locality changed readily. The block, as seen in the figure, has a bead on each edge; these beads are grooved to admit the label, which is of stiff parchment paper. The upper groove is deepest, so that the upper edge of the label may be pressed into it sufficiently to allow the lower edge to drop into the lower groove. It will be seen that we then have a label free to move, the entire periphery giving the utmost freedom for exhibiting every aspect of the specimen. Of course these blocks may be made with upright sides. Though the labels are more expensive for the bevelled ones, the latter have a more pleasing appearance.

COMPETITION BETWEEN THE ANILINE AND MADDER DYES.

BY A. S. MACRAE.

As these dyes are globularly used to the extent of some one hundred million dollars per annum; as they are as well known to the manufacturers of New England as to the horse-hide colorers of Japan, it may be interesting to inquire what effects, in *esse* and *posse* the one is having upon the other in commercial value. And as the market price invariably depends upon supply and demand, the source of the former must be examined into that the estimate of the latter may lead to judicious deductions.

Previous to the modern use of the above, indigo, cochineal, and the vegetable or wood dyes were altogether in vogue, and the inestimable appreciation of the indigo was primarily the cause which led to the discovery of aniline. The coloring matter of indigo has long been technically known as anil, and the manner in which it gave the name to aniline, has perhaps never been published before this present article. The botanist had ever been puzzled to know whence came the coloring matter of the indigo plant. Where it was indigenous the dyeing matter was inherent; but although the plant flourished almost anywhere in tropical climates, it invariably lost its color yielding power on this transportation! How was this? The botanist had to appeal to the chemist for explanation. Investigation demonstrated that the anil or coloring matter was solely due to the subsoil over which the indigo plant fructified, and that apart from this metaliferous or possibly bituminous earth, the coloring idiosyncrasy was lost. It will thus be seen that the article cannot be produced at will, but only where it and the soils are indigenous. However much this certainty baffled the botanist, it only set the chemist a-thinking. His analysis and synthesis showed beyond cavil, that anil, pure and simple, was neither more nor less than a hydro-carbonic compound, and that amongst some of these artificially produced compounds, anil, otherwise than the anil of indigo, might yet be discovered. The cheapest object for this research naturally suggested itself, and common coal-tar—the refuse of gas works—presented itself as the most economic basis of naphtha, and the matrix of an abundant hydro-carbon. It would be irrelevant here to trace the success which crowned the chemists' efforts to produce anil, or as it was now called, aniline, from this once—but now no longer so—rejected filth. But one portion of the discovery must be referred to, not only in demonstrating the discoverers' wonderful patience, but as proof of the capricious supply of this marvellous product. Coal tar, then, yields naphtha; naphtha, benzole; benzole, nitro-benzole; nitro-benzole, aniline. When the naphtha was first distilled from coal tar, no benzole was discovered in it, or, if it was discovered, in such small quantities as to defy remunerative production. But the trace was there, and as most auriferous deposits are discovered by traces, these said traces were pursued until the golden goal was scientifically and successfully attained. When the naptha was distilled by different temperatures, it was found that benzole was produced at one temperature that was smothered at another, and that by grading the distillations actual benzole could be eliminated in paying quantities! From this moment common coal-tar became the matrix of those valuable aniline dyes, which under the names of roseine, aniline reds and crimsons, Nicholson's blues, Humbolts, mauves, magentas, Bismark browns, oranges, iodine greens, purples, magdalas, violets, greens, phosphines, etc., have astonished the world for the last twenty years. Nearly all the dazzling colors worn now-a-days, that dim the sun and flaunt the eyes, are derived from the very cheapest of bases named, yet have arrived at such a value in the manipulation, that prices run from $2 to $30 a pound and in some cases even $6 an ounce.

At the period of these discoveries, madder had largely superceded indigo, cochineal and other dyes, and at its producable price was certainly the most economic dyeing product extant. Madder is neither more nor less than the ordinary madder root ground, a root capable of cultivation to an unlimited extent. Turkey in Asia, Italy, France, Spain, Holland, and Naples produced it in enormous quantities and British India soon followed suit. The importations into Great Britain at one time amounted to 50,000 tons, and at least a similar quantity was consumed in the countries of production. Unknown as madder may be by that nomenclature, every housewife knows it under the appellation of the "Turkey Red," the name manufacturers gave to their prints dyed by this article. Some idea of its consumption even in America may be given, when it is stated that the writer of this article saw some 500 tons of this madder in the manufactory of A. & W. Sprague & Co., of Providence, R. I., when he visited those works a few years ago.

If then aniline is used by the *pound* where madder is used by the *ton*, it may well be asked by merchants, manufacturers and dyers, what will be the effect of the competition between them? the one the limited production of human manipulation, the other the unlimited production of cultivated nature. We will examine the question.

"Every dog has its day," and in the day of aniline there was but one opinion, that it would sweep every other dye out of the vat-house. Not only was its application so simple, requiring solvents instead of mordants, but at the price, and especially at the price then current for all dyes, it was the cheapest, with given results. A cosmopolitan demand at once set in, therefore, for anilines, a demand which not only enhanced figures to famine prices, but which was far beyond the possibility of supply. That supply depended on coal tar; coal tar depended upon gas works; gas works, after all, are of limited number all over the world—*ergo*, the aniline supply could be but limited. As madder fell into a state of almost desuetude, prices naturally depreciated, until from an average of twelve cents a pound, it is not now worth two cents. Thus, as aniline became scarce, madder became cheap, and manufacturers were enabled to pit their "Turkey Reds" in the shape of Pompadour prints and their like, at prices the very best informed anilinists, or anybody else, never dreamt of. And this brings us to the issue.

