584; Criticism of pretension of statistics, 586; Historical criticism, 588; Application in physics, 589; Clausius and Clerk-Maxwell, 590; Mathematical representation of experimental laws, 592; Irreversibility of natural processes, 593; Lord Kelvin, 594; "Availability" a theorem in probability, 597; "Selection" as conceived by Clerk-Maxwell, 598; Statistical knowledge of nature, 600; As opposed to historical and mechanical knowledge, 603; Sameness and variation, 607; Darwin, 608; Galton, 609; "Pangenesis," 610; Lends itself to statistical treatment, 611; Problem of Heredity, 613; Mr Bateson's historical treatment, 615; "Particulate" descent, 615; Application of theory of error, 618; Difference in application to living and lifeless units, 620; Professor Pearson: The mathematical problem, 621; Statistical knowledge one-sided, 624; Critical methods, 626; The instrument of exact research, 626.

## CHAPTER XIII.

## ON THE DEVELOPMENT OF MATHEMATICAL THOUGHT DURING THE NINETEENTH CENTURY.

History of thought, 627; Difference between thought and knowledge, 628; Popular prejudices regarding mathematics, 628; Use of mathematics, 630; Twofold interest in mathematics, 632; Origin of mathematics, 634; Gauss, 636; Cauchy, 636; Process of generalisation, 638; Inverse operations, 639; Modern terms indicative of modern thought, 643; Complex quantities, 644; The continuous, 644; The infinite, 644; Doctrine of series: Gauss, 645; Cauchy's Analysis, 647; Revision of fundamentals, 649; Extension of conception of number, 650; The geometrical and the logical problems, 651; Quaternions, 654; Foundations of geometry, 656; Descriptive geometry, 658; Poncelet, 659; Character of modern geometry, 662; Method of projection, 663; Law of continuity, 664; Ideal elements, 664; Principle of duality, 665; Reciprocity, 666; Steiner, 667; Mutual influence of metrical and projective geometry, 668; Plücker, Chasles, Cayley, 671; Historical and logical foundations, 671; Generalised co-ordinates, 673; Ideal elements, 674; Invariants, 676; Theory of forms, 678; Theory of numbers, 680; Symmetry, 681; Determinants, 682; Calculus of operations, 684; Principle of substitution, 686; General solution of equations, 687; Theory of groups, 689; Continuous and discontinuous groups, 691; Theory of functions, 693; Physical analogies, 696; The potential, 698; Riemann, 700; Weierstrass, 702; Riemann and Weierstrass compared, 707; Examination of foundations, 709; Non-Euclidean geometry, 712; Curva-