanguinity is the sum of the consanguinities of the elements. The value for single first cousin is one-eighth; hence for two-fold first cousin it must be a quarter; for three-fold first cousin three-eighths; and for four-fold first cousin one-half.

I propose to accept the late Dr. Morgan's invitation[1] to criticise the data furnished in his tables. He took for the basis of his schedule of questions the Roman method of denoting relationships. That method was no doubt sufficient for the purpose for which it was intended; but for the purpose of a scientific inquiry, which to be useful must involve the discrimination of very nice differences, we require a more exact analysis. In Morgan's Tables we nowhere find the distinction between an elementary and a compound relationship: thus, for example, *brother* may mean brother with respect to father, or brother with respect to mother, or brother with respect to both father and mother. The questions of the schedule are not test questions, but aim at being exhaustive. They amount to 268—a number

[1] "Systems of Consanguinity and Affinity," p. 9.

sufficiently great to make it difficult to keep an American Indian to the task of answering, and to cause the filling up of a schedule by another person to occupy two or three years, but still a number very far from being exhaustive, when we consider that without going beyond the fifth order there are more than 27,000 elementary relationships. These 268 questions are not distributed so well as they might have been, for 228 are devoted to the first two classes—the lineal and the collateral, while only 37 are devoted to the remaining classes. This disproportion becomes all the more striking, when we bear in mind that the principal application to which Morgan attempted to put the data was to determine the forms through which the institution of marriage is supposed to have passed.

When we examine his tables we find that the specification of sex in a relationship is introduced or omitted in a very arbitrary manner. For example, in his first Table, question 4, we have given as the equivalents of mother of great grandfather terms which are really equivalent to (1) grandmother of grandmother, (2) great grandmother of father, (3) grandmother of grandfather, (4) great great grandmother, while we have, in addition, terms which are really equivalent to the heading. Question 13 is "grandson" (common term), and question 14 is "grandson" (descriptive phrase). Under the former heading, besides proper equivalents of grandson, I find some terms which are equivalent to grandchild, others to son of son, and one to son of daughter; and there is no difference in the nature of the entries under the other heading, excepting that son of daughter is more frequently introduced.

The tables have three columns, one of which is devoted to the description of a relationship in English, the second to the corresponding relationship in the foreign language, and the third to a translation of the entry in the second. Now if the second entry is the precise equivalent of the first, then the first is the proper translation of the second, and accordingly we find that the entries in the first and third columns are frequently the same. There is room for a third column, when and only when the question is understood to be what is the idiomatic expression in the foreign language of the given relationship, and what is a literal translation of that expression into English. This is the case with the Chinese method. But in the case of the American Indian methods this cannot be said to be the meaning of the entry of the third column. It is not co-extensive with, but includes the entry of the second column.

The analysis of this paper suggests two methods of dealing with Morgan's data or of recording more exact ones. First, the general relationships of Table I, broken up, if necessary, into

species, may be taken as the schedule of questions, and their equivalents in the particular language entered in another column; second, the principal relationship words or phrases in the particular language may be made the argument, and their equivalent in the scientific notation be made the entry. The first method tests whether the data are complete within the orders of relationship considered; and the mere arrangement of the data, when so stated, is sufficient to show the principal characteristics of the particular system examined.

In Table V I have given an example of how the second method may be employed. The relationship words and phrases in the English language are defined not in terms of one another but in terms of an exact scientific notation. Mr. Francis Galton suggested to me that I should show that this could be done. The relationship terms of any language may be exactly defined in this manner.

I have supplied (Plate V) the graphic notation to the problem of giving a complete representation of the descent of property according to the English law. The purchaser is the origin of the scheme; three generations of lineal descendants and four generations of lineal ascendants are taken into account. A family is sufficiently represented by two sons and one daughter, because the elder son succeeds before the younger, and the youngest son before any daughter, but all the daughters together. The order of succession among the lineal descendants is indicated by the numbers. Suppose the issue of the purchaser exhausted, then the inheritance goes back to the lineal ascendants or their issue in the order indicated by the Roman numerals. Each lineal ancestor forms a stock and his family breaks up into sub-stocks, which succeed in the manner indicated by the numbers enclosed within the brackets. The issue of each sub-stock succeeds in the same order as the issue of the purchaser. The sub-stocks 1, 2, 3, 4, 5, 6, succeed after the father, while (1′), (2′), (3′), succeed after the mother. The diagram supposes sub-stocks attached to each pair of stocks, and issue to each of the sub-stocks.