We cannot now see, whatever we foresaw in bygone days, that madder and its derivatives, have anything at all to fear from aniline and its beautiful eliminates. As circumstances alter cases, so the position of the two chief dyes are equalized by the extent of the supply and the restrictions of demand. Aniline can not be produced *ad libitum*, madder can. Almost unlimited high prices will always be given for the former; but the latter, experience shows us for the first time, can be grown for almost unlimited low prices. The rich and the poor consumers can thus be well served; but madders go with the poor and therefore the popular prices of both may, nay they will, fluctuate as markets may dictate; but the fear that aniline will end in the supercession of madder is, we think, entirely groundless. The madder "day" is imminent, if not actual now-a-days, and wherever we go its "hues" are more prominent than those of its great competitors.

THE influence of magnetisation on the tenacity of iron has been lately studied by Signor Piazzoli. Iron wires were hung between two hooks and ruptured by pouring water into a vessel suspended from them. They were about 350 mm. long, and were inclosed in a spiral with four windings one over another, which were either all traversed by a current in one direction, or two by a current in one direction, and two by an equal opposite current, so that in both cases the wires were equally strongly heated by the spiral; but in one case they were magnetised, in the other not. The weights required to break wires annealed in charcoal—weight of one metre, $G = 0{\cdot}299$—were, during magnetisation, $P = 1260\text{-}1306$; without magnetisation, $P' = 1213\text{-}1270$. In the case of wires annealed in carbonic oxide—where $G = 0{\cdot}46$ g·—$P = 1732{\cdot}4\text{-}1742{\cdot}7$; $P' = 1703{\cdot}62\text{-}1719{\cdot}87$. In the case of wires annealed in hydrogen $P = 1289{\cdot}5\text{-}1310{\cdot}1$; $P' = 1263\text{-}1299{\cdot}7$. In each separate series accordingly the difference, $P - P'$ was frequently less than the difference between the highest and lowest weights required for rupture of apparently identical wires; still, the mean values in each of the fourteen series were from about 1 to 3 per cent greater for the magnetised than for the unmagnetised wires, showing that the tenacity of iron increases on magnetisation.

DEGENERATION.

By ALFRED R. WALLACE.

Degeneration causes an organism to become more simple in structure, in adaptation to less varied and less complex conditions of life. "Any new set of conditions occurring to an animal which render its food and safety very easily attained, seem to lead as a rule to degeneration; just as an active healthy man degenerates when he becomes suddenly possessed of a fortune; or as Rome degenerated when possessed of the riches of the ancient world. The habit of the parasitism clearly acts upon animal organisation in this way. Let the parasitic life once be secured, and away go legs, jaws, eyes and ears; the active and highly-gifted crab, insect, or annellid may become a mere sac, absorbing nourishment and laying eggs."

We see incipient cases of degeneration in the loss of limbs of the serpentiform lizards and the pisciform mammals; the loss of eyes in the inhabitants of caverns and in some earth-burrowers; the loss of wings in the Apteryx and of toes in the horse; and, still more curious, the loss of the power of feeding themselves in some slave-holding ants. More pronounced cases are those of the barnacles—degenerated crustacea, and the mites—degenerate spiders; while we reach the climax of the process in Ascidians—degenerate vertebrates, and such mere living sacs as the parasitic Sacculina and Lernæocera, which are degenerated crustaceans. Not only such lesser groups as the above, but whole orders may be the result of degeneration. Such are the headless bivalve mollusca known as Lamellibranchs, which are believed to have degenerated from the head-bearing active cuttle-fish type; while the Polyzoa or Moss-polyps stand in the same relation to the higher Mollusca as do the Ascidians to the higher Vertebrates.

While discarding the hypothesis that all savages are the descendants of more civilized races, Prof. Lankester yet admits the application of his principle to explain the condition of some of the most barbarous races—"such as the Fuegians, the Bushmen, and even the Australians. They exhibit evidence of being descended from ancestors more cultivated than themselves." He even applies it to the higher races in intellectual matters, and asks: "Does the reason of the average man of civilized Europe stand out clearly as an evidence of progress when compared with that of the men of bygone ages? Are all the inventions and figments of human superstition and folly, the self-inflicted torturing of mind, the reiterated substitution of wrong for right, and of falsehood for truth, which disfigure our modern civilization—are these evidence of progress? In such respects we have at least reason to fear that we may be degenerate. It is possible for us—just as the Ascidian throws away its tail and its eyes and sinks into a quiescent state of inferiority—to reject the good gift of reason with which every child is born, and to degenerate into a contented life of material enjoyment accompanied by ignorance and superstition."

This is very suggestive; but we may, I think, draw a yet higher and deeper teaching from the phenomena of degeneration. We seem to learn from it the absolute necessity of labor and effort, of struggle and difficulty, of discomfort and pain, as the condition of all progress, whether physical or mental, and that the lower the organism the more need there is of these ever-present stimuli, not only to effect progress, but to avoid retrogression. And if so, does not this afford us the nearest attainable solution of the great problem of the origin of evil? What we call evil is the *essential* condition of progress in the lower stages of the development of conscious organisms, and will only cease when the mind has become so thoroughly healthy, so well balanced, and so highly organized, that the happiness derived from mental activity, moral harmony, and the social affections, will itself be a sufficient stimulus to higher progress and to the attainment of a more perfect life.

For numerous instructive details connected with degenerated animals we refer our readers to the work itself—truly a small book on a great subject, and one which discusses matters of the deepest interest, alike to the naturalist and the philosopher..—*Nature.*