the income of a family of moderate means. Taking rich and poor together, and estimating the cost of washing at no more than 3d. per head weekly, the annual charge of washing to the metropolis alone is 1,535,030l., which is equal to about one-twenty fifth of the whole capital invested in the cotton manufactures of the United Kingdom. Hard water usually contains lime; and in washing that earth unites with the fatty acid of soap, producing an insoluble body of no use as a detergent. For every 100 gallons of Thames water, 30 oz. of soap are thus wasted, before a detergent lather is formed. In personal ablution we economize this excessive waste by the uncomfortable practice, universally followed in London, of taking about an ounce of water into the hands, and converting it into a lather, the water in the basin being only employed to rinse this off, instead of aiding in the detergence. But in washing linen this plan cannot be followed, every particle of the lime being removed before the soap becomes useful; this, as a matter of economy, is frequently accomplished by carbonate of soda, as being cheaper than soap. The amount of soap and soda salt thus wasted in the metropolis has been stated to be equal to the gross water rental. Hard water, besides wasting soap, produces a greater tear and wear of clothes.

All these facts are well known to manufacturers; and hence the care with which a water is selected before the seat of a manufactory is determined. Why, then, should we not attend to our domestic manufactures, considered trifling only because they are carried on with a great division of labour, unseen in its aggregate? Yet these domestic manufactures are of more importance, economically, than those carried on in large and imposing factories.

I wish I had time to refer, with sufficient detail, to the discovery of Mercer, who has shown that the immersion of cotton in soda or in sulphuric acid causes an equal contraction of the fibres, thus producing the mechanical effect of a loom. If a very fine calico, containing as much as 180 picks to the inch, be thus treated, it contracts to calico of 260 picks to the inch—a fineness not yet attained by any mechanical contrivance. This calico, in addition to its acquired fineness, has also assumed powers which enable it to receive colours superior to those assumed by ordinary calico. Before leaving this important discovery of Mercer, I should allude to one other by the same chemist. The French calico-printers employ mousselines-de-laine consisting altogether of wool; while in England we use a much cheaper fabric, consisting of wool and cotton. The colours on this mixture are, however, extremely meagre when compared with the former; but Mercer has shown that the mixed fabric acquires the properties of the other when it is treated with a bath of chloride of lime. This, one of the greatest discoveries ever made in calico-printing, has been of great value to this country.

I cannot, however, allude to all the triumphs of Chemistry in calico-printing, an art which has grown with the growth of Chemistry, and strengthened with its strength. The knowledge of mordants and of colours, and the other results of chemical discoveries, are of every-day occurrence. Let us take one of the last examples. Lapis lazuli, long celebrated for its beautiful blue, almost ranked among the precious stones, and was sold at a price which put it quite out of the reach of the calico-printer. But chemists, ascertaining its composition by analysis, soon learned how to make it by synthesis. Artificial ultramarine is now manuf[illegible]red at three or four shillings per pound. But when it was n[illegible], how was it to be fixed on cloth? From its insolubility its fixa[illegible]on was a real difficulty. Chemists suggested that the ultramarine might be mixed with albumen, which, being coagulated with heat, would retain the colour on the cloth to which it was applied. Whole barrels of the dried white of eggs are now to be seen at calico-print works. Yet this is an expensive process. Could common cheese not be substituted for the white of eggs? Cheese is soluble in ammonia; and the ultramarine, being mixed with this solution, is retained by the cheese, when the ammonia evaporates. Now, therefore, the ultramarine is fastened on by cheese, made from the buttermilk of Scotland, and sold under the name of lactarine.

Stannate of soda is a salt largely used by calico printers. The usual mode of preparing it was, (1), tin was reduced from its ore; (2), this tin was dissolved in muriatic acid; (3), it was oxidized by nitric acid or chlorine; (4), the oxide thus formed was precipitated and redissolved by soda, this bulky, aqueous solution being furnished to calico-printers. Mercer simplified the process, and obtained it in the solid state by two operations: (1), the tin was obtained as before; (2), this tin was fused with a mixture of nitrate of soda and caustic soda, the former oxidizing it, and the latter forming stannate of soda with the oxide thus formed. Young showed in the exhibition a still further simplification. The common ore of tin is an oxide: why then was it necessary to reduce it to the metallic state merely to oxidize it again? He therefore fused the ore at once with soda, the impurities remaining undissolved; and the salt was made by one operation. I quote this instance as a remarkable example of the tendency of Chemistry to simplify processes of manufacture.

I might refer to the important discoveries of yellow and red prussiate of potash, the formers of Prussian blue; but this would only be to cite one out of innumerable appliances. I prefer, therefore, to finish this part of the subject, by alluding to the resists and discharges used in calico-printing. In order to preserve white patterns in the process of dyeing, the nations of the East, whence calico-printing originated, still employ the most laborious mechanical devices, each white spot being covered with sealing-wax, or by being tied up and protected from the dye. By the aid of chemistry, we either discharge the colour on the cloth, or we put upon it bodies which resist the action of the mordants and prevent the colour attaching to that particular part. Acids made from the lees of wine (tartaric acid) and from the lemon (citric acid) are now largely used in these operations, and hence come the beautiful patterns we enjoy in our dresses. It was found that, even when the whites were thus obtained, they became soiled in washing off the excess of mordants from the other parts of the cloth; and the only mode of preventing this was, to treat the cloth with a bath of cowdung. Large dairies were consequently necessary adjuncts of a calico-print work. Chemistry has shown that the action of the manure is due to its phosphates; and a mixture of phosphate of soda, phosphate of lime, and size, is now substituted for the filthy baths formerly indispensable. I could spend hours in discoursing to you on the triumphs of Chemistry in the dyeing of textile fabrics, whether of cotton, wool, and silk, or their mixtures; but I must content myself with these few isolated examples, and pass on to other subjects.

Leather.—The manufacture of leather has been less advanced by the application of Chemical Science than any other of the arts. If Simon, the tanner of Joppa, had been able to send leather to the Exhibition, no doubt he would have carried off a medal for leather as good, and made exactly by the same process, as that of our most eminent manufacturers of the present day. And yet the science of leather production is better understood now than then; but so many physical conditions are involved in the production of good leather, that scientific processes have been unable to satisfy them all. The hides, steeped in an infusion of oak bark, absorb tannin and are converted into leather. Good sole leather takes about a year to tan, and even calf-skins consume a month in the operation. Chemists have certainly indicated substitutes for bark, containing a greater amount of tannin; and these, as for