Appendix.—After I read the above paper Mr. Francis Galton suggested to me that the notation would be improved were the symbols so taken that the expressions could be spoken. The simplest way of carrying out this idea seems to me to be to use the vowels *a* and *o* instead of the consonants *c* and *p*; to employ *m* and *f* as before to denote male and female, while *mf* may be taken to denote both; and to introduce *y* as a consonant between two vowels not separated by *m*, *f*, or *mf*. On Table V will be found the vocalised equivalents of the ordinary terms of relationship formed in accordance with these principles. After

further study of this matter I may be able to make improvements; but the scheme given is so far a construction of a small portion of the scientific language discussed by Professor Max Müller in his "Lectures on the Science of Language."[1]

Explanation of Plates II to V.

Plate II.

Figures illustrative of the text of the paper.

Plate III.

Diagram showing characteristics of the classes occurring in the first five orders of the author's system.

Plate IV.

Graphical statement of the English Laws of Marriage and their consequences.

Plate V.

Diagram showing Descent of Property according to the English Law.

Discussion.

Mr. Galton said that the attempt to express relationship was essentially a difficult task, not to be got through by any Royal road; it was like attempting to define the position of a large number of draughtsmen on a board, which could not be done without a great deal of detailed description. We were apt to underrate the difficulty of expressing relationship owing to the imperfect nomenclature to which habit had accustomed us, but as soon as we found it necessary to define a relationship accurately, the imperfection of our language and the vagueness of our ordinary conceptions became manifest. There was an especial source of verbal confusion in the way in which the same relationship was sometimes singly and sometimes doubly expressed. We say, for example, on the one hand, that A is father of B, or conversely that B is son of A, and on the other hand that the relationship between A and B is that of father and son. There was an incongruity in using the two phrases as equivalent. "Father and son" in the single sense means the father and the son of a third person, and refers to three generations, viz.: to the father of A, to A, and to A's son, whereas in the double sense it refers to two generations only.

He thought that Dr. Macfarlane had attacked the problem of relationship with thoroughness, ability, and success, and that he had done a very acceptable work for all who concerned themselves with genealogies of the complicated descriptions referred to by

[1] Max Müller's "Lectures on the Science of Language," vol. ii, p. 48.

Dr. Macfarlane. The diagrammatic form seemed to himself the most distinctive and self-explanatory. Some few, however, of the series of letters were perhaps a little too long and cumbrous compared with the simplicity of the relationship they conveyed, as, for example, the formula by which a husband's sister was expressed. He should like to receive an assurance from the author that he was able himself readily to decipher his own formulæ, after he had laid the subject by for a time and had temporarily ceased to be familiar with it.

Mr. PARK HARRISON, the Rev. Professor HARLEY, and the CHAIRMAN also took part in the discussion.

Dr. MACFARLANE, in reply to questions asked, stated that a little practice was sufficient to enable one to use either the analytical or graphical notation, while in reading off the notation to others the difficulty consisted in framing an expression in ordinary words having a meaning exactly equivalent to that concisely and precisely expressed by the notation; that the expression of the complex relationships in terms of the fundamental symbols c, p, m, f, while a principle of the analysis, did not preclude the introduction of single letters to denote the more frequently occurring complex ideas, just as the chemist, while expressing the composition of every substance in terms of the elementary substances, introduced special symbols to denote frequently occurring combinations; and that he wrote m and f not as suffixes but in the same letter as c and p, though they were symbols of a different kind, because the expressions were then more easily written and printed, and besides, for some applications numerical suffixes had to be introduced to distinguish the different children, or the different sons, or the different daughters.

TABLE V.—DEFINITION OF THE ENGLISH TERMS OF RELATIONSHIP.

Term or Phrase.	Equivalent.	Vocalised Equivalent.
Aunt, half blood	$fcpp$ ..	fayoyo.
„ full blood	$fc^{m}_{f}pp$ ..	famfoyo.
„ half blood, paternal	$fcpmp$ ..	fayomo.
„ full blood, „	$fc^{m}_{f}pmp$ ..	famfofo.
„ half blood, maternal	$fcpfp$ ..	fayofo.
„ full blood, „	$fc^{m}_{f}pfp$ ..	famfofo.
Brother, half blood	mcp	mayo.
„ full blood	$mc^{m}_{f}p$ ..	mamfo.
„ german	$mcmp$ ..	mamo.

TABLE I.—GENERAL RELATIONSHIPS OF THE FIRST FIVE ORDERS—THEIR

Order.	Genus.	General Meaning.	Irreducible Meaning.	Class.
I.....	*c* ..	child	child	lineal, descending .. ..
	p ..	parent	parent	lineal, ascending .. ..
II. ..	*cc* ..	grandchild	grandchild	lineal, descending .. ..
	cp ..	child of parent	brother or sister	collateral .. .. ..
	pc ..	parent of child	consort	affinal .. .. ..
	pp ..	grandparent	grandparent	lineal, ascending .. ..
III. ..	*ccc* ..	great grandchild	great grandchild	lineal, ascending .. ..
	ccp ..	grandchild of parent	nephew or niece	collateral, ...
	cpc ..	child of parent of child	step-child	step-lineal, descending ..
	cpp ..	child of grandparent	uncle or aunt	collateral .. .. ..
	pcc ..	parent of grandchild	child-in-law	affinal .. .. ..
	pcp ..	parent of child of parent	step-parent	step-lineal, ascending ..
	ppc ..	grandparent of child	parent-in-law	affinal .. .. ..
	ppp ..	great grandparent	great grandparent	lineal, ascending .. ..
IV. ..	*cccc* ..	great great grandchild	great great grandchild	lineal, descending .. ..
	cccp ..	great grandchild of parent	grandnephew or grandniece	collateral .. .. ..
	ccpc ..	grandchild of parent of child	child of step-child	step-lineal, descending ..
	ccpp ..	grandchild of grandparent	first cousin	collateral .. .. ..
	cpcc ..	child of parent of grandchild	step-child of child	step-lineal, descending ..
	cpcp ..	child of parent of child of parent	step-brother or step-sister	step-collateral .. ..
	cppc ..	child of grandparent of child	brother or sister of consort	first collateral of affinal ..
	cppp ..	child of great grandparent	granduncle or grandaunt	collateral .. .. ..
	pccc ..	parent of great grandchild	consort of grandchild	affinal .. .. ..
	pccp ..	parent of grandchild of parent	consort of brother or sister	first affinal of collateral ..
	pcpc ..	parent of child of parent of child	step-consort	step-affinal .. .. ..
	pcpp ..	parent of child of grandparent	step-parent of parent	step-lineal, ascending ..
	ppcc ..	grandparent of grandchild	parent-in-law of child	affinal .. .. ..
	ppcp ..	grandparent of child of parent	parent of step-parent	step-lineal, ascending ..
	pppc ..	great grandparent of child	grandparent of consort	affinal .. .. ..
	pppp .	great great grandparent	great great grandparent	lineal, ascending .. ..
V. ..	*ccccc* .	great great great grandchild	great great great grandchild	lineal, descending .. ..
	cccp .	great great grandchild of parent	great grandnephew or niece	collateral .. .. ..
	ccpc .	great grandchild of parent of child	grandchild of step-child	step-lineal, descending ..
	ccpp	great grandchild of grandparent	child of first cousin	collateral .. .. ..
	cpcc .	grandchild of parent of grandchild ..	child of step-child of child	step-lineal, descending ..
	cpcp .	grandchild of parent of child of parent ..	child of step-brother or sister	step-collateral .. ..
	cppc	grandchild of grandparent of child	nephew or niece of consort	first collateral of affinal ..
	cppp	grandchild of great grandparent	child of granduncle or grandaunt ..	collateral .. .. ..
	cpcc .	child of parent of great grandchild	step-child of grandchild	step-lineal, descending ..
	cpccp .	child of parent of grandchild of parent ..	step-child of brother or sister	first step-lineal of collateral
	cpcpc .	child of parent of child of parent of child ..	step-step-child	step-step-lineal, descending
	cpcpp	child of parent of child of grandparent ..	step-brother or step-sister of parent ..	step-collateral .. ..
	cppcc .	child of grandparent of grandchild	brother or sister of children-in-law ..	first collateral of affinal ..
	cppcp	child of grandparent of child of parent ..	brother of sister of step-parent	first collateral of step-lineal
	cpppc	child of great grandparent of child	uncle or aunt of consort	second collateral of affinal
	cpppp	child of great great grandparent	great granduncle or aunt	collateral .. .. ..
	pcccc .	parent of great great grandchild	consort of great grandchild	affinal .. .. ..
	pcccp .	parent of great grandchild of parent ..	consort of nephew or niece	second affinal of collateral
	pccpc	parent of grandchild of parent of child ..	consort of step-child	first affinal of step lineal
	pccpp	parent of grandchild of grandparent	consort of uncle or aunt	first affinal of collateral ..
	pcpcc	parent of child of parent of grandchild ..	step-consort of child	step-affinal .. .. ..
	pcpcp	parent of child of parent of child of parent ..	step-step parent	step-step-lineal, ascending
	pcppc	parent of child of grandparent of child ..	step-parent of consort	first step-lineal of affinal ..
	pcppp	parent of child of great grandparent ..	step-parent of grandparent	step-lineal, ascending ..
	ppccc	grandparent of great grandchild	parent-in-law of grandchild	affinal .. .. ..
	ppccp	grandparent of grandchild of parent ..	parent-in-law of brother or sister ..	first affinal of collateral ..
	ppcpc	grandparent of child of parent of child ..	parent of step-consort	step-affinal .. .. ..
	ppcpp	grandparent of child of grandparent ..	parent of step-parent of parent	step-lineal, ascending ..
	pppcc	great grandparent of grandchild	parent of parent-in-law of child ..	affinal .. .. ..
	pppcp	great grandparent of child of parent ..	grandparent of step-parent	step-lineal, ascending ..
	ppppc	great great grandparent of child	grandparent of parent-in-law	affinal .. .. ..
	ppppp	great great great grandparent	great great great grandparent	lineal, ascending .. ..

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EIR MEANING AND CLASSIFICATIONS.

	Sub-class.	Number.	Index.	Sign.	Grade.
..	..	first ..	1	+	1
..	..	first ..	−1	−	−1
..	..	second ..	2	+	2
..	first ..	first ..	1−1	+ −	0
..	first ..	first ..	−1+1	− +	0
..	..	second ..	−2	−	−2
..	..	third ..	3	+	3
..	first ..	second ..	2−1	+ −	1
..	first ..	first ..	1−1+1	+ − +	1
..	second ..	first ..	1−2	+ −	−1
..	second ..	first ..	−1+2	− +	1
..	first ..	first ..	−1+1−1	− + −	−1
..	first ..	second ..	−2+1	− +	−1
..	..	third ..	−3	−	−3
..	..	fourth ..	4	+	4
..	first ..	third ..	3−1	+ −	2
..	first ..	second ..	2−1+1	+ − +	2
..	second ..	second ..	2−2	+ −	0
..	second ..	first ..	1−1+2	+ − +	2
..	first ..	first ..	1−1+1−1	+ − + −	0
..	first ..	first ..	1−2+1	+ − +	0
..	third ..	first ..	1−3	+ −	−2
..	third ..	first ..	−1+3	− +	2
..	first ..	first ..	−1+2−1	− + −	0
..	first ..	first ..	−1+1−1+1	− + − +	0
..	second ..	first ..	−1+1−2	− + −	−2
..	second ..	second ..	−2+2	− +	0
..	first ..	second ..	−2+1−1	− + −	−2
..	first ..	third ..	−3+1	− +	−2
..	..	fourth ..	−4	−	−4
..	..	fifth ..	5	+	5
..	first ..	fourth ..	4−1	+ −	3
..	first ..	third ..	3−1+1	+ − +	3
..	second ..	third ..	3−2	+ −	1
..	second ..	second ..	2−1+2	+ − +	3
..	first ..	second ..	2−1+1−1	+ − + −	1
..	first ..	second ..	2−2+1	+ − +	1
..	third ..	second ..	2−3	+ −	−1
..	third ..	first ..	1−1+3	+ − +	3
ıl ..	first ..	first ..	1−1+2−1	+ − + −	1
; ..	first ..	first ..	1−1+1−1+1	+ − + − +	1
..	second ..	first ..	1−1+1−2	+ − + −	−1
..	second ..	first ..	1−2+2	+ − +	1
ıl ..	first ..	first ..	1−2+1−1	+ − + −	−1
..	first ..	first ..	1−3+1	+ − +	−1
..	fourth ..	first ..	1−4	+ −	−3
..	fourth ..	first ..	−1+4	− +	3
..	first ..	first ..	−1+3−1	− + −	1
..	first ..	first ..	−1+2−1+1	− + − +	1
..	second ..	first ..	−1+2−2	− + −	−1
..	second ..	first ..	−1+1−1+2	− + − +	1
..	first ..	first ..	−1+1−1+1−1	− + − + −	−1
..	first ..	first ..	−1+1−2+1	− + − +	−1
..	third ..	first ..	−1+1−3	− + −	−3
..	third ..	second ..	−2+3	− +	1
..	first ..	second ..	−2+2−1	− + −	−1
..	first ..	second ..	−2+1−1+1	− + − +	−1
..	second ..	second ..	−2+1−2	− + −	−3
..	second ..	third ..	−3+2	− +	−1
..	first ..	third ..	−3+1−1	− + −	−3
..	first ..	fourth ..	−4+1	− +	−3
..	..	fifth ..	−5		−5

TABLE II.—GENERAL RELATIONSHIPS OF

ORDER I.

Genus.

Line.		*m m*	*m f*	*f m*	*f f*
		m c m son of man	*m c f* son of woman	*f c m* daughter of man	*f c f* daughter of woman
p		*m p m* father of man	*m p f* father of woman	*f p m* daughter of man	*f p f* daughter of woman

Genus.

Line.		
	c c	son
	c p	broth
	p c	father
	p p	fathe

'S OF THE FIRST TWO ORDERS DIVIDED INTO THEIR ULTIMATE SPECIES.

ORDER II.

m m m	*m m f*	*m f m*	*m f f*	*f m m*	*f m f*	
m c m c m son of son of man	*m c m c f* son of son of woman	*m c f c m* son of daughter of man	*m c f c f* son of daughter of woman	*f c m c m* daughter of son of man	*f c m c f* daughter of son of woman	*f c.* daughte o
m c m p m brother-german of man	*m c m p f* brother-german of woman	*m c f p m* brother-uterine of man	*m c f p f* brother-uterine of woman	*f c m p m* sister-german of man	*f c m p f* sister-german of man	*f* sister-ut
m p m c m father of son of man (man)	*m p m c f* father of son of woman	*m p f c m* father of daughter of man (man)	*m p f c f* father of daughter of woman	*f p m c m* mother of son of man	*f p m c f* mother of son of woman (woman)	*f* mother o
m p m p m father of father of man	*m p m p f* father of father of woman	*m p f p m* father of mother of man	*m p f p f* father of mother of woman	*f p m p m* mother of father of man	*f p m p f* mother of father of woman.	*f p* mother r

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ffm	*fff*
fcfcm ıughter of daughter of man	*fcfcf* daughter of daughter of woman
fcfpm ister-uterine of man	*fcfpf* sister-uterine of woman
fpfcm ıother of daughter of man	*fpfcf* mother of daughter of woman (woman)
fpfpm other of mother of man	*fpfpf* mother of mother of woman

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TABLE III.—POSSIBLE RELATIONSHIPS OF A MAN TO A WOMAN, AND OF A WOMAN TO A MAN. (Within the first five Orders.)

		Man to Woman.		Woman to Man.	
Order.	Genus.	Notation.	Meaning.	Notation.	Meaning.
I.	*c*	*mcf*	*son	*fcm*	*daughter.
	p	*mpf*	*father	*fpm*	*mother.
II.	*cc*	*mccf*	*grandson	*fccm*	*granddaughter.
	cp	*mcpf*	*brother	*fcpm*	*sister.
	pc	*mpcf*	husband	*fpcm*	wife.
	pp	*mppf*	*grandfather	*fppm*	*grandmother.
III.	*ccc*	*mcccf*	great grandson	*fcccm*	great granddaughter.
	ccp	*mccpf*	*nephew	*fccpm*	*niece.
	cpc	*mcmpcf*	*son of husband	*fcpcm*	*daughter of wife.
	cpp	*mcppf*	*uncle	*fcppm*	*aunt.
	pcc	*mpcfcf*	*husband of daughter	*fpcmcm*	*wife of son.
	pcp	*mpcfpf*	*stepfather	*fpcmpm*	*step-mother.
	ppc	*mpmpcf*	*father of husband	*fpfpcm*	*mother.
	ppp	*mpppf*	great grandfather	*fpppm*	great grandmother.
IV.	*cccc*	*mccccf*	great grandson	*fccccm*	great great granddaughter.
	cccp	*mcccpf*	grandnephew	*fcccpm*	grandniece.
	ccpc	*mccmpcf*	*son of step-child	*fcfpcm*	*daughter of step-child.
	ccpp	*mccppf*	first cousin (male)	*fcppm*	first cousin (female).
	cpcc	*mcpccf*	stepson of child	*fcpccm*	step-daughter of child.
	cpcp	*mcpcpf*	step-brother	*fcpcpm*	step-sister.
	cppc	*mcpmpcf*	*brother of husband	*fcpfpcm*	*sister of wife.
	cppp	*mcpppf*	granduncle	*fcpppm*	grandaunt.
	pccc	*mpcfccf*	*husband of granddaughter	*fpcmccm*	*wife of grandson.
	pccp	*mpcfcpf*	*husband of sister	*fpcmcpm*	*wife of brother.
	pcpc	[*mpcfpcm*].	[husband of wife]	[*fpcmpcf*]	[wife of husband].
	pcpp	*mpcfppf*	*stepfather of parent	*fpcmppm*	*step-mother of parent.
	ppcc	*mppccf*	father-in-law of child	*fppccm*	mother-in-law of child.
	ppcp	*mppcpf*	father of step-parent	*fppcpm*	mother of step-parent.
	pppc	*mppmpcf*	*grandfather of husband	*fppfpcm*	*grandmother of wife.
	pppp	*mpppppf*	great great grandfather	*fppppm*	great great grandmother.
V.	*ccccc*	*mcccccf*	great great great grandson	*fccccm*	great great great granddaughter.
	cccpc	*mcccmpcf*	great grandnephew	*fcccpm*	great grandniece.
	cccpp	*mcccppf*	grandson of step-child	*fccfpcm*	granddaughter of step-child.
	ccpcc	*mccpccf*	son of first cousin	*fccppm*	daughter of first cousin.
	ccpcp	*mccpcpf*	son of step-child of child	*fcpccm*	daughter of step-child of child.
	ccppc	*mccpmpcf*	son of step-brother or step-sister	*fcpcpm*	daughter of step-brother or step-sister.
	ccppp	*mccppppf*	*nephew of husband	*fcpfpcm*	*niece of wife.
	cpccc	*mcpcccf*	son of granduncle or grandaunt	*fcpppm*	daughter of granduncle or grandaunt.
	cpccp	*mcpccpf*	step-son of grandchild	*fcpccm*	step-daughter of grandchild.
	cpcpc	*mcpcmpcf*	step-son of brother or sister	*fcpcpm*	step-daughter of brother or sister.
	cpcpp	*mcpcppf*	step-step-son	*fcpfpcm*	step-step daughter.
	cppcc	*mcppccf*	step-brother of parent	*fcppm*	step-sister of parent.
	cppcp	*mcppcpf*	brother of child-in-law	*fppccm*	sister of child in-law.
	cpppc	*mcpppmpcf*	brother of step-parent	*fppcpm*	sister of step-parent.
	cpppp	*mcppppf*	*uncle of husband	*fpppfpcm*	*aunt of wife.
	pcccc	*mpcfcccf*	great granduncle	*fppppm*	great grandaunt.
	pcccp	*mpcfccpf*	husband of great granddaughter	*fpcmccm*	wife of great grandson.
	pccpc	*mpcfcmpcf*	*husband of niece	*fpcmccpm*	*wife of nephew.
	pccpp	*mpcfcppf*	husband of step-daughter	*fpcmcfpcm*	wife of step-son.
	pcpcc	*mpcfpcmcf*	*husband of aunt	*fpcmcppm*	*wife of uncle.
	pcppc	*mpcfpmpcf*	other husband of daughter-in-law	*fpcmpcfcm*	other wife of son-in-law.
	pcppp	*mpcfpppf*	step-father of husband	*fpcmpcfpm*	step-step-mother.
	ppccc	*mppcccf*	step-father of grandparent	*fpcmpfpcm*	step-mother of wife.
	ppccp	*mppccpf*	father-in-law of grandchild	*fpcmpppm*	step-mother of grandparent.
	ppcpc	*mpfpcmpcf*	father-in-law of brother or sister	*fppcccm*	mother-in-law of grandchild.
	ppcpp	*mppcppf*	father of another wife of husband	*fppccpm*	mother-in-law of brother or sister.
	pppcc	*mpppccf*	father of step-parent of parent	*fpmpcfpcm*	mother of another husband of wife
	pppcp	*mpppcpf*	father of parent-in-law of child	*fpppccm*	mother of step-parent of parent.
	ppppc	*mpppmpcf*	grandfather of step-parent	*fppfpcm*	grandmother-in-law of child.
	ppppp	*mppppppf*	great grandfather-in-law	*fpppfpcm*	grandmother of step-parent.
			great great great grandfather	*fppppm*	great grandmother-in-law.
					great great great grandmother.

TABLE IV.—CONS

AGNATIC SYSTEM FOR

Order.	Genus.					
I.	*c*					*c m* child of man.
	p					*m p* father.
II.	*cc*			*c m c m* child of son of man.		
	c p					*c m p* brother or sister-german.
	p p			*m p m p* father of father.		
III.	*c c c*	*c m c m c m* child of son of son of man.		*c m c m c f* child of son of son of woman.		*c* child of son
	c c p			*c m c m p* child of brother-german.		
	c p p			*c m p m p* brother or sister-german of father.		
	p p p	*m p m p m p* father of father of father.		*m p m p f p* father of father of mother.		*m* father of
IV.	*c c c c*	*c m c m c m c m* child of son of son of son of man.	*c m c m c m c f* child of son of son of woman.	*c m c m c f c m* child of son of son of daughter of man.	*c m c m c f c f* child of son of son of daughter of woman.	*c m c f c m c m* child of son of daughter of son of man.
	c c c p	*c m c m c m p* child of son of brother-german.		*c m c m c f p* child of son of brother-uterine.		*c n* child of son
	c c p p	*c m c m p m p* child of brother-german of father.		*c m c m p f p* child of brother-german of mother.		*c m* child of broth
	c p p p	*c m p m p m p* brother or sister-german of father of father.		*c m p m p f p* brother or sister-german of father of mother.		*c* brother or sist o
	p p p p	*m p m p m p m p* father of father of father of father.	*m p m p m p f p* father of father of father of mother.	*m p m p f p m p* father of father of mother of father.	*m p m p f p f p* father of father of mother of mother.	*m p f p m p m p* father of mother o father of father.

CONSANGUINEOUS RELATIONSHIPS OF THE FIRST FOUR ORDERS GROUPED IN LINES AND S

I FORMED BY THE EXTREME TERMS ON THE LEFT; UTERINE SYSTEM FORMED BY THE EXTREME TERMS ON

c m c f
child of son of woman.

c f c m
child of daughter of man.

m p f p
father of mother.

f p m p
mother of father.

c m c f c m
of son of daughter of man.

c m c f c f
child of son of daughter of woman.

c f c m c m
child of daughter of son of man.

c f c m
child of daughter of

c m c f p
child of brother uterine.

c f c m p
child of sister-german.

c m p f p
brother or sister-german of mother.

c f p m p
brother or sister-uterine of father.

m p f p m p
ther of mother of father.

m p f p f p
father of mother of mother.

f p m p m p
mother of father of father.

f p m p
mother of fathe

n c m
son of
f son of
n.

c m c f c m c f
child of son of daughter of son of man.

c m c f c f c m
child of son of daughter of daughter of man.

c m c f c f c f
child of son of daughter of daughter of woman.

c f c m c m c m
child of daughter of son of son of man.

c f c m c m c f
child of daughter of son of son of woman.

c f c m c f c m f
child of daughter of son of daughter of man.

c m c f c m p
d of son of sister-german.

c m c f c f p
child of son of sister-uterine.

c f c m c m p
child of daughter of brother-german.

c f c m
child of daughter of

c m c f p m p
f brother-uterine of father.

c m c f p f p
child of brother-uterine of mother.

c f c m p m p
child of sister-german of father.

c f c m
child of sister-gern

c m p f m p
r or sister-german of mother of father.

c m p f p f p
brother or sister-german of mother of mother.

c f p m p m p
brother or sister-uterine of father of father.

c f p m
brother or sister-ute
moth

p m p
other of
father.

m p f p m p f p
father of mother of father of mother.

m p f p f p m p
father of mother of mother of father.

m p f p f p f p
father of mother of mother of mother.

f p m p m p m p
mother of father of father of father.

f p m p m p f p
mother of father of father of mother.

f p m p p m p
mother of father of mother of father.

SPECIES.

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)N THE RIGHT.

c f
child of woman.

f p
mother.

c f c f
child of daughter of woman.

c f p
brother or sister-uterine.

f p f p
mother of mother.

c m c f
r of son of woman.

c f c f c m
child of daughter of daughter of man.

c f c f c f
child of daughter of daughter of woman.

c f c f p
child of sister-uterine.

c f p f p
brother or sister-uterine of mother.

n p f p
ther of mother.

f p f p m p
mother of mother of father.

f p f p f p
mother of mother of mother.

c f c m c f c f
child of daughter of son of daughter of woman.

c f c f c m c m
child of daughter of daughter of son of man.

c f c f c m c f
child of daughter of daughter of son of woman.

c f c f c f c m
child of daughter of daughter of daughter of man.

c f c f c f c f
child of daughter of daughter of daughter of woman.

m c f p
: of brother-uterine.

c f c f c m p
child of daughter of sister-german.

c f c f c f p
child of daughter of sister-uterine.

m p f p
;erman of mother.

c f c f p m p
child of sister-uterine of father.

c f c f p f p
child of sister-uterine of mother.

m p f p
uterine of father of other.

c f p f p m p
brother or sister-uterine of mother of father.

c f p f p f p
brother or sister-uterine of mother of mother.

f p m p f p f p
mother of father of mother of mother.

f p f p m p m p
mother of mother of father of father.

f p f p m p f p
mother of mother of father of mother.

f p f p f p m p
mother of mother of mother of father.

f p f p f p f p
mother of mother of mother of mother.

Term of Phrase.	Equivalent.	Vocalised Equivalent.
Brother uterine	$mcfp$	mafo.
Child	c	ya.
Consort	pc	yoya.
Cousin, first	$ccpp$	yayayoyo.
„ second	$cccppp$	yayayayoyoyo.
Daughter	fc	fa.
Daughter-in-law	$fpcmc$	foyama.
Father	mp	mo.
Father-in-law	$mppc$	moyoya.
Grandchild	cc	yaya.
Granddaughter	fcc	faya.
Grandson	mcc	maya.
Husband	$mpcf$	moyaf.
Mother	fp	fo.
Mother-in-law	$fppc$	foyoya.
Nephew, half blood	$mccp$	mayayo.
„ full blood	$mcc\,{}^{m}_{f}p$	mayamfo.
Niece, half blood	$fccp$	fayayo.
„ full blood	$fcc\,{}^{m}_{f}p$	fayamfo.
Parent	p	yo.
Sister, half blood	fcp	fayo.
„ full blood	$fc\,{}^{m}_{f}\,p$	famfo.
„ german	$fcmp$	famo.
„ uterine	$fcfp$	fafo.
Son	mc	ma.
Son-in-law	$mpcfc$	moyafa.
Step-brother	$mcpcp$	mayoyayo.
Step-child	cpc	yayoya.
Step-daughter	$fcpc$	fayoya.
Step-father	$mpcfp$	moyafo.
Step-mother	$fpcmp$	foyamo.
Step-parent	pcp	yoyayo.
Step-sister	$fcpcp$	fayoyayo.
Step-son	$mcpc$	mayoya.
Uncle, half blood	$mcpp$	mayoyo.
„ full blood	$mc\,{}^{m}_{f}\,pp$	mamfoyo.
„ half blood, paternal	$mcpmp$	mayomo.
„ full blood, „	$mc\,{}^{m}_{f}\,pmp$	mamfomo.
„ half blood, maternal	$mcpfp$	mayofo.
„ full blood „	$mc\,{}^{m}_{f}\,pfp$	mamfofo.
Wife	$fpcm$	foyam